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Vol. XX.

A MONOGRAPH OF THE
SOUTH ASIAN, PAPUAN, MELANESIAN
AND AUSTRALIAN FROGS
OF THE GENUS RANA.

By
G. A. BOULENGER, LL.D., D.Sc., F.R.S.

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*Price Six Rupees.*

A MONOGRAPH OF THE SOUTH ASIAN,  
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FROGS OF THE GENUS  
*RANA*.<sup>1</sup>

By G. A. BOULENGER, LL.D., D.Sc., F.R.S., etc.

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The species of the large genus *Rana*, now about 195 in number,<sup>2</sup> have long been in need of a thorough revision. In the following pages I propose to deal with those inhabiting the Indo-Malay Region, or rather Southern Asia, to which I have added the few which extend the range of the genus to the Papuan and Melanesian islands and the extreme north of Australia (Cape York). I have taken as the northern and western limit of the area dealt with a line drawn from Palestine through Northern Persia, the Hindoo-Coosh (Hindu Kush) and Karakorum mountains to and including the Yang-tse-Kiang, a limit answering better the requirements of a survey of the distribution of Tailless Batrachians than those usually adopted for other groups of animals.

The collection of the British Museum has greatly increased of late and affords ample material for the study I have undertaken; in addition to this I have received much help from Dr. Annandale, both in material and in discussing some knotty points in connexion with Indian species. My grateful thanks are due to him.

I therefore hope and trust the detailed descriptions I have drawn up, making use of several characters hitherto neglected, will prove of lasting value for the better understanding of the species, and of their inter-relationships. The description of Frogs is much more difficult than that of Reptiles, the naked skin depriving us of the aid derived from the proportions and disposition of the shields and scales and their numerical characters; measurements of the different parts of the body are of first importance, and I have therefore prepared tables of very numerous adult or half-grown specimens, in order to convey exact information on this point, and also to show the amount of individual variation, a matter of great importance which is so often passed over.

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<sup>1</sup> At Dr. Boulenger's request I have added notes on the habits, geographical range, etc., of species with which I am personally acquainted. These notes are enclosed in square brackets and initialled. *N. Annandale*.

<sup>2</sup> Nearly twice the number given in my Catalogue of 1882, after elimination of the Madagascar species which are now placed in the genera *Mantidactylus*, Blgr. and *Aglyptodactylus*, Blgr.

The time has come to rid ourselves of the empirical methods which have necessarily prevailed so long in zootaxy, and to endeavour to group species, as far as possible, according to their probable phylogenetic relationships, and for this purpose it is desirable to fix one's ideas by establishing a theoretical prototype from which phyletic lines may be drawn up. This I have recently attempted to do in a paper<sup>1</sup> of which an abstract is here given.

The *Firmisternia* are certainly derived from the Arcifera, as shown by their ontogeny, and among the latter the Cystignathidae agree in so many points with the Ranidæ that we may legitimately assume a direct genetic relationship between them.

Dealing first with external characters, I consider the complete separation of the outer metatarsals by web as the most primitive character, which is not correlated with the degree of development of the web between the toes. In all the series of allied forms in which the phyletic tendencies are clearly indicated, we can follow the gradual reduction of the membrane; the species with fully webbed toes are, therefore, the least specialized, so far as this character is concerned.

The dilatation of the tips of the digits is a specialization culminating in the large scansorial discs of the species adapted to an arboreal life.

The primitive frog must have had a well-developed tympanum covered by a very thin skin. The reduction of the organ, which may be completely concealed under the thick skin, leads to its suppression (*R. pleskei*).

The prominent glands on the back have often a tendency to run together in longitudinal ridges, irregular at first and ultimately localized, such as the dorso-lateral fold which characterizes a great number of species. However, this fold may again disappear, as some species of *Hylorana* seem to show; it is therefore necessary to distinguish, from the other characters taken in conjunction, whether the absence of the fold is primary or secondary.

The skeleton affords important indications for judging of the phylogenetic relationships. I have limited myself to the use of characters which may be ascertained without difficulty on spirit specimens. Such are those derived from the skull, which can be examined by lifting up the skin, usually feebly adherent, and the pectoral arch, which can be exposed by making an incision along the breast and removing the muscles. The shape of the terminal phalanges is easily revealed by the dissection of the tip of one of the fingers or toes.

I regard as the most typical a skull such as that of *R. hexadactyla*, in which the nasals are large, and in contact with each other and with the frontoparietals, the upper surface of the ethmoid being covered over. From such a type we may derive on the one hand those forms in which the cranial roof is expanded, and

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<sup>1</sup> *Bull. Soc. Zool. France*, 1918, p. 111.

the bones rugose and more or less confluent with the skin, on the other those in which the nasals and the frontoparietals are reduced.

Most species agree with the type of the genus, *Rana temporaria*, in having a strong, horizontal clavicle (so-called precoracoid), and a simple omosternum (episternum). But the omosternum may be forked at the base, A-shaped, and this I regard as a specialization; whilst the oblique direction of the clavicle, diverging from the coracoid towards the median line, as in a few African species, is certainly an approximation to the original condition in the Cystignathidae. The African frogs of the subgenera *Hildebrandtia* and *Ptychadena* show a high specialization in the reduction of the clavicles.

The species with simply pointed terminal phalanges I regard as the most primitive; a transverse distal expansion, which may be carried so far as to give the bone the shape of a T or a Y, in connexion with the scansorial discs, is a departure from the primitive type, and so is the claw-shaped phalanx which is characteristic of *Ptychadena*.<sup>1</sup>

Basing our considerations on these theoretical conceptions, we find that *Rana hexadactyla* is, among Asiatic species, the nearest approach to the ideal prototype: Outer metatarsals separated, fully webbed toes, pointed fingers and toes, distinct tympanum, absence of dorso-lateral glandular fold, condition of the skull. In the shoulder-girdle, with horizontal clavicles and forked omosternum, it is, however, more advanced than some of its African congeners.

I therefore start with *R. hexadactyla*, from which the series headed by *R. tigrina* and *R. grunniens* can be directly derived. How other series, corresponding to the subgenera into which the genus is divided, may be derived from *Rana*, *sensu stricto*, is expressed in the synopsis given further on.

Having explained the principles by which I have been guided in the classification of the species, I need hardly add that their application is not without many difficulties, which I am still unable to overcome. I trust, however, that the present arrangement constitutes a marked progress on past attempts.

A few words of explanation are necessary concerning the method of taking measurements.

The length of the head and of the snout are taken along the axis, and the posterior extremity of the head corresponds to the articulation of the skull with the vertebral column, which can be approximately ascertained, in the flesh, by feeling with the points of the compasses. The width of the head is the greatest width, at the commissures of the jaws.

The tympanum,<sup>2</sup> of which the greatest diameter is given, is compared with the eye, measured along the side of the head. The limbs are measured fully stretched out, the hind limb from the

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<sup>1</sup> Cf. Boulenger, *C.R. Ac. Sci. Paris*, CLXV, 1917, p. 987.

<sup>2</sup> In a recent paper published in the *Records of the Indian Museum* (XV, 1918, p. 97), Mr. Bains Prashad proposes to substitute the name 'tympanic area'

middle line of the thigh where it joins the body. By foot is meant the foot without the tarsus; it is measured from the tarso-metatarsal articulation. Each finger or toe is measured from the point at which it joins its fellow, and if this is not the same on both sides, as in the case of the fourth toe, from the point most remote from the tip. The length of the first toe is reckoned from the distal extremity of the base of the inner metatarsal tubercle.

### Genus *Rana*, L.

Tongue extensively free and more or less deeply notched and bifid behind. Vomerine teeth (exceptionally absent). Pupil roundish-subtriangular or horizontal, or rhombic and very contractile.<sup>1</sup> Fingers free, toes more or less extensively webbed (exceptionally nearly free). Omosternum and sternum with a bony style. No intercalary bone between the penultimate and distal phalanges.

Divided into 9 subgenera:—

I. Clavicles strong, straight or feebly curved, horizontal or directed forward, narrowly separated on the median line.

A. Digits not dilated at the end, or with dilatations devoid of horizontal groove.

1. Tympanum present; squamosal not forming a suture with the maxillary.

a. Outer metatarsals separated by web, at least in the distal half.

*Rana*, *sensu stricto*. Type: *R. temporaria*, L. 14 Eurasian species, 22 American, 11 African, 45 Indo-Malayan, 1 Papuan.

b. Outer metatarsals united or separated only in their distal extremity; omosternum usually forked at the base.<sup>2</sup>

*Tomopterna*, D. et B. Type: *T. delalandii*, D. et B. 4 Indian species, 4 African. Burrowing forms, connected with *Rana* (*R. tigrina-limnocharis* group) through the Indian *R. rufescens*, Jerd.

2. Tympanum present; squamosal forming a suture with the maxillary.

a. Outer metatarsals completely united; omosternum entire.

*Pyxicephalus*, Tsch. Monotype: *P. adspersus*, Tsch., Africa. Burrowing form like the preceding, probably derived from another group of *Rana*.

b. Outer metatarsals separated in the distal third or fourth; omosternum forked at the base.

*Aubria*, Blgr. Monotype: *R. subsigillata*, A. Dum., Africa. Probably derived from the *R. tigrina* group, like *Tomopterna*, but in a different direction.

to tympanum as universally used. When we say the tympanum is distinct, we do not convey the idea that it is exposed; just as we are fully justified in stating that the eye of a frog is distinct even when the transparent lower lid is drawn over it. Mr. Baini Prashad has quoted various authors to show that "a great deal of confusion exists regarding the tympanum being a structure distinct from the skin or otherwise." He should have referred to the introduction to my book,

'The Tailless Batrachians of Europe' (Ray Society, 1897), in which (p. 11), dealing with the external characters, I have thus described the state of things:—"The tympanum, or drum of the ear, is absent in *Bombinator* and *Pelobates*. When present it may be concealed under the skin, as in some specimens of *Discoglossus*, *Pelodytes*, and *Bufo vulgaris*, or appear on the temple behind the eye as a round or oval disk covered with thin skin."

<sup>1</sup> As in *R. corrugata*, *kuhlii* and *spinosa*.

<sup>2</sup> The character suffers exceptions, as Miss Procter has pointed out to me that the omosternum may be simple in specimens of *R. delalandii*. Is this to be regarded as a case of reversion to the original condition? It shows at any rate that great systematic importance cannot be attached to the shape of the omosternum.

3. No tympanum ; outer metatarsals separated in the distal third or fourth ; omosternum entire.

*Nanorana*, Gthr. Monotype : *N. pleskei*, Gthr., Kashmir and Thibet. Connected with the *R. liebigii* group through *R. blanfordii*, Blgr.

- B. Toes, often also fingers, dilated at the end, the dilatation, or disc, bearing a crescentic or horseshoe-shaped horizontal groove.

1. Outer metatarsals united or separated only in the distal third ; omosternum forked at the base.

*Discodeles*, Blgr. Type : *R. guppyi*, Blgr. 6 Indo-Malayan species, 3 Melanesian. Connected with *Rana* (*R. grunniens* group) ; leads to the Indo-Malayan, Papuan, and Melanesian genera *Cornufer*, Tsch., and *Platymantis*, Gthr.

2. Outer metatarsals separated at least in the distal half ; omosternum entire.

*Hylorana*, Tsch. Type : *R. erythraea*, Schleg. 58 South Asian species, 1 African, 5 Papuan and Melanesian. Completely connected with *Rana* (*Ranae typicae*) ; leads to the Indo-Malayan genera *Staurois*, Cope, and *Simomantis*, Blgr.<sup>1</sup>

- II. Clavicles very slender, curved or directed obliquely backwards, widely separated on the median line.

- A. Outer metatarsals united ; omosternum entire.

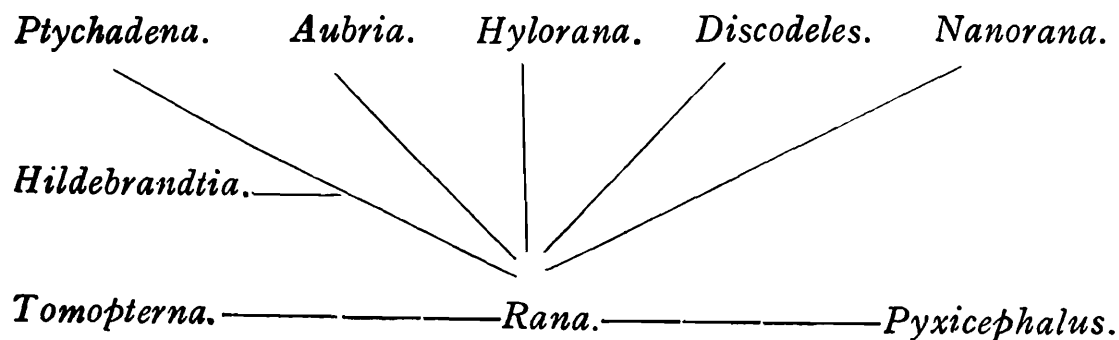
*Hildebrandtia*, Nieden. Type : *R. ornata*, Peters. 7 species from Africa. Burrowing forms.

- B. Outer metatarsals separated ; omosternum forked at the base ; distal phalanges claw-shaped.

*Ptychadena*, Blgr. Type : *R. mascareniensis*, D. et B. 16 species from Africa.

These two last subgenera are probably derived, as divergent series, from a common ancestral type connected with the subgenus *Rana*.

The following diagram expresses the relations between these subgenera, as I conceive them.



Subgenus *Rana*, s. str.

#### SYNOPSIS OF THE SPECIES.

- I. Dorso-lateral glandular fold absent or, if present, not connected with the supratemporal fold ; outer metatarsals separated at least in the distal half.
- A. Tympanum very distinct, smooth ; nasal bones in contact with each other, with two exceptions<sup>2</sup> ; omosternal style forked at the base.
1. Inner metatarsal tubercle small but very prominent, pointed, digitiform ; fingers pointed ; toes webbed to the tips ; male with external vocal sacs.
- Vomerine teeth in strong oblique series in the adult ; first finger longer than second ; toes pointed ; tibia 2 to 2½ times as long as broad ; throat and belly with granules and small warts ... .. *R. hexadactyla*, Less.

<sup>1</sup> Cf. Boulenger, *Ann. and Mag. N. H.* (9) I, 1918, p. 372.

<sup>2</sup> *R. microdisca* and *palavanensis*.

- Vomerine teeth in small groups; first and second fingers equal; tips of toes swollen or dilated into very small discs; tibia  $2\frac{1}{2}$  to  $3\frac{1}{2}$  times as long as broad; throat and belly usually smooth ... *R. cyanophlyctis*, Schn.
2. Inner metatarsal tubercle small or large, blunt or compressed, not digitiform; toes  $\frac{1}{3}$  to entirely webbed.
- a. Toes with obtuse or slightly swollen tips; vomerine teeth between the choanae, often extending posteriorly beyond them; male with a more or less developed pad on the inner finger.
- a. No outer metatarsal tubercle; toes  $\frac{1}{4}$  to entirely webbed; first finger longer than second; tibia  $2\frac{1}{4}$  to 3 times as long as broad; male with external vocal sacs.
- Toes completely webbed; tibio-tarsal articulation reaching tip of snout ... *R. verruculosa*, Roux.
- Toes completely or nearly completely webbed; tibio-tarsal articulation not reaching tip of snout ... *R. tigrina*, Daud.
- Toes incompletely webbed, or with the web deeply notched; tibio-tarsal articulation not reaching tip of snout ... *R. cancrivora*, Gravh.
- β. Usually a more or less distinct outer metatarsal tubercle.
- \* Toes  $\frac{2}{3}$  to  $\frac{3}{4}$  webbed; tibia  $3\frac{1}{2}$  to 4 times as long as broad; head and back rough with warts of unequal size; male with internal vocal sacs ... *R. verrucosa*, Gthr.
- \*\* Toes usually not more than  $\frac{1}{2}$  webbed, rarely  $\frac{2}{3}$ ; male with external vocal sacs.
- Toes  $\frac{1}{2}$  to  $\frac{2}{3}$  webbed; tibia  $2\frac{3}{4}$  to  $3\frac{1}{2}$  times as long as broad; tibio-tarsal articulation not reaching beyond tip of snout; first finger longer than second ... *R. limnocharis*, Wieg.
- Toes not quite  $\frac{1}{2}$  webbed; tibia 3 to 4 times as long as broad; tibio-tarsal articulation not reaching tip of snout; first finger not or but very slightly longer than second ... *R. greenii*, Blgr.
- Toes barely  $\frac{1}{3}$  webbed; tibia 4 to  $4\frac{1}{2}$  times as long as broad; tibio-tarsal articulation reaching tip of snout or beyond; first finger longer than second ... *R. brevipalmata*, Peters.
- b. Toes with the tips dilated into distinct discs; male without or with internal vocal sacs, without enlargement of the fore limb or inner finger, often with tooth-like bony processes in front of lower jaw.
- a. Vomerine teeth extending behind level of choanae, or entirely behind them.
- \* Tibia 3 to 4 times as long as broad; nasal bones large and in contact with each other and with the frontoparietals.
- † Toes  $\frac{3}{4}$  to entirely webbed; interorbital region flat.
- § First finger much longer than second.
- Tympanum  $\frac{1}{2}$  to  $\frac{2}{3}$  diameter of eye; tibia more than twice in length from snout to vent; heels not overlapping; male without vocal sacs, without tooth-like processes in lower jaw ... *R. grunniens*, Daud.
- Tympanum  $\frac{2}{5}$  to  $\frac{5}{6}$  diameter of eye; tibia  $1\frac{3}{4}$  to  $2\frac{1}{7}$  times in length from snout to vent; heels overlapping; discs of toes very small, male without vocal sacs, with tooth-like processes in lower jaw ... *R. macrodon*, D. et B.
- Tympanum  $\frac{1}{4}$  to  $\frac{2}{5}$  diameter of eye; tibia 2 to  $2\frac{1}{4}$  times in length from snout to vent; heels not overlapping; discs of toes rather large; male with vocal sacs, with tooth-like processes in lower jaw ... *R. magna*, Stejn.
- Tympanum  $\frac{2}{6}$  to  $\frac{3}{5}$  diameter of eye; tibia nearly 2 to  $2\frac{1}{4}$  times in length from snout to vent; heels overlapping; discs of toes very small; male with vocal sacs, with tooth-like processes in lower jaw ... *R. modesta*, Blgr.
- §§ First finger not much longer than second.
- Tympanum  $\frac{1}{3}$  size of eye; first finger as long as or a little shorter than second ... *R. microtympanum*, [v. Kamp.

- Tympanum  $\frac{1}{2}$  to  $\frac{3}{4}$  diameter of eye ; first finger a little longer than second ; tibia  $1\frac{3}{4}$  to  $2\frac{1}{2}$  times in length from snout to vent ; heels overlapping ; male without vocal sacs, without tooth-like processes in lower jaw ... *R. doriae*, Blgr.
- †† Toes  $\frac{2}{3}$  to nearly entirely webbed ; male with the interorbital region very convex, swollen behind, with tooth-like processes in the lower jaw, no vocal sacs, and the tympanum as large as or a little larger than the eye.
- Tibia at least twice in length from snout to vent ; inner metatarsal tubercle  $\frac{1}{2}$  to  $\frac{2}{3}$  length of inner toe ; interorbital swelling of male rounded behind ... *R. macrognathus*, Blgr.
- Tibia at least twice in length from snout to vent ; inner metatarsal tubercle  $\frac{1}{3}$  to  $\frac{1}{2}$  length of inner toe ; interorbital swelling of male followed by a dermal flap ... *R. pileata*, Blgr.
- Tibia  $1\frac{1}{2}$  to 2 times in length from snout to vent ; inner metatarsal tubercle about  $\frac{2}{3}$  length of inner toe ; back with 8 or 10 glandular longitudinal folds ; interorbital swelling of male followed by a knob-like prominence ... *R. plicatella*, Stol.
- ††† Toes  $\frac{1}{3}$  to  $\frac{1}{2}$  webbed ; tibia  $1\frac{2}{3}$  to 2 times in length from snout to vent.
- Tympanum  $\frac{1}{2}$  to  $\frac{2}{3}$  diameter of eye ; inner metatarsal tubercle feebly prominent,  $\frac{2}{5}$  to  $\frac{3}{5}$  length of inner toe ; male without vocal sacs, without tooth-like prominences in lower jaw ... *R. hascheana*, Stol.
- Tympanum  $\frac{3}{8}$  to  $\frac{3}{4}$  diameter of eye ; inner metatarsal tubercle very prominent,  $\frac{2}{3}$  to  $\frac{3}{4}$  length of inner toe ; male with vocal sacs and tooth-like prominences in lower jaw ... *R. limborgii*, W. Schl.
- \*\* Tibia 4 to 5 times as long as broad, less than twice in length from snout to vent ; toes  $\frac{2}{3}$  to  $\frac{3}{4}$  webbed ; first finger as long as or a little longer than second ; nasal bones moderately large and separated from each other.
- No dorso-lateral fold ; male without vocal sacs, with rather small tooth-like prominences in lower jaw ... *R. microdisca*, Boettg.
- A dorso-lateral fold ; male with vocal sacs, without tooth-like prominences in lower jaw ... *R. palavanensis*, Blgr.
- β. Vomerine teeth in nearly transverse series on a level with the posterior borders of the choanae ; nostrils close to the tip of the snout ; tympanum  $\frac{1}{2}$  diameter of eye ; first finger longer than second ; toes nearly entirely webbed ... *R. narina*, Stejn.
- B. Tympanum hidden or but feebly distinct ; tips of toes dilated into more or less distinct discs ; male without vocal sacs, without enlargement of the fore limb, with large tooth-like prominences in front of lower jaw ; nasal bones in contact with each other ; omosternal style forked at the base.
- Tibio-tarsal articulation reaching temple or posterior border of eye ; heels not meeting ; tibia 2 to  $2\frac{1}{2}$  times as long as broad,  $2\frac{1}{3}$  to  $2\frac{2}{3}$  times in length from snout to vent ; toes entirely webbed ; first finger usually a little shorter than second ... *R. corrugata*, Peters.
- Tibio-tarsal articulation reaching temple or eye ; heels meeting or not ; tibia  $2\frac{1}{3}$  to 3 times as long as broad, 2 to  $2\frac{1}{2}$  times in length from snout to vent ; toes entirely or nearly entirely webbed ; first finger as long as or a little longer than second ... *R. kuhlii*, D. et B.
- Tibio-tarsal articulation reaching beyond eye ; heels overlapping ; tibia  $2\frac{1}{2}$  to  $3\frac{1}{2}$  times as long as broad,  $1\frac{1}{2}$  to 2 times in length from snout to vent ; toes  $\frac{2}{3}$  to nearly entirely webbed ; first finger as long as or a little longer than second ... *R. laticeps*, Blgr.
- C. Tympanum hidden or only moderately distinct ; no tooth-like processes in front of lower jaw ; omosternal style not forked at the base.
1. Tibio-tarsal articulation not reaching beyond eye ; no dorso-lateral fold ;

- toes entirely or nearly entirely webbed ; breeding male with much thickened fore limb and horny spinules on the inner fingers and on the breast.
- a. Tympanum distinct ; a tarsal fold ; male with internal vocal sacs.
- a. Tibio-tarsal articulation reaching eye ; tibia  $2\frac{1}{3}$  to  $3\frac{1}{3}$  times as long as broad, twice in length from snout to vent.
- First finger longer than second ; tips of toes not swollen ; inner metatarsal tubercle  $\frac{2}{3}$  length of inner toe ... *R. feae*, Blgr.
- First and second fingers equal ; tips of toes slightly dilated ; inner metatarsal tubercle compressed, sharp-edged ... *R. yunnanensis*, And.
- First finger slightly longer than second ; tips of toes swollen ; inner metatarsal tubercle  $\frac{5}{7}$  length of inner toe ... *R. tibetana*, Blgr.
- β. Tibio-tarsal articulation reaching temple or posterior border of eye ; tibia 3 to  $3\frac{1}{3}$  times as long as broad,  $2\frac{1}{5}$  to  $2\frac{1}{3}$  times in length from snout to vent ; first finger as long as or a little shorter than second ; tips of toes obtuse or slightly swollen ; inner metatarsal tubercle  $\frac{2}{5}$  to  $\frac{1}{2}$  length of inner toe ... *R. sternosignata*, Murr.
- b. Tympanum hidden or very indistinct ; first finger longer than second.
- Tibio-tarsal articulation reaching shoulder or tympanum ; tibia  $2\frac{1}{3}$  times as long as broad,  $2\frac{1}{5}$  to  $2\frac{1}{3}$  times in length from snout to vent ; heels not overlapping ; tips of toes not swollen ; inner metatarsal tubercle  $\frac{1}{3}$  length of inner toe ; male with internal vocal sacs ... *R. phrynoides*, Blgr.
- Tibio-tarsal articulation reaching eye ; tibia  $2\frac{2}{3}$  to  $3\frac{1}{3}$  times as long as broad, about twice in length from snout to vent ; heels overlapping ; tips of toes swollen ; inner metatarsal tubercle  $\frac{2}{3}$  length of inner toe ; male with internal vocal sacs ... *R. spinosa*, David.
- Tibio-tarsal articulation reaching eye ; tibia  $1\frac{2}{3}$  to nearly 2 times in length from snout to vent ; heels overlapping ; tips of toes swollen ; inner metatarsal tubercle  $\frac{1}{4}$  length of inner toe ; male without vocal sacs ... *R. gammiei*, And.
- II. Tibio-tarsal articulation reaching nostril, tip of snout, or beyond ; heels overlapping ; tibia 3 to 4 times as long as broad,  $1\frac{2}{3}$  to 2 times in length from snout to vent ; first finger as long as or a little shorter than second ; tips of toes swollen.
- a. Male with much thickened fore limb, with horny spinules on the inner finger and on the breast.
- Head a little broader than long ; tympanum feebly distinct ; toes  $\frac{3}{4}$  webbed ; dorso-lateral fold distinct only in front ; male without vocal sacs ... *R. annandalii*, Blgr.
- Head much broader than long ; tympanum hidden or very indistinct ; toes entirely webbed ; a dorso-lateral fold usually distinct ; male with internal vocal sacs ... *R. liebigii*, Gthr.
- b. Male with fore limb not much thickened, without spinules, without vocal sacs ; head a little broader than long.
- Tympanum distinct ; toes entirely webbed ; a feeble dorso-lateral fold ... *R. assamensis*, W. Scl.
- Tympanum hidden ; toes entirely webbed ; no dorso-lateral fold ... *R. vicina*, Stöl.
- Tympanum very indistinct ; toes  $\frac{2}{3}$  to  $\frac{3}{4}$  webbed ; no dorso-lateral fold ... *R. blanfordii*, Blgr.
- II. A glandular dorso-lateral fold,<sup>1</sup> connected with the supratemporal fold ; tympanum very distinct, smooth.
- A. Omosternal style not forked at the base.
- I. Outer metatarsals separated nearly to the base.
- a Canthus rostralis very obtuse or indistinct ; interorbital space much

<sup>1</sup> Absent or indistinct in some specimens of *R. grahami* and *R. malabarica*.

- narrower than the upper eyelid ; tibia 3 to 4 times as long as broad ; nasal bones large and in contact with each other or narrowly separated.
- Fingers pointed ; toes entirely webbed ; male with internal vocal sacs ... *R. planicyi*, Lataste.
- Fingers obtuse or obtusely pointed ; toes  $\frac{3}{4}$  to entirely webbed ; male with external vocal sacs ... *R. esculenta*, L.
- Fingers obtusely pointed ; toes  $\frac{1}{2}$  webbed ; male with external vocal sacs and a very large flat gland on the side of the body ... *R. pleuraden*, Blgr.
- b. Canthus rostralis distinct ; interorbital space at least  $\frac{2}{3}$  the width of the upper eyelid ; nasal bones small and widely separated from each other ; male with internal vocal sacs.
- Head as long as broad or a little broader ; tympanum  $\frac{2}{5}$  to  $\frac{3}{5}$  diameter of eye ; tibio-tarsal articulation reaching tip of snout or a little beyond ; tibia 3 to 4 times as long as broad ; toes entirely webbed ... *R. grahami*, Blgr.
- Head as long as broad or a little broader ; tympanum  $\frac{2}{5}$  to  $\frac{3}{5}$  diameter of eye ; tibio-tarsal articulation reaching nostril, tip of snout, or a little beyond ; tibia 4 to  $5\frac{1}{2}$  times as long as broad ; toes  $\frac{1}{2}$  to  $\frac{3}{4}$  webbed ... *R. japonica*, Gthr.
- Head longer than broad ; tympanum  $\frac{2}{5}$  to  $\frac{3}{5}$  diameter of eye ; tibio-tarsal articulation reaching beyond tip of snout ; tibia  $5\frac{1}{2}$  to 6 times as long as broad ; toes  $\frac{1}{2}$  webbed ... *R. longicrus*, Stejn.
- II. Outer metatarsals bound together in their basal third or half ; tibia 4 to  $4\frac{1}{2}$  times as long as broad ; tibio-tarsal articulation reaching anterior border of eye or between eye and tip of snout ; toes  $\frac{1}{2}$  to  $\frac{3}{5}$  webbed ; tympanum  $\frac{2}{5}$  to  $\frac{3}{4}$  diameter of eye.
- Heels strongly overlapping ; inner metatarsal tubercle compressed, very prominent,  $\frac{2}{5}$  to  $\frac{3}{5}$  length of inner toe ... *R. lateralis*, Blgr.
- Heels not overlapping ; inner metatarsal tubercle less than  $\frac{1}{2}$  length of inner toe ... *R. okinavana*, Boettg.
- B. Omosternal style forked at the base ; outer metatarsals united in their basal half ; tibia  $3\frac{1}{2}$  to 4 times as long as broad ; tibio-tarsal articulation reaching tympanum or eye ; toes  $\frac{1}{3}$  to  $\frac{1}{2}$  webbed ; tympanum  $\frac{2}{3}$  to once diameter of eye ; male with external vocal sacs and a humeral gland ... *R. malabarica*, Tsch.

The synopsis is not an artificial key merely for the ready identification of the species ; although I trust it will answer that most important purpose, it also aims at conveying the expression of what I conceive to be the true relationships from a phyletic standpoint. These relationships are best expressed by the following attempt at grouping the species into natural sections :—

A. RANAÆ HEXADACTYLÆ. The most generalized type, from which the three following sections, as well as the genus *Oxyglossus*, may be conceived to have been derived.

*R. hexadactyla*, *R. cyanophlyctis*.

B. RANAÆ TIGRINÆ. Lead to *Tomopterna*.

*R. verruculosa*, *R. cancrivora*, *R. tigrina*, *R. verrucosa*, *R. limnocharis*, *R. greenii*, *R. brevipalmata*.

C. RANAÆ GRUNNIENTES. Lead to *Discodeles*.

*R. grunniens*, *R. macrodon*, *R. magna*, *R. modesta*, *R. microtympanum*, *R. doriae*, *R. macrognathus*, *R. pileata*, *R. plicatella*, *R. hascheana*, *R. limborgii*, *R. microdisca*, *R. palavanensis*, *R. narina*.

D. RANAE KUHLIANAE. Lead to the genus *Nyctibatrachus*.

*R. corrugata*, *R. kuhlii*, *R. laticeps*.

E. RANAE LIEBIGIANAE.. Derived from some primitive type, unknown.<sup>1</sup> Leads to *Nanorana*.

*R. feae*, *R. yunnanensis*, *R. tibetana*, *R. sternosignata*, *R. spinosa*, *R. phrynoides*, *R. gammiei*, *R. liebigii*, *R. annandalii*, *R. assamensis*, *R. vicina*, *R. blanfordii*.

F. RANAE TYPICAE. The group characteristic of the Eurasian and North American regions, of which the *Ranae catesbiana*e probably represent the most primitive type. Lead to *Hylorana*.

*R. plancyi*, *R. esculenta*, *R. pleuraden*, *R. grahami*, *R. japonica*.  
*R. longicrus*, *R. lateralis*, *R. okinavana*.

G. RANAE MALABARICAE. Probably derived from the preceding; a second species (*R. galamensis*) in Africa.

*R. malabarica*.

### 1. *Rana hexadactyla*.

*Rana grunniens*, part., Daud, *Hist. Rain. Gren. Crap.* p. 65 (1803), and *Hist. Rept.* VIII, p. 127 (1803).

*Rana hexadactyla*, Lesson, in Bélang., *Voy. Ind. Or., Rept.* p. 331 (1834); Tschudi, *Class. Batr.* pp. 40, 80 (1838); Günth., *Cat. Batr. Sal.* p. 11 (1858), and *Rept. Brit. Ind.* p. 405 (1864); Steind., *Novara, Amph.* p. 19 (1867); Günth., *Proc. Zool. Soc.* 1875, p. 568; Bouleng., *Cat. Batr. Ecaud.* p. 17 (1882), and *Faun. Ind., Rept.* p. 441 (1890); Ferguson, *Journ. Bomb. N.H. Soc.* XV, 1904, p. 500, pl. A, fig. 2; Annand. and Rao, *Rec. Ind. Mus.* XV, 1918, p. 31, pl. ii, fig. 2.

*Dactylethra bengalensis*, Lesson, *Ill. Zool.* pl. xlvii (1834).

*Rana cutipora*, Dum. et Bibr., *Erp. Gén.* VIII, p. 339 (1841).

*Rana robusta*, Blyth, *Journ. As. Soc. Beng.* XXIII, 1854, p. 298.

? *Rana neweraellia*, Kelaart, *Prodr. Faun. Zeyl.* I, p. 292 (1852).

Vomerine teeth in strong oblique series from the inner anterior corners of the choanae to a little beyond the level of their posterior borders; less developed in the young, in which they form short oblique series or small groups just behind the level of the posterior borders of the choanae. The cornua at the back of the tongue longer and more pointed than usual in the genus, often with a median process between them.

Form robust, body not at all constricted at the waist.

Head as long as broad or broader than long, much depressed; snout rounded or obtusely pointed, scarcely projecting beyond the mouth, longer than the eye in the adult; canthus rostralis indistinct; loreal region very oblique, feebly concave; nostril nearer the end of the snout than the eye; distance between the nostrils equal to or a little greater than the interorbital width, which is much less than that of the upper eyelid; tympanum distinct,  $\frac{2}{3}$  to once the diameter of the eye,  $1\frac{1}{2}$  to 4 times as long as its distance from the latter.

<sup>1</sup> Of which the Erithrean-Abyssinian *R. beccarii*, Blgr. is perhaps the nearest surviving representative.

Fingers slender, pointed, with a more or less distinct dermal border, first longer than second, third longer than the snout; subarticular tubercles small, feebly prominent.

Hind limb thick, moderately long, the tibio-tarsal articulation reaching the tympanum or the eye, the heels meeting or not when the limbs are folded at right angles to the body; tibia 2 to  $2\frac{1}{2}$  times as long as broad,  $2\frac{1}{4}$  to  $2\frac{1}{2}$  times in length from snout to vent, shorter than the fore limb or than the foot. Toes pointed, with very broad web reaching the tips, the free border almost rectilinear; the fourth toe not extending very much beyond the third and fifth; outer metatarsals separated nearly to the base; subarticular tubercles very small or indistinct; a strong dermal fringe on the outer toe; tarsal fold slightly distinct or absent; a small but very prominent, pointed, digitiform inner metatarsal tubercle,<sup>1</sup> its base about  $\frac{1}{3}$  the length of the inner toe; no outer tubercle.

Skin smooth above, with small porous warts on the sides; a strong fold from the eye to the shoulder, more or less distinctly connected with its fellow across the head just behind the eyes. Lower parts more or less distinctly granulate, with enlarged porous warts on the throat and under the thighs, and with a curved series of porous warts (sensory organs) along each side of the belly, and another near the flanks.

Adult olive or dark brown above, sometimes with a yellow vertebral streak, or with a yellowish lateral band from behind the shoulder to the groin. Young with two or three yellowish bands along the back, in addition to the lateral band. Lower parts white, the thighs usually striped black and white, the black stripes two or three in number.

Males with a white external vocal sac on each side, projecting through a slit close to the posterior third of the mandibular ramus, the slit as long as or a little longer than the eye; no other secondary sexual characters.<sup>2</sup>

Nasal bones large, in contact with each other and with the frontoparietals, which are narrow and grooved along the sagittal suture; ethmoid entirely covered over in the adult; zygomatic branch of squamosal very long. Omosternal style forked at the base. Terminal phalanges obtusely pointed.

The tadpole has been described and figured by Ferguson and by Annandale and Rao, and I have also examined specimens from Cochin. Tail 2 to  $2\frac{2}{3}$  times as long as body, acutely pointed, with the dorsal crest extending on the body. Beak white, broadly edged with black; lip forming two lobes on each side; only one series of horny teeth in the upper lip, marginal; two or three on the lower lip, the outer marginal, all, or only the outer, uninterrupted.

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<sup>1</sup> Containing 3 or 4 ossicles on end.

<sup>2</sup> As observed by Ferguson in *R. cyanophlyctis*, the male does not clasp the female in the manner our European frogs do, but digs the hands into the axils.

## Measurements in millimetres.

|                      | 1.  | 2.  | 3.   | 4.  | 5.  | 6.  | 7. | 8. |
|----------------------|-----|-----|------|-----|-----|-----|----|----|
|                      | ♂   | ♀   | Hgr. | ♂   | ♀   | ♀   | ♀  | ♀  |
| From snout to vent.. | 93  | 130 | 48   | 65  | 115 | 104 | 59 | 60 |
| Head ..              | 30  | 39  | 18   | 23  | 35  | 33  | 20 | 20 |
| Width of head ..     | 35  | 50  | 18   | 26  | 42  | 41  | 21 | 20 |
| Snout ..             | 11  | 14  | 6    | 8   | 12  | 11  | 7  | 7  |
| Eye ..               | 8   | 10  | 6    | 7   | 10  | 9   | 7  | 7  |
| Interorbital width   | 3   | 5   | 2    | 2.5 | 4   | 3.5 | 2  | 2  |
| Tympanum ..          | 6   | 7   | 4    | 6   | 9   | 7   | 4  | 4  |
| Fore limb            | 51  | 70  | 27   | 37  | 60  | 57  | 32 | 30 |
| First finger ..      | 11  | 16  | 7    | 9   | 14  | 14  | 7  | 7  |
| Second finger ..     | 10  | 13  | 6    | 8   | 11  | 11  | 6  | 6  |
| Third finger         | 13  | 17  | 8    | 11  | 16  | 15  | 8  | 9  |
| Fourth finger ..     | 9   | 13  | 5    | 8   | 11  | 11  | 6  | 6  |
| Hind limb            | 145 | 190 | 72   | 98  | 153 | 148 | 84 | 84 |
| Tibia ..             | 42  | 55  | 21   | 28  | 45  | 43  | 25 | 25 |
| Foot ..              | 46  | 61  | 26   | 34  | 51  | 52  | 30 | 30 |
| Third toe            | 29  | 38  | 17   | 20  | 32  | 30  | 18 | 18 |
| Fourth toe           | 42  | 53  | 23   | 29  | 45  | 45  | 25 | 26 |
| Fifth toe ..         | 35  | 46  | 19   | 23  | 37  | 37  | 21 | 22 |

1—2. Madras. 3. Malabar. 4—7. Ceylon. 8. S. Ceylon.

*Habitat*.—Southern India and Ceylon.

[In life the adult of this species has the back of a bright leaf-green colour, with the mid-dorsal streak, if present, primrose-yellow. In half-grown individual the colours are paler and the conspicuous spots of the young frequently persist.

The locality "Puri" given by Mr. Narayan Rao and myself (*Rec. Ind. Mus.* XV, p. 31) is probably incorrect, being based on somewhat faded specimens of tadpoles from running water (see my note on *R. cyanophlyctis*). On a recent tour through the eastern districts of the Madras Presidency I failed to find *R. hexadactyla* north of Nellore.

This frog usually lives amongst dense aquatic vegetation, in which its green colour conceals it admirably. In Madras it is eaten by Frenchmen, being captured by means of a hook baited with a red rag and pulled on a line through the weeds it frequents. N. A.].

2. *Rana cyanophlyctis*.

- Rana cyanophlyctis*, Schneid., *Hist. Amph.* I, p. 137 (1799); Peters, *Mon. Berl. Ac.* 1863, p. 78; Günth., *Rept. Brit. Ind.* p. 406 (1864); Steind., *Novara, Amph.* p. 20 (1867); Stoliczka, *Proc. As. Soc. Beng.* 1872, p. 102; Blanf., *Zool. E. Persia*, p. 433 (1876); Bouleng., *Cat. Batr. Ecaud.* p. 17 (1828), and *Faun. Ind., Rept.* p. 442 (1890); Murray, *Zool. Sind.*, p. 398 (1884); Anders., *Proc. Zool. Soc.* 1895, p. 660, pl. xxxvii. fig. 2; Ferguson, *Journ. Bomb. N.H. Soc.* XV, 1904, p. 500; Bouleng., *Faun. Mal. Pen., Rept.* p. 228 (1912); Annand. and Rao, *Rec. Ind. Mus.* XV, 1918, p. 30, fig.
- Rana bengalensis*, Gray, *Ind. Zool.* I, pl. lxxxii, fig. 2 (1834); Kelaart, *Prodr. Faun. Zeyl.* I, p. 192 (1852).
- Rana leschenaultii*, Dum. et Bibr., *Erp. Gen.* VIII, p. 342 (1841); Cantor, *Cat. Mal. Rept.* p. 138 (1847); Günth., *Cat. Bat. Sal.* p. 11 (1858).
- Dicroglossus adolfi*, Günth., *Proc. Zool. Soc.* 1860, p. 158, pl. xxviii, fig. B, and *Rept. Brit. Ind.* p. 402 (1864).
- Rana ehrenbergii*, Peters, *Mon. Berl. Ac.* 1863, p. 70; Bouleng., *Cat. Batr. Ecaud.*, p. 18.

Vomerine teeth in small, round or oblique groups on a level with the posterior borders of the choanae or just behind them, equally distinct from each other and from the latter, or closer together. Tongue as in the preceding species.

Form less robust than in the preceding, with more distinct waist.

Head broader than long, rarely as long as broad, much depressed; snout rounded or very obtusely pointed, scarcely projecting beyond the mouth, as long as or longer than the eye; canthus rostralis indistinct; loreal region very oblique, feebly concave; nostril equally distant from the eye and from the end of the snout, or a little nearer the former; distance between the nostrils equal to or a little greater or a little less than the inter-orbital width, which is usually much narrower than (not more than half) that of the upper eyelid; tympanum  $\frac{3}{5}$  to nearly once the diameter of the eye,  $1\frac{1}{2}$  to 5 times as long as its distance from the latter.

Fingers more or less pointed, with a more or less distinct dermal border, first and second equal, third longer than the snout; subarticular tubercles small, feebly prominent.

Hind limb rather thick, moderately long, the tibio-tarsal articulation reaching the tympanum, the eye, or between the eye and the nostril, the heels meeting or not when the limbs are folded at right angles to the body; tibia  $2\frac{1}{2}$  to  $3\frac{1}{2}$  times as long as broad, 2 to  $2\frac{1}{2}$  times in length from snout to vent, shorter than the fore limb or than the foot. Toes with the tips swollen or dilated into very small discs, with very broad web reaching the tips, the free border very feebly emarginate; the fourth toe not extending very much beyond the third and fifth; outer metatarsals separated nearly to the base; subarticular tubercles very small, feebly prominent; a strong dermal fringe on the outer toe; tarsal fold feeble or absent; a small but very prominent, pointed, digitiform inner metatarsal tubercle, its base  $\frac{1}{5}$  to  $\frac{1}{4}$  the length of the inner toe; no outer tubercle.

Skin of upper parts with large pores, smooth or granular, often with small warts which may be tipped with minute asperities; a strong fold from the eye to the shoulder, often connected with its fellow across the head just behind the eyes. Lower parts smooth.

Greyish or olive above, with dark olive round spots or marblings; a more or less distinct dark, light-edged band along each flank, and on the front and back of the thighs, often disappearing in the adult; spots not forming complete cross-bands on the limbs. Lower parts white, marbled spotted, dotted or vermiculated with blackish.

Males with a grey or blackish external vocal sac on each side, projecting through a slit close to the posterior half of the mandibular ramus, the slit as long as or a little longer than the eye; no other secondary sexual characters.

Skeleton as in *R. hexadactyla*, but nasal bones smaller and terminal phalanges of toes a little expanded at the end.

*Measurements in millimetres.*

|                       | 1.  | 2.  | 3.  | 4.  | 5.  | 6.  | 7. | 8.  | 9. | 10. | 11. | 12. | 13. | 14. | 15. | 16. | 17. | 18. | 19. | 20. | 21. | 22. | 23. | 24. | 25. | 26. | 27. | 28. | 29. | 30. | 31. | 32. | 33. | 34. | 35. | 36. |
|-----------------------|-----|-----|-----|-----|-----|-----|----|-----|----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
|                       | ♂   | ♀   | ♀   | ♀   | ♂   | ♂   | ♂  | ♀   | ♀  | ♀   | ♂   | ♂   | ♂   | ♂   | ♀   | ♀   | ♀   | ♀   | ♀   | ♀   | ♂   | ♂   | ♀   | ♀   | ♂   | ♀   | ♀   | ♂   | ♀   | ♂   | ♀   | ♀   | ♂   | ♂   | ♀   | ♀   |
| From snout to vent .. | 66  | 92  | 88  | 75  | 57  | 64  | 60 | 85  | 64 | 55  | 47  | 47  | 46  | 45  | 74  | 68  | 60  | 65  | 60  | 45  | 39  | 44  | 47  | 62  | 42  | 55  | 54  | 40  | 50  | 45  | 64  | 61  | 40  | 38  | 60  | 56  |
| Head ..               | 21  | 31  | 30  | 26  | 20  | 21  | 21 | 28  | 21 | 19  | 16  | 17  | 17  | 16  | 25  | 23  | 21  | 21  | 20  | 16  | 14  | 15  | 16  | 20  | 15  | 20  | 20  | 14  | 15  | 15  | 21  | 20  | 14  | 14  | 20  | 19  |
| Width of head ..      | 24  | 38  | 36  | 30  | 23  | 25  | 25 | 33  | 25 | 22  | 17  | 19  | 19  | 18  | 28  | 25  | 23  | 24  | 22  | 17  | 15  | 16  | 17  | 21  | 16  | 22  | 21  | 15  | 17  | 16  | 23  | 22  | 14  | 15  | 21  | 19  |
| Snout ..              | 7   | 12  | 10  | 9   | 7   | 7   | 7  | 9   | 8  | 6   | 5   | 5.5 | 5.5 | 6   | 10  | 8   | 7   | 8   | 7   | 5   | 5   | 5   | 6   | 7   | 5   | 7   | 7   | 4.5 | 5   | 5.5 | 7   | 6.5 | 5   | 5   | 6.5 | 6   |
| Eye ..                | 7   | 8   | 8   | 8   | 7   | 7   | 7  | 9   | 7  | 6   | 5   | 5.5 | 5.5 | 5   | 7   | 7   | 6   | 6   | 6   | 5   | 5   | 5   | 5   | 6   | 5   | 6   | 6   | 4.5 | 5   | 5.5 | 7   | 6.5 | 5   | 5   | 6.5 | 6   |
| Interorbital width .. | 2   | 3.5 | 4   | 3   | 2   | 2.5 | 2  | 3   | 2  | 2   | 1   | 1   | 1   | 1   | 2   | 2   | 2   | 2   | 2   | 1.5 | 1   | 1   | 1.5 | 2   | 1   | 2   | 2   | 1   | 1   | 1   | 2   | 2   | 1   | 1.5 | 2   | 2   |
| Tympanum ..           | 4.5 | 6   | 6   | 6   | 4.5 | 5   | 6  | 6   | 5  | 4   | 3.5 | 3   | 3   | 3   | 5   | 5   | 4   | 5   | 5   | 4   | 3   | 3.5 | 4   | 5   | 3   | 5   | 4   | 3.5 | 4   | 4   | 5   | 5   | 3   | 3   | 4.5 | 4   |
| Fore limb ..          | 38  | 55  | 52  | 47  | 34  | 38  | 38 | 50  | 35 | 32  | 25  | 24  | 26  | 26  | 40  | 37  | 34  | 35  | 34  | 26  | 20  | 24  | 25  | 34  | 24  | 33  | 31  | 21  | 25  | 27  | 38  | 34  | 24  | 22  | 32  | 30  |
| First finger ..       | 8   | 12  | 12  | 10  | 7   | 7   | 7  | 10  | 8  | 7   | 6   | 5   | 5   | 5   | 8   | 8   | 7   | 8   | 8   | 6   | 4   | 6   | 6   | 7.5 | 5   | 7   | 7   | 4   | 5   | 5.5 | 9   | 7   | 5   | 4   | 8   | 7   |
| Second finger ..      | 8   | 12  | 12  | 10  | 7   | 7   | 7  | 10  | 8  | 7   | 6   | 5   | 5   | 5   | 8   | 8   | 7   | 8   | 8   | 6   | 4   | 6   | 6   | 7.5 | 5   | 7   | 7   | 4   | 5   | 5.5 | 9   | 7   | 5   | 4   | 8   | 7   |
| Third finger ..       | 10  | 14  | 14  | 12  | 9   | 9   | 9  | 13  | 10 | 9   | 7   | 6   | 6   | 6   | 10  | 10  | 9   | 10  | 10  | 7   | 5   | 7   | 8   | 10  | 6   | 9   | 9   | 5   | 6   | 7   | 11  | 9   | 6   | 5   | 10  | 9   |
| Fourth finger ..      | 8   | 12  | 12  | 10  | 7   | 7   | 7  | 10  | 7  | 6   | 5.5 | 5   | 4.5 | 5   | 7   | 8   | 6   | 7   | 7   | 5   | 3.5 | 5   | 5.5 | 7   | 4.5 | 6   | 6   | 3.5 | 4.5 | 5   | 8   | 6   | 5   | 3.5 | 7   | 6   |
| Hind limb ..          | 94  | 130 | 130 | 107 | 90  | 95  | 92 | 124 | 95 | 88  | 70  | 67  | 70  | 68  | 99  | 93  | 85  | 93  | 87  | 71  | 52  | 68  | 71  | 90  | 66  | 83  | 78  | 60  | 70  | 73  | 98  | 86  | 64  | 61  | 87  | 78  |
| Tibia ..              | 29  | 41  | 40  | 34  | 28  | 30  | 29 | 39  | 29 | 27  | 22  | 20  | 21  | 21  | 32  | 30  | 26  | 29  | 27  | 22  | 16  | 20  | 22  | 27  | 20  | 25  | 24  | 19  | 21  | 22  | 30  | 27  | 20  | 19  | 26  | 23  |
| Foot ..               | 32  | 44  | 45  | 37  | 31  | 32  | 31 | 42  | 32 | 30  | 24  | 22  | 22  | 22  | 35  | 33  | 30  | 32  | 30  | 24  | 17  | 24  | 24  | 30  | 22  | 29  | 27  | 20  | 23  | 24  | 32  | 29  | 22  | 21  | 30  | 27  |
| Third toe ..          | 20  | 30  | 30  | 24  | 19  | 19  | 19 | 25  | 20 | 18  | 16  | 14  | 14  | 15  | 20  | 19  | 17  | 20  | 20  | 16  | 11  | 15  | 15  | 19  | 13  | 18  | 18  | 12  | 14  | 16  | 20  | 18  | 13  | 13  | 20  | 16  |
| Fourth toe ..         | 26  | 39  | 39  | 32  | 25  | 27  | 26 | 35  | 27 | 26  | 20  | 18  | 19  | 19  | 29  | 27  | 26  | 27  | 26  | 21  | 13  | 20  | 20  | 26  | 19  | 24  | 23  | 16  | 18  | 21  | 27  | 25  | 18  | 18  | 25  | 22  |
| Fifth toe ..          | 21  | 32  | 32  | 26  | 22  | 21  | 21 | 29  | 22 | 21  | 17  | 15  | 16  | 16  | 23  | 21  | 21  | 23  | 22  | 17  | 11  | 16  | 16  | 21  | 16  | 21  | 19  | 14  | 15  | 17  | 21  | 20  | 15  | 15  | 21  | 18  |

1—4. Aithalhim, near Aden. 5. Abian country, S. Arabia. 6—8. Upper Hushabi, S. Arabia. 9—10. Pishin, Baluchistan. 11. Quetta, Baluchistan. 12—17. S. Waziristan, Afghanistan, 4500 f. 18—19. Kashmir, 20. Bhim Tal, Kamaon Himalayas, 4500 f. 21. Simla, Himalayas (type of *Dicroglossus adolfi*). 22—23. Pharping, Nepal. 24. Nepal. 25—27. Benares. 28—29. Trevandrum, Travancore. 30—32. Piermud, Travancore. 33—36. Ceylon.

Tadpole with the tail  $1\frac{1}{2}$  to 2 times as long as the body, pointed, the dorsal crest extending on the body. Beak entirely black, surrounded by a large circular lip, with a single, marginal, series of horny teeth in front, and two series behind, both uninterrupted.<sup>1</sup> Size large (up to 100 milim. or more).

Eggs small, 1 to  $1\frac{1}{2}$  milim. in diameter.

*Habitat.* South Arabia, Baluchistan, Afghanistan, Himalayas up to 6,000 ft., India and Ceylon. The occurrence of this species in the Malay Peninsula (*fide* Cantor) is very doubtful.

There is something wrong in Duméril and Bibron's description of *R. leschenaultii*, as the belly is stated to be 'percé de pores disposés en lignes,' as in *R. hexadactyla*, which is not the case in any of the specimens examined by me. I have examined the type specimens, nine in number, in the Paris Museum, and find in two of them a short series of pores on each side of the posterior part of the belly. The usual absence of the series of small porous warts on the lower parts is one of the most striking characters distinguishing *R. cyanophlyctis* from *R. hexadactyla*.

[The tadpoles of this species are plastic and vary considerably with their environment. Those from the edge of streams are more slender and smaller than those from still water. The former can often be distinguished from the tadpoles of *R. hexadactyla* by little but colour.

I have recently described the manner in which *R. cyanophlyctis* skips over the surface of the water (*Rec. Ind. Mus.* XVI, p. 122)—a habit first noticed by the Emperor Babur in the 16th century and wrongly attributed in recent times to *R. limnocharis*, the structure of the feet of which is quite unsuitable.

The geographical range of *R. cyanophlyctis* extends along the Mekran Coast into Persian Baluchistan, where Blanford's specimens were obtained. It is also common in the Quetta hills up to at least 6,000 feet. I failed to find it in the Baluchistan desert or in Seistan, but Nikolsky has described a race from the latter country. I have seen no specimens from Burma and the species is evidently very scarce in the Malay Peninsula, in which it is probably confined to the northern districts. There can, however, be no doubt as to its occurrence in Peninsular Siam, where I captured a perfectly typical specimen: see *Mem. As. Soc. Bengal* VI, p. 45.

At Quetta I have seen frogs of this species floating with *R. sternosignata* on the surface of a pond the edge of which was frozen. They seemed fairly active, but did not skip. This habit of skipping, however, seems to be less well-developed, as I have noticed both in the Nilgiris and Himalayas, among individuals living at high altitudes than in those in the plains. Hill specimens, moreover, are usually smaller than plains specimens, but this is not the case at Quetta —N A.].

<sup>1</sup> According to Annandale and Rao, the condition of the rows of horny teeth is variable; they figure a specimen with a single short row on each side of the upper lip and a short inner row on each side of the lower.

### 3. *Rana verruculosa*.

*Rana tigrina* var. *verruculosa*, Roux, Zool. Jahrb. Syst. XXX, 1911, p. 504.

Vomerine teeth in oblique series originating in the middle between the choanae or a little further back and extending beyond the level of their posterior borders.

Head slightly broader than long; snout rather pointed, a little longer than the eye; canthus rostralis obtuse; loreal region oblique; nostril a little nearer the eye than the tip of the snout; interorbital space narrower than the upper eyelid; tympanum very distinct, a little more than half the diameter of the eye and narrowly separated from the latter.

Fingers rather short, obtuse, first longer than the second, third longer than the snout; subarticular tubercles moderate.

Hind limb rather long, the tibio-tarsal articulation reaching the tip of the snout, the heels overlapping when the limbs are folded at right angles to the body; tibia  $3\frac{1}{4}$  times as long as broad,  $\frac{1}{2}$  length of head and body, a little shorter than the fore limb or than the foot. Toes obtuse, entirely and very broadly webbed, the web feebly emarginate; outer metatarsals separated nearly to the base; subarticular tubercles oval, moderately prominent; a tarsal fold; inner metatarsal tubercle oval,  $\frac{1}{3}$  the length of the inner toe; no outer tubercle.

Skin of upper parts corrugated, back with numerous, very prominent, short oval warts disposed irregularly, sides with larger warts; smaller, subconical warts on the limbs; sometimes a fold across the head, behind the eyes; a rather prominent curved glandular fold above and behind the tympanum.

Grey above, uniform on the back, somewhat marbled with black and yellow on the sides; hinder side of thighs vermiculate with black and white. Lower parts white, with small grey spots on the throat.

Males with external vocal sacs, forming folds on the sides of the throat, which are blackish.

#### *Measurements of male type specimen.*

|                    |     |     |     |            |
|--------------------|-----|-----|-----|------------|
| From snout to vent | ... | ... | ... | 54 millim. |
| Head               | ... | ... | ... | 19         |
| Width of head      | ... | ... | ... | 20         |
| Snout              | ... | ... | ... | 8.5        |
| Eye                | ... | ... | ... | 7          |
| Interorbital width | ... | ... | ... | 3.5        |
| Tympanum           | ... | ... | ... | 4          |
| Fore limb          | ... | ... | ... | 30         |
| Hind limb          | ... | ... | ... | 83         |
| Tibia              | ... | ... | ... | 26         |
| Foot               | ... | ... | ... | 29         |

*Habitat.* Wetter Island, Sunda Archipelago.

I have not seen examples of this frog, but am indebted to Dr. Rou for notes which show that if *R. cancrivora* is to be regarded as a valid species, *R. verruculosa* also deserves to be treated as such.

4. *Rana tigrina*.

- Rana tigrina*, Daud., *Hist. Rain. Gren. Crap.* p. 64, pl. xx (1803), and *Hist. Rept.* VIII, p. 125 (1803); Kelaart, *Prodr. Faun. Zeyl.* p. 192 (1852); Günth., *Proc. Zool. Soc.* 1875, p. 567; Anders., *Anat. Zool. Res. Yunnan*, p. 837 (1879); Bouleng., *Faun. Ind., Rept.* p. 449, fig. (1890); S. Flower, *Proc. Zool. Soc.* 1896, p. 901, and 1899, p. 891, pl. lix, fig. 2; Stejneger., *Herp. Japan*, p. 139, fig. (1907); Annand., *Mem. As. Soc. Beng.* VI, 1917, p. 122, figs., pl. v, figs. 1-2, and pl. vi, fig. 1; Bouleng., *Rec. Ind. Mus.* XV, 1918, pp. 51, 65; Annand., *Rec. Ind. Mus.* XV, 1918, p. 60, fig.
- ? *Rana picta*, Gravenh., *Delic. Mus. Zool. Vratisl.* I, p. 39 (1829).
- Rana brama*, Lesson, in Bélanger., *Voy. Ind. Or., Rept.* p. 329, pl. vi (1834).
- Rana tigrina*, part., Dum. et Bibr., *Érp. Gén.* VIII, p. 375 (1841); Günth., *Cat. Batr. Sal.* p. 9 (1858); Peters, *Mon. Berl. Ac.* 1863, p. 77; Günth., *Rept. Brit. Ind.*, p. 407 (1864); Steind., *Novara, Amph.* p. 17 (1867); Bouleng., *Cat. Batr. Ecaud.* p. 26 (1882), and *Faun. Mal. Pen., Rept.* p. 234, fig. (1912).
- Rana malabarica* (non D. et B.), Kelaart, *op. cit.*, p. 191.
- Rana crassa*, Jerdon, *Fourn. As. Soc. Beng.* XXII, 1853, p. 531; Anders., *Proc. Zool. Soc.* 1871, p. 199; Annand., *Rec. Ind. Mus.* XV, 1918, p. 61, fig.
- Rana occipitalis*, Günth., *Cat. Batr. Sal.* p. 130, pl. xi (1858); Bocage, *Forn. Sc. Lisb.* I, 1866, p. 73; Boettg., *Abh. Senck. Ges.* XII, 1881, p. 416; Bouleng., *Cat. Batr. Ecaud.* p. 27 (1882); Bocage, *Herp. Angola*, p. 155 (1895); Werner, *Sitzb. Ak. Wien*, CXVI, i, 1908, p. 1887.
- Pyxicephalus fodiens*, Peters, *Mon. Berl. Ac.* 1860, p. 186.
- Rana hydraletis* (Boie), Peters, *Mon. Berl. Ac.* 1863, p. 78.
- Hoplobatrachus ceylanicus*, Peters, *Mon. Berl. Ac.* 1863, p. 449; Günth., *Rept. Brit. Ind.* p. 410 (1864).
- Rana bragantina*, Bocage, *Rev. Mag. Zool.* 1864, p. 253.
- Rana tigrina*, var. *pantherina* (Fitz.), Steind., *Novara, Amph.* pl. i, figs. 14-17 (1867).
- Rana* (*Hoplobatrachus*) *ceylanica*, Günth., *Ann and Mag. N.H.* (4) IX, 1872, p. 87.
- Rana tigrina*, var. *ceylanica*, Boettg., *Ber. Offenb. Ver. Nat.* 1892, p. 94.
- Rana burkilli*, Annand., *Rec. Ind. Mus.* V, 1910, p. 79.
- Rana rugulosa* (non Wiegman.), Annand., *Mem. As. Soc. Beng.* VI, 1917, p. 126, pl. v, fig. 3; Malcolm Smith, *Fourn. N.H. Soc. Siam*, II, 1917, p. 263, pl.—, fig. 2; Annand., *Rec. Ind. Mus.* XV, 1918, p. 60.
- Rana tigrina*, vars. *crassa*, *occipitalis*, *burkilli*, Bouleng., *Rec. Ind. Mus.* XV, 1918, p. 57.

## Forma typica.

Vomerine teeth in strong or very strong, oblique, straight or slightly curved series narrowly separated from each other, originating close to the anterior border of the choanae and extending beyond the level of their posterior borders. A rather feeble bony process at the anterior extremity of the lower jaw in adult specimens.

Head as long as broad or broader than long, rather strongly depressed; snout rounded or pointed, projecting more or less beyond the mouth, longer than the eye; canthus rostralis obtuse; loreal region very oblique, more or less concave; nostril equidistant from the eye and the tip of the snout or nearer the latter; interorbital space much narrower than the upper eyelid; tympanum very distinct,  $\frac{2}{3}$  to once the diameter of the eye,  $1\frac{1}{2}$  to  $2\frac{1}{2}$  times its distance from the latter.

Fingers rather short or moderately long, obtusely pointed, with a more or less distinct dermal border, first longer than the second, third shorter than the snout; subarticular tubercles rather small and feebly prominent.

Hind limb moderately long, the tibio-tarsal articulation reaching the eye or between the eye and the nostril, the heels overlapping when the limbs are folded at right angles to the body; tibia  $2\frac{1}{4}$  to 3 times as long as broad,  $1\frac{5}{8}$  to  $2\frac{1}{4}$  times in length from snout to vent, as long as or a little longer or a little shorter than the fore limb or than the foot. Toes obtuse or somewhat swollen at the end, entirely webbed, the web but feebly emarginate; outer metatarsals separated nearly to the base; subarticular tubercles rather small; a dermal fold on the outer side of the fifth toe, and a feeble one on the inner side of the first and of the tarsus, interrupted by the inner metatarsal tubercle, which is blunt, feebly compressed,  $1\frac{2}{3}$  to 3 times in the length of the inner toe and  $7\frac{1}{2}$  to  $12\frac{1}{2}$  times in that of the tibia; no outer metatarsal tubercle.

Skin of upper parts smooth or granulate, with large prominent warts and longitudinal glandular folds, these folds usually regular, though not extending along the whole length of the back, 6 to 14 in number; a strong glandular fold from the eye to the shoulder, and usually a fold across the head behind the eyes. Lower parts smooth.

Yellowish, green, or olive above, with dark spots, which may be disposed in longitudinal series on the back, or form two or three cross-bands; a narrow yellow vertebral streak often present; young with a yellowish lateral band, from behind the eye, which may entirely disappear in the adult; a dark canthal streak and a more or less distinct light streak above the upper lip, which may be blackish or spotted with blackish; limbs with dark cross-bands, which may be irregular or replaced by large spots; hinder side of thighs marbled black and yellow; often a fine yellow line along the upper surface of the thigh and another along the inner side of the calf. Lower parts white, without spots, or with only a few on the throat.

Male with a white external vocal sac on each side of the throat, forming longitudinal folds; fore limb moderately thickened; a strong pad on the inner side of the first finger, covered, during the breeding season, with a greyish-brown velvet-like horny layer.

Nasal bones large, in contact with each other and with the fronto-parietals; ethmoid hidden above or only a small portion uncovered; fronto-parietals narrow, feebly grooved along the median line, sometimes fused; zygomatic process of squamosal long. Omosternum forked at the base. Terminal phalanges obtusely pointed.

Tadpole with the tail attenuate to a fine point and about twice as long as the body. Circular lip entirely bordered with papillae; beak entirely black, the upper mandible with a strong median cusp, the lower with two; horny teeth in 3 or 4 upper and 4 or 5 lower series, the outer upper long and uninterrupted,

the outer lower short and uninterrupted, the outer but one lower long and uninterrupted.

Eggs small, 2 millim. in diameter in female measuring 162 millim. from snout to vent.

*Measurements in millimetres.*

|                           | 1.<br>♂ | 2.<br>♂ | 3.<br>♀ | 4.<br>♂ | 5.<br>♀ | 6.<br>♀ | 7.<br>♀ | 8.<br>♀ | 9.<br>♀ | 10.<br>♀ | 11.<br>♀ | 12.<br>♀ | 13.<br>♀ | 14.<br>♀ |
|---------------------------|---------|---------|---------|---------|---------|---------|---------|---------|---------|----------|----------|----------|----------|----------|
| From snout to vent        | 108     | 77      | 86      | 108     | 120     | 142     | 153     | 162     | 70      | 65       | 88       | 80       | 158      | 114      |
| Head ..                   | 36      | 26      | 29      | 38      | 38      | 46      | 50      | 51      | 24      | 22       | 30       | 29       | 50       | 38       |
| Width of head             | 43      | 26      | 29      | 40      | 41      | 55      | 60      | 62      | 25      | 23       | 32       | 29       | 61       | 40       |
| Snout                     | 16      | 10      | 12      | 17      | 16      | 20      | 19      | 21      | 9       | 9        | 11       | 12       | 21       | 16       |
| Eye ..                    | 10      | 8       | 9       | 11      | 11      | 12      | 13      | 15      | 8       | 8        | 10       | 9        | 14       | 10       |
| Interorbital width ..     | 4       | 3       | 3       | 4       | 4       | 5       | 5       | 6       | 3       | 3        | 3        | 3        | 6        | 5        |
| Tympanum                  | 9       | 6       | 6       | 8       | 8       | 11      | 10      | 11      | 6       | 5        | 6        | 6        | 11       | 8        |
| Fore limb                 | 53      | 37      | 40      | 54      | 57      | 75      | 75      | 80      | 37      | 33       | 47       | 41       | 75       | 53       |
| First finger              | 11      | 7       | 8       | 9       | 11      | 15      | 16      | 15      | 7       | 7        | 9        | 7        | 16       | 11       |
| Second finger             | 9       | 6       | 6       | 7       | 9       | 12      | 12      | 11      | 5       | 5        | 7        | 6        | 12       | 9        |
| Third finger              | 12      | 8       | 9       | 10      | 14      | 15      | 16      | 15      | 7       | 8        | 10       | 8        | 16       | 12       |
| Fourth finger             | 9       | 5       | 6       | 6       | 7       | 12      | 11      | 11      | 5       | 5        | 7        | 6        | 11       | 9        |
| Hind limb                 | 167     | 117     | 130     | 156     | 170     | 202     | 210     | 222     | 100     | 97       | 125      | 116      | 225      | 174      |
| Tibia                     | 58      | 38      | 43      | 51      | 54      | 71      | 72      | 74      | 31      | 30       | 43       | 38       | 75       | 60       |
| Foot ..                   | 55      | 36      | 42      | 50      | 52      | 67      | 72      | 68      | 32      | 30       | 45       | 38       | 71       | 55       |
| Third toe                 | 27      | 17      | 20      | 27      | 27      | 33      | 36      | 33      | 15      | 15       | 22       | 17       | 34       | 27       |
| Fourth toe                | 41      | 28      | 33      | 39      | 43      | 50      | 55      | 49      | 24      | 24       | 37       | 29       | 54       | 43       |
| Fifth toe                 | 27      | 18      | 23      | 27      | 28      | 35      | 41      | 35      | 17      | 17       | 25       | 19       | 35       | 28       |
| First toe                 | 13      | 9       | 10      | 12      | 13      | 17      | 16      | 17      | 7       | 7        | 9        | 8        | 17       | 14       |
| Inner metatarsal tubercle | 7       | 3       | 4.5     | 5       | 6       | 9       | 6       | 9       | 4       | 4        | 5        | 4        | 9        | 6        |

1. Sikkim. 2—3. Nepal. 4—5. Lahore. 6. Benares. 7. Lingasugur, Deccan. 8. Madras. 9—10. Malabar. 11—12. Ceylon. 13—14. Penang (?).

*Habitat.* India from the Nepal Valley and the base of the Himalayas, Ceylon, Assam, Burma, and Southern Yunnan.

The locality 'Penang,' attached to specimens from Cantor's collection in the British Museum, is very doubtful, as in the case of other specimens, probably from India, described by Cantor as found in the Malay Peninsula.

[The geographical range of *R. tigrina* extends as far north and west as Peshawar, and I believe the base of the Baluchistan hills. The few specimens I have seen from the extreme north-west of India are, however, much duller in colour than those from Bengal and seem to be in other respects intermediate between the *forma typica* and *R. crassa*. Specimens from the Nepal Valley, beyond the outer foot-hills of the Himalayas, are typical. *N A.*]

This species has a much wider distribution, extending to Siam, China, and Tropical Africa, but the specimens from these outlying countries deserve to be distinguished as races, which are even regarded by some as valid species. The four forms which I recognize, one of which, *R. occipitalis*, Gthr., is African, may be distinguished as follows:—

A. Regular longitudinal glandular folds, 6 to 14 in number, usually present on the back.

Tibio-tarsal articulation reaching eye or between eye and nostril; heels overlapping; tibia  $1\frac{5}{8}$  to  $2\frac{1}{4}$  times in length of head and body; metatarsal tubercle  $\frac{1}{3}$  to  $\frac{2}{3}$  length of inner toe.

*Forma typica.*

Tibio-tarsal articulation reaching tympanum or eye; heels not overlapping; tibia  $2\frac{1}{7}$  to  $2\frac{1}{2}$  times in length of head and body; metatarsal tubercle  $\frac{2}{3}$  to once length of inner toe var. *crassa*, Jerd.

B. Glandular folds much broken up or absent; if long, fewer in number; inner metatarsal tubercle  $\frac{1}{4}$  to  $\frac{2}{3}$  length of inner toe.

Tibio-tarsal articulation reaching eye or between eye and nostril var. *occipitalis*, Gthr.

Tibio-tarsal articulation reaching shoulder, tympanum, or posterior border of eye var. *pantherina*, Fitz.

Var. *crassa*, Jerd.

(*R. fodiens*, Peters, *ceylanica*, Peters).

A stouter, often more toad-like form, with very large, shovel-shaped inner metatarsal tubercle, the length of which is 1 to  $1\frac{1}{2}$  times in the length of the inner toe and 5 to 7 times in the length of the tibia. The tibio-tarsal articulation reaches the tympanum or the eye, the heels do not overlap, and the length of the tibia, which is always less than that of the fore limb, is  $2\frac{1}{7}$  to  $2\frac{1}{2}$  times in that of head and body.

The web between the toes may be more deeply notched than in the typical form.

The coloration is the same as in the typical form, but the yellow vertebral streak appears to be more frequently absent. Some specimens have large black spots on the gular region.

Annandale observes that the colour of living specimens from Madras is much duller than in the typical *R. tigrina*, a dull brown being substituted for the greens and yellows.

The differences which separate *R. crassa* from *R. tigrina* are closely paralleled by the typical *R. esculenta* and its var. *lessonae*, which are connected by a complete gradation, and I feel sure that if a large number of specimens of *R. tigrina* could be obtained, from Ceylon for instance, exactly the same difficulties would arise in defining the var. *crassa*. Annandale, who believes *R. crassa* to be entitled to specific rank, mentions that "the behaviour of the living specimens sent to me from Madras differed totally from that of individuals of *R. tigrina*, s.s. The former when placed in a vivarium the bottom of which was covered with sand, burrowed immediately and concealed themselves below the surface. This I have never known *R. tigrina* to do. Moreover, they did not possess anything like the same power of leaping."<sup>1</sup> I have since pointed out<sup>2</sup> that similar fossorial habits have been observed in

<sup>1</sup> *Rec. Ind. Mus.* XV, 1918, p. 63.

<sup>2</sup> *Ann. and Mag. N.H.* (9) 11, 1918, p. 255.

the vars. *lessonae* and *chinensis* of *R. esculenta*, and that this fact should be borne in mind by those who appeal to such ethological departures from the normal as an argument in favour of specific distinction.

*Measurements in millimetres.*

|                           |    | 1.  | 2.  | 3.  | 4.  | 5.  | 6.  | 7.  |
|---------------------------|----|-----|-----|-----|-----|-----|-----|-----|
|                           |    | ♀   | ♂   | ♀   | ♂   | ♂   | ♀   | ♀   |
| From snout to vent        | .. | 82  | 90  | 89  | 76  | 76  | 112 | 102 |
| Head                      | .. | 28  | 31  | 29  | 23  | 26  | 36  | 33  |
| Width of head             |    | 30  | 36  | 32  | 26  | 27  | 40  | 39  |
| Snout                     | .. | 10  | 12  | 11  | 9   | 10  | 14  | 15  |
| Eye                       | .  | 8   | 11  | 9   | 9   | 9   | 11  | 11  |
| Interorbital width        |    | 4   | 3   | 3   | 2.5 | 2   | 4   | 4   |
| Tympanum                  |    | 6   | 6   | 6   | 5   | 5   | 8   | 8   |
| Fore limb                 | .. | 39  | 49  | 42  | 36  | 39  | 57  | 60  |
| First finger              |    | 8   | 9   | 8   | 7   | 7   | 10  | 11  |
| Second finger             |    | 6.5 | 7   | 6   | 5   | 5   | 8   | 8   |
| Third finger              | .. | 9   | 10  | 9   | 7   | 8   | 11  | 11  |
| Fourth finger             | .. | 6.5 | 7   | 6   | 5   | 5   | 8   | 8   |
| Hind limb                 |    | 100 | 139 | 118 | 98  | 106 | 155 | 161 |
| Tibia                     | .. | 35  | 42  | 35  | 31  | 52  | 48  | 48  |
| Foot                      |    | 38  | 44  | 41  | 32  | 32  | 50  | 50  |
| Third toe                 | .. | 15  | 23  | 21  | 13  | 16  | 27  | 27  |
| Fourth toe                | .. | 25  | 34  | 31  | 24  | 25  | 38  | 40  |
| Fifth toe                 | .. | 17  | 26  | 23  | 16  | 17  | 29  | 29  |
| First toe                 | .  | 7   | 9   | 7   | 6   | 7   | 9   | 10  |
| Inner metatarsal tubercle | .. | 7   | 6   | 6   | 6   | 5   | 7   | 7   |

1. Benares. 2—3. Madras. 4. Malabar. 5—7. Ceylon.

*Habitat.* This variety is on record from the United Provinces (Benares, Agra), Orissa (Chandbally), Madras town, Malabar and Ceylon.

Var. *pantherina*, Fitz.

(*R. burkilli*, Annand.; *R. rugulosa*, Annand. nec Wiegman.).

Differs from the typical form in the generally shorter hind limb, the tibio-tarsal articulation reaching the shoulder, the tympanum, or the posterior border of the eye, the heels not or but slightly overlapping, and the length of the tibia, which is less than that of the fore limb, being contained  $2\frac{1}{5}$  to  $2\frac{1}{2}$  times in that of head and body. The inner metatarsal tubercle is blunt, and its length is  $2\frac{1}{2}$  to 4 times in that of the inner toe,  $8\frac{2}{3}$  to 14 times in that of the tibia.

Although usually more rounded than in the typical form, the shape of the snout cannot be used for the distinction of this variety since it is more pointed and prominent in some specimens from China (Shanghai) than in others from India (Madras).

The folds on the back, if present, are short, and in many cases they are more correctly described as elongate warts.

The absence of any trace of a light streak above the upper lip, which is marked with vertical dark bars, one or two of which may extend to the eye, also distinguishes this form; the light lateral band and the vertebral streak are absent in all the specimens examined by me. The lower parts are often spotted or

*Measurements in millimetres.*

|                           |    | 1.<br>♀ | 2.<br>♂ | 3.<br>♀ | 4.<br>♂ | 5.<br>♂ | 6.<br>♂ | 7.<br>♀ | 8.<br>♀ | 9.<br>♂ | 10.<br>♂ | 11.<br>♀ | 12.<br>♂ | 13.<br>♀ | 14.<br>♀ | 15.<br>♀ | 16.<br>♀ | 17.<br>♀ |
|---------------------------|----|---------|---------|---------|---------|---------|---------|---------|---------|---------|----------|----------|----------|----------|----------|----------|----------|----------|
| From snout to vent        | .. | 142     | 60      | 57      | 127     | 93      | 120     | 130     | 133     | 90      | 85       | 95       | 90       | 117      | 92       | 91       | 90       | 89       |
| Head                      | .. | 47      | 20      | 19      | 39      | 30      | 40      | 41      | 44      | 32      | 28       | 32       | 27       | 37       | 28       | 28       | 29       | 29       |
| Width of head             | .. | 53      | 21      | 21      | 44      | 32      | 44      | 45      | 53      | 34      | 32       | 34       | 30       | 43       | 32       | 31       | 33       | 31       |
| Snout                     | .. | 20      | 9       | 8       | 16      | 12      | 16      | 16      | 16      | 11      | 12       | 12       | 12       | 15       | 11       | 12       | 12       | 11       |
| Eye                       | .. | 13      | 7       | 6       | 11      | 10      | 11      | 12      | 12      | 9       | 8        | 8        | 8        | 10       | 9        | 9        | 9        | 9        |
| Interorbital width        | .. | 5       | 2.5     | 2.5     | 4       | 3       | 4       | 5       | 5       | 3       | 4        | 4        | 4        | 5        | 3        | 3        | 3        | 3        |
| Tympanum                  | .. | 10      | 4       | 4       | 9       | 6       | 8       | 8       | 9       | 7       | 7        | 6        | 8        | 8        | 7        | 7        | 7        | 7        |
| Fore limb                 | .. | 73      | 29      | 27      | 65      | 48      | 59      | 63      | 70      | 48      | 45       | 49       | 50       | 58       | 48       | 45       | 46       | 46       |
| First finger              | .. | 15      | 6       | 6       | 13      | 9       | 12      | 12      | 13      | 10      | 10       | 9        | 11       | 12       | 9        | 9        | 9        | 10       |
| Second finger             | .. | 13      | 5       | 5       | 10      | 8       | 10      | 10      | 10      | 8       | 8        | 8        | 9        | 10       | 7        | 7        | 8        | 8        |
| Third finger              | .. | 15      | 7       | 6       | 14      | 10      | 14      | 14      | 14      | 11      | 10       | 10       | 11       | 13       | 10       | 10       | 10       | 10       |
| Fourth finger             | .. | 12      | 4       | 4       | 10      | 7       | 10      | 9       | 10      | 7       | 7        | 8        | 9        | 9        | 7        | 7        | 7        | 7        |
| Hind limb                 | .. | 180     | 80      | 72      | 159     | 128     | 165     | 178     | 192     | 129     | 120      | 140      | 138      | 160      | 116      | 123      | 125      | 125      |
| Tibia                     | .. | 58      | 26      | 24      | 52      | 40      | 52      | 57      | 62      | 38      | 38       | 39       | 40       | 47       | 38       | 37       | 39       | 38       |
| Foot                      | .. | 62      | 26      | 24      | 54      | 44      | 59      | 59      | 64      | 44      | 42       | 43       | 47       | 54       | 42       | 43       | 42       | 42       |
| Third toe                 | .. | 31      | 15      | 13      | 27      | 22      | 32      | 28      | 35      | 23      | 23       | 25       | 26       | 28       | 21       | 22       | 23       | 23       |
| Fourth toe                | .. | 60      | 21      | 18      | 42      | 35      | 51      | 46      | 54      | 38      | 34       | 35       | 39       | 43       | 32       | 34       | 34       | 34       |
| Fifth toe                 | .. | 35      | 16      | 13      | 30      | 26      | 36      | 33      | 38      | 27      | 24       | 26       | 28       | 30       | 23       | 24       | 24       | 25       |
| First toe                 | .. | 17      | 7       | 6       | 14      | 11      | 15      | 15      | 16      | 12      | 12       | 12       | 13       | 14       | 11       | 11       | 10       | 11       |
| Inner metatarsal tubercle | .. | 6       | 3       | 2       | 6       | 3       | 5       | 4       | 6       | 4       | 3        | 3        | 4        | 5        | 4        | 3        | 4        | 4        |

1. Toungoo. 2. Thayetmyo. 3. Mandalay. 4. Pegu. 5. Takhana, Siam. 6. Tachin, C. Siam. 7—8. Siam. 9. Hué. 10—11. Ningpo. 12—13. Shanghai. 14—17. Formosa.

marbled with blackish, but a specimen from Pegu is without any spots, and others from Siam and Shanghai have the markings reduced to a streak in the middle of the throat.

This form is hardly to be distinguished from the African var. *occipitalis*, Gthr., the range of which extends from the Egyptian Soudan and Uganda to the Senegal and other parts of West Africa as far south as Angola. I am not sure I could always tell a Burmese or Siamese frog from an African, and the tadpoles are identical.

*Habitat.* Burma, Siam, French Indo-China, China, and Formosa. Annandale also records this frog from Koh Samuie Id., N.E. coast of Malay Peninsula, and reports having received a single specimen from Madras town, among several of the var. *crassa*.

The name *pantherina*, Fitz., based on specimens from Hong Kong, is the earliest that can be assigned to this variety. The type of *R. burkilli*, Annand. is from Tavoy, Tenasserim.

### 5. *Rana cancrivora*.

*Rana cancrivora*, Gravenh., *Delic. Mus. Zool. Vratisl.* I, p. 41 (1829); Tschudi, *Class. Batr.*, p. 39 (1838); Annand., *Mem. As. Soc. Beng.*, VI, 1917, p. 128, pl. v, fig. 4; Malcolm Smith, *Fourn. N.H. Soc. Siam*, II, 1917, p. 264; Bouleng., *Rec. Ind. Mus.* XV, 1918, pp. 55, 65; Annand., *Rec. Ind. Mus.* XV, 1918, p. 63 fig.

*Rana vittigera*, Wieg., *N. Act. Ac. Leop. Carol.* XVII, 1835, p. 255, pl. xxi, fig. 1.

*Rana rugulosa*, Wieg., *t.c.* p. 258, pl. xxi, fig. 2.

*Rana tigrina*, part., Dum. et Bibr., *Exp. Gén.* VIII, p. 3751 (1841); Günth., *Cat. Batr. Sal.* p. 9 (1858); Peters, *Mon. Berl. Ac.* 1863, p. 77; Günth., *Rept. Brit. Ind.*, p. 407 (1864); Steind., *Novara, Amph.* p. 17 (1867); Bouleng., *Cat. Batr. Ecaud.* p. 26 (1882); van Kampen, *Nat. Tijdschr. Nederl. Ind.* LXIX, 1909, p. 33; Bouleng., *Faun. Mal. Pen.*, *Rept.* p. 234 (1912).

? *Rana gracilis*, var. *pulla*, Stoliczka, *Fourn. As. Soc. Beng.* (2) XXXIX, 1870, p. 142.

*Rana schlüteri*, Werner, *Zool. Anz.* 1893, p. 84, *Verh. zool-bot. Ges. Wien*, XLIII, 1893, p. 357, and *Zool. Anz.* 1897, p. 266; Stejneger, *Herp. Japan*, p. 142 (1907).

*Rana tigrina*, var. *angustopalmata*, van Kampen, in M. Web., *Zool. Ergebn.* IV, p. 388, pl. xvi, fig. 3 (1907).

*Rana tigrina*, var. *schlueteri*, Barbour, *Mem. Mus. Comp. Zool.* XLIV 1912, p. 64.

*Rana tigrina*, var. *cancrivora*, Bouleng., *Rec. Ind. Mus.* XV 1918, p. 58.

This frog has usually been confounded with *R. tigrina*, and I should have regarded it as a variety but for the fact, which is now well established, that the tadpole is very different and very similar to that of *R. limnocharis*, as first pointed out by van Kampen.

The vomerine teeth, which vary very considerably, often differ from those of *R. tigrina* in being disposed in rather short oblique series, well separated from the anterior borders of the choanae; but some specimens<sup>1</sup> have longer and stronger series, which may touch the inner anterior borders of the choanae.

<sup>1</sup> From Borneo, Java and Celebes.

The shape of the head varies greatly; it is often quite as long as broad, and it may even be slightly longer<sup>1</sup>; the snout may be broadly rounded or as pointed as in any specimen of the typical *R. tigrina*. The diameter of the tympanum is  $\frac{1}{2}$  to  $\frac{7}{8}$  that of the eye and  $1\frac{1}{3}$  to 2 times its distance from the latter.

The tibio-tarsal articulation reaches the eye or between the eye and the nostril, exceptionally only as far as the tympanum<sup>2</sup>; the heels strongly overlap; the length of the tibia is  $2\frac{1}{2}$  to 3 times its width and is contained  $1\frac{3}{4}$  to  $2\frac{1}{3}$  times in the length from snout to vent. The web between the toes is strongly notched and does not reach the tip of the fourth; in some specimens even the two last phalanges of the fourth toe are free, and such may be described as having the foot  $\frac{3}{4}$  webbed. The inner metatarsal tubercle is blunt and its length is contained  $2\frac{1}{6}$  to 3 times in that of the inner toe; no outer tubercle.

Longitudinal dermal folds, in the strict sense, are often absent on the body; if present, they are reduced to 2 or 3 pairs, the longest of which start from behind the upper eyelid at some distance from the supratemporal fold; a V-shaped glandular fold often present in the middle of the back, between the shoulders.

The coloration is much as in *R. tigrina*, var. *pantherina*, but there may be, rather exceptionally,<sup>3</sup> a light streak along the side of the body, as in the typical *R. tigrina*; a light vertebral line or broad band is sometimes present, but it is very rarely accompanied by a light line along the calf.<sup>4</sup> Lower parts white, rarely spotted or marbled with blackish; the male's gular sacs grey or blackish.

The tadpole is very different from that of *R. tigrina* and hardly to be distinguished from that of *R. limnocharis*. The beak is devoid of the strong cusps and is white edged with black, and the horny teeth are in 2 upper and 3 lower series, all except the inner upper long and uninterrupted; the marginal papillae are present only on the sides of the upper lip. The tail is rather obtusely pointed, and not twice as long as the body.

The eggs measure 1 to  $1\frac{1}{3}$  millim. in diameter.

*Habitat.* Malay Peninsula and Archipelago. The types of *R. vittigera* and *R. rugulosa* are from the Philippines and China (Macao, Cape Syng-more).

[*Rana cancrivora* is by far the commonest frog in rice-fields and ditches round the Inland Sea of Singgora in Peninsular Siam and also in the Malay State of Patani. It appears, however, to be rare (if it exists) in the southern districts of the Malay Peninsula.

Individuals are frequently found in brackish water, and I have seen one jump into the sea from a rock and swim ashore apparently without suffering. N. A.].

Completely linked with *R. tigrina* through the var. *pantherina*, it is highly remarkable for this species to be characterized by so

<sup>1</sup> In a male from Padas, Borneo.

<sup>2</sup> In a female from Chumpon, Siam.

<sup>3</sup> Specimens from the Philippines and Celebes.

<sup>4</sup> Specimens from the Philippines.

*Measurements in millimetres.*

|                            | 1.  | 2.  | 3.  | 4.  | 5.  | 6.  | 7.  | 8.  | 9.  | 10. | 11. | 12. | 13. | 14. | 15. | 16. | 17. | 18. | 19. | 20. | 21. | 22. | 23. | 24. | 25. | 26. | 27. | 28. | 29. | 30. | 31. |
|----------------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
|                            | ♂   | ♀   | ♂   | ♀   | ♂   | ♂   | ♂   | ♀   | ♀   | ♀   | ♂   | ♀   | ♀   | ♂   | ♂   | ♀   | ♂   | ♂   | ♂   | ♀   | ♂   | ♂   | ♀   | ♀   | ♀   | ♀   | ♀   | ♀   | ♀   | ♂   | ♂   |
| From snout to vent         | 57  | 77  | 49  | 82  | 60  | 88  | 77  | 88  | 75  | 65  | 56  | 67  | 59  | 57  | 57  | 73  | 86  | 81  | 78  | 86  | 59  | 54  | 57  | 57  | 66  | 61  | 75  | 72  | 72  | 82  | 68  |
| Head ..                    | 20  | 25  | 16  | 27  | 21  | 28  | 26  | 29  | 26  | 22  | 20  | 22  | 21  | 20  | 21  | 23  | 29  | 27  | 27  | 29  | 20  | 19  | 18  | 19  | 22  | 21  | 26  | 24  | 22  | 24  | 25  |
| Width of head              | 20  | 28  | 18  | 30  | 21  | 32  | 27  | 30  | 27  | 22  | 20  | 22  | 22  | 21  | 22  | 27  | 31  | 27  | 27  | 29  | 19  | 21  | 18  | 20  | 23  | 21  | 27  | 26  | 25  | 26  | 25  |
| Snout ..                   | 7   | 10  | 7   | 11  | 8   | 44  | 11  | 12  | 11  | 9   | 7   | 9   | 8   | 7   | 7   | 9   | 11  | 11  | 11  | 12  | 8   | 7   | 8   | 8   | 9   | 8   | 10  | 10  | 9   | 10  | 10  |
| Eye ..                     | 7   | 8   | 6   | 8   | 7.5 | 8   | 8   | 8   | 8   | 8   | 7   | 8   | 7   | 7   | 7   | 8   | 8   | 8   | 8   | 8   | 7   | 6   | 7   | 7   | 8   | 7   | 8   | 9   | 8   | 8   | 8   |
| Interorbital width         | 2.5 | 2.5 | 2   | 3.5 | 3   | 4   | 3   | 3   | 3   | 3   | 2.5 | 3   | 2.5 | 2   | 2   | 3   | 3   | 3   | 3   | 3   | 2.5 | 2.5 | 2.5 | 2.5 | 2.5 | 2.5 | 2.5 | 3   | 3   | 2.5 | 3   |
| Tympanum                   | 4   | 5   | 3.5 | 6   | 4   | 6   | 6   | 6   | 6   | 4   | 4   | 4   | 4   | 4   | 4   | 4.5 | 6   | 6   | 7   | 6   | 4   | 4   | 4   | 4.5 | 5   | 5   | 5   | 6   | 6   | 5   | 6   |
| Fore limb ..               | 34  | 42  | 30  | 46  | 36  | 47  | 40  | 47  | 42  | 32  | 31  | 35  | 32  | 33  | 34  | 39  | 47  | 45  | 43  | 47  | 36  | 34  | 34  | 34  | 37  | 32  | 42  | 39  | 36  | 45  | 41  |
| First finger               | 6   | 9   | 6   | 9   | 7   | 9   | 10  | 11  | 10  | 7   | 6   | 7   | 7   | 7   | 7   | 8   | 9   | 10  | 10  | 10  | 7   | 6   | 7   | 7   | 9   | 8   | 9   | 9   | 8   | 10  | 9   |
| Second finger              | 5.5 | 7   | 5   | 8   | 6   | 8   | 7   | 8   | 8   | 6   | 5   | 6   | 6   | 6   | 5   | 7   | 6   | 8   | 7   | 7   | 5   | 5   | 5   | 5   | 5   | 7   | 7   | 7   | 8   | 7   | 8   |
| Third finger               | 7   | 10  | 7   | 10  | 8   | 10  | 10  | 11  | 10  | 7   | 6.5 | 7   | 7   | 7   | 7   | 9   | 9   | 10  | 10  | 10  | 7   | 7   | 8   | 8   | 9   | 8   | 9   | 9   | 9   | 11  | 9   |
| Fourth finger              | 5.5 | 6   | 4   | 6   | 5.5 | 7   | 6   | 8   | 7   | 5   | 5   | 6   | 6   | 5   | 5   | 6   | 6   | 8   | 7   | 7   | 5   | 5   | 5   | 5   | 6   | 6   | 7   | 6   | 6   | 8   | 7   |
| Hind limb                  | 81  | 102 | 74  | 119 | 86  | 131 | 115 | 132 | 112 | 93  | 82  | 102 | 87  | 95  | 92  | 108 | 127 | 120 | 121 | 140 | 90  | 87  | 88  | 93  | 111 | 95  | 107 | 103 | 105 | 122 | 110 |
| Tibia ..                   | 25  | 33  | 23  | 38  | 27  | 42  | 37  | 42  | 36  | 29  | 26  | 33  | 29  | 30  | 30  | 35  | 41  | 39  | 38  | 43  | 28  | 27  | 28  | 29  | 36  | 31  | 34  | 32  | 35  | 37  | 35  |
| Foot ..                    | 29  | 36  | 25  | 41  | 32  | 45  | 40  | 45  | 39  | 29  | 26  | 35  | 30  | 31  | 30  | 36  | 43  | 43  | 43  | 47  | 30  | 29  | 30  | 33  | 36  | 31  | 36  | 35  | 35  | 41  | 38  |
| Third toe                  | 15  | 18  | 14  | 20  | 17  | 22  | 19  | 23  | 20  | 14  | 13  | 17  | 14  | 15  | 15  | 18  | 21  | 20  | 20  | 23  | 15  | 14  | 15  | 18  | 19  | 17  | 18  | 17  | 17  | 20  | 20  |
| Fourth toe                 | 24  | 30  | 19  | 33  | 25  | 37  | 32  | 37  | 31  | 23  | 19  | 27  | 24  | 24  | 25  | 26  | 36  | 36  | 35  | 38  | 22  | 22  | 23  | 25  | 29  | 26  | 30  | 29  | 29  | 33  | 33  |
| Fifth toe                  | 17  | 21  | 14  | 23  | 18  | 27  | 22  | 27  | 21  | 16  | 14  | 19  | 17  | 16  | 17  | 18  | 24  | 24  | 25  | 25  | 16  | 16  | 16  | 18  | 21  | 18  | 23  | 22  | 20  | 25  | 23  |
| First toe                  | 6.5 | 9   | 6   | 10  | 8   | 11  | 9   | 11  | 10  | 7   | 6   | 8   | 7   | 7   | 7   | 9   | 9   | 11  | 10  | 12  | 7   | 7   | 7   | 8   | 9   | 7   | 9   | 9   | 8   | 10  | 10  |
| Inner metatarsal tubercle. | 3   | 4   | 2   | 4   | 3   | 4   | 4   | 4   | 4   | 3   | 2.5 | 3   | 2.5 | 3   | 2.5 | 3   | 4   | 4   | 4   | 4   | 2.5 | 3   | 3   | 3   | 3.5 | 3   | 4   | 3.5 | 3   | 4   | 4   |

1—2. Chumpon, Peninsular Siam. 3. Jambu, Jalor. 4. Kedah. 5. Deli, Sumatra. 6—9. Java. 10. Sumbawa. 11—13. Sumba. 14—15. Ombay. 16. Timor. 17—20. Borneo. 21—24. Padas, N. Borneo. 25—26. Philippines. 27—28. Surigao, Philippines. 29. Laguna del Bay, Philippines. 30. Manado, Celebes. 31. Kema, Celebes.

different a tadpole. According to the principles that have guided me in the classification, *R. cancrivora* should be regarded as derived from *R. tigrina* and as leading to *R. limnocharis*, with which it agrees in the larval condition, more of the normal type prevailing in the genus *Rana*.

I conclude that the differentiation of the tadpole in the two species has arisen independently from that of the adult, and cannot therefore accept the suggestion made by Annandale that the case in question points to forms originally distinct having converged to resemble each other in the adult condition. My opinion is supported by various examples grouped by Giard under the term poecilogony.<sup>1</sup>

### 6. *Rana verrucosa*.

*Rana verrucosa*, Günth., *Proc. Zool. Soc.* 1875, p. 567; Bouleng., *Cat. Batr. Ecaud.*, p. 29, pl. iv, fig. 1 (1882), and *Faun. Ind., Rept.*, p. 448 (1890); Boettg., *Ber. Offenb. Ver. Nat.* 1892, p. 94; Annand., *Rec. Ind. Mus.* XV, 1918, p. 17, pl. i, fig. 1.

Vomerine teeth in strong oblique series, touching the anterior borders of the choanae or narrowly separated from them.

Head a little broader than long, moderately depressed; snout obtusely pointed, feebly projecting beyond the mouth, as long as the eye; canthus rostralis obtuse; loreal region very oblique, concave; nostril equidistant from the eye and the tip of the snout or a little nearer the latter; the distance between the nostrils greater than the interorbital width, which is less than that of the upper eyelid; tympanum very distinct,  $\frac{3}{8}$  to  $\frac{2}{3}$  the diameter of eye and about twice its distance from the latter.

Fingers obtusely pointed, first longer than the second, third as long as the snout or a little longer or a little shorter; subarticular tubercles large and very prominent.

Hind limb rather long, the tibio-tarsal articulation reaching the nostril or the tip of the snout, the heels strongly overlapping when the limbs are folded at right angles to the body; tibia  $3\frac{1}{2}$  to 4 times as long as broad,  $1\frac{3}{4}$  to  $1\frac{9}{10}$  times in length from snout to vent, as long as or slightly shorter than the foot or the fore limb. Toes obtusely pointed or slightly swollen at the end,  $\frac{2}{3}$  to  $\frac{3}{4}$  webbed, two phalanges of fourth free; outer metatarsals separated nearly to the base; subarticular tubercles rather small but very prominent; tarsal fold reduced to the distal half; inner metatarsal tubercle elliptical, rather compressed,  $\frac{1}{3}$  to  $\frac{1}{2}$  the length of the inner toe; a small outer metatarsal tubercle.

Head and back rough with warts of unequal size, some of which may form curved folds on the anterior half of the back; sometimes a rather indistinct fold across the head, behind the eyes; a strong, curved glandular fold from the eye to the shoulder. Lower parts smooth, granulate under the thighs near the vent.

<sup>1</sup> Cf. Boulenger, *Rec. Ind. Mus.* XV, 1918, p. 65, and *C.R. Ac. Sc. Paris*, CLXVII, 1918, p. 60.

Grey or brown above, with darker spots and large markings of which the most frequent and regular are a V-shaped band between the eyes, a >--<-shaped marking between the shoulders, and one or two cross-bars on the posterior part of the body; a broad light vertebral stripe is sometimes present, but, unlike what is the rule in *R. limnocharis* and most other species, it is usually interrupted by the dark markings; lips with dark vertical bars, two of which usually proceed from the eye; limbs with complete or interrupted dark cross-bars; sides of thighs black spotted with yellow, or marbled black and yellow. Lower parts white, throat often spotted or mottled with brown.

Male with internal vocal sacs and a rather feebly developed pad on the inner side of the first finger.

Osteological characters as in *R. limnocharis*.

Tadpole with the tail obtusely pointed, about  $1\frac{1}{3}$  times as long as the body. Beak white, broadly edged with black; a long marginal series of upper labial teeth with a short series on each side; 3 long uninterrupted series of lower labial teeth, outer shortest; lower lip with a series of papillae.

*Measurement in millimetres.*

|                    | 1. | 2.  | 3.  | 4.  | 5.  | 6.  | 7.  | 8.  | 9.  |
|--------------------|----|-----|-----|-----|-----|-----|-----|-----|-----|
|                    | ♂  | ♀   | ♀   | ♀   | ♀   | ♀   | ♀   | ♀   | ♀   |
| From snout to vent | 39 | 59  | 53  | 50  | 43  | 43  | 40  | 48  | 33  |
| Head               | 15 | 20  | 19  | 18  | 16  | 16  | 15  | 17  | 12  |
| Width of head      | 16 | 22  | 20  | 20  | 17  | 18  | 16  | 18  | 13  |
| Snout              | 5  | 7   | 6.5 | 6.5 | 6   | 6   | 5   | 6.5 | 4.5 |
| Eye                | .. | 5   | 7   | 6.5 | 6.5 | 6   | 6   | 5   | 6   |
| Interorbital width | .. | 2.5 | 3.5 | 3   | 3   | 2.5 | 2.5 | 2.5 | 3   |
| Tympanum           | .. | 3   | 4.5 | 4   | 4   | 3.5 | 3.5 | 3   | 4   |
| Fore limb.         | .. | 23  | 35  | 30  | 29  | 25  | 25  | 23  | 27  |
| First finger       | .. | 4.5 | 7   | 6   | 6   | 5   | 5   | 5   | 6   |
| Second finger      | .. | 3.5 | 6   | 5   | 5   | 4   | 4   | 4   | 5   |
| Third finger       | .. | 4.5 | 8   | 6.5 | 7   | 6   | 6   | 5.5 | 6   |
| Fourth finger      | .. | 3.5 | 5   | 5   | 5   | 4   | 4   | 4   | 4   |
| Hind limb          | .. | 66  | 103 | 88  | 90  | 75  | 80  | 70  | 83  |
| Tibia              | .. | 22  | 33  | 28  | 28  | 23  | 25  | 23  | 27  |
| Foot               | .. | 22  | 33  | 28  | 28  | 25  | 25  | 23  | 27  |
| Third toe          | .. | 12  | 17  | 15  | 16  | 14  | 13  | 12  | 15  |
| Fourth toe         | .. | 18  | 28  | 23  | 23  | 20  | 20  | 18  | 23  |
| Fifth toe.         | .. | 12  | 19  | 16  | 16  | 14  | 13  | 12  | 15  |

1—7. Malabar (types). 8. Man Kodnur, Travancore. 9. Koni, Travancore.

*Habitat.* Malabar hills, up to 7000 feet in the Nilgiris, 4000 feet in Travancore.

[This frog is very abundant in the Travancore hills. It is less common in the Nilgiris, but by no means scarce in the artificial lake at Ootacamund.

Unlike *R. limnocharis* var. *nilagirica*, *R. verrucosa* avoid small springs and pools and is usually found at the edge of streams or large reservoirs. Though the two frogs occur in the Nilgiris in practically the same localities I have never seen them together. N A.].

7. *Rana limnocharis*.

- Rana limnocharis* (Boie), Wiegman, *N. Acta Ac. Leop.-Carol.* XVII, i, 1835, p. 255; Stoliczka, *Proc. As. Soc. Beng.* 1872, p. 102, and *Fourn. As. Soc. Beng.* XLII, 1873, p. 116; S. Flower, *Proc. Zool. Soc.* 1899, p. 893; Boulenger, *Spol. Zeyl.* II, 1904, p. 73; Van Kampen, *Zool. Jahrb., Syst.* XXII, 1905, p. 703; Stejneger, *Herp. Japan*, p. 127, figs. (1907); Van Kampen, *Nat. Tijdschr. Ned. Ind.* LXIX, 1909, p. 35; Boulenger, *Vert. Faun. Mal. Pen., Rept. Batr.* p. 236 (1912); Malcolm Smith, *Fourn. N. H. Soc. Siam*, II, 1916, p. 165; Annandale, *Mem. As. Soc. Beng.* VI, 1917, p. 133, figs., pl. v. fig. 6; Annandale and Rao, *Rec. Ind. Mus.* XV, 1918, p. 33.
- Rana gracilis* (non Gravenhorst), Wiegman, *l.c.*; Peters, *Mon. Berl. Ac.* 1863, p. 78; Andersson, *Proc. Zool. Soc.* 1871, p. 200; Günther, *Proc. Zool. Soc.* 1875, p. 567; Andersson, *Anat. Zool. Res. Yunnan*, p. 840 (1879).
- Rana nilagirica*, Jerdon, *Fourn. As. Soc. Beng.* XXI, 1853, p. 531; Boulenger, *Spol. Zeyl.* II, 1904, p. 73.
- Rana agricola*, Jerdon, *l.c.*
- Rana vittigera*, part., Günther, *Cat. Batr. Sal.* p. 9 (1858).
- Rana gracilis*, part., Günther, *Rept. Brit. Ind.* p. 1409 (1864); Stoliczka, *Fourn. As. Soc. Beng.* XXXIX, 1870, p. 142; Boulenger, *Cat. Batr. Ecaud.* p. 28 (1882).
- Rana gracilis*, var. *andamanensis*, part., Stoliczka, *t. c.* p. 143.
- Rana limnocharis*, part., Boulenger, *Faun. Ind., Rept.* p. 450 (1890).
- Rana tigrina* (non Daud.), Annandale, *Rec. Ind. Mus.* VIII, 1912, p. 8.
- Rana wasi*, Annandale, *Mem. As. Soc. Beng.* VI, 1917, p. 131, pl. v, fig. 5.
- Rana limnocharis*, subsp. *andamanensis*, Annandale, *t. c.* p. 133, pl. v, fig. 7.
- Rana limnocharis*, subsp. *nilagirica*, Annandale, *t. c.* p. 134.
- Rana limnocharis*, subsp. *syhadrensis*, Annandale, *Rec. Ind. Mus.* XVI, 1919, p. 123.

## Forma typica.

Vomerine teeth in more or less oblique series between the choanae or extending a little beyond the level of their posterior borders, usually short and more widely separated from the anterior corners of the latter than from each other, but exceptionally<sup>1</sup> nearly touching the choanae in front; sometimes<sup>2</sup> almost entirely behind the level of the choanae.

Head as long as broad, exceptionally slightly longer or slightly broader, moderately depressed; snout rounded or pointed,<sup>3</sup> projecting more or less beyond the mouth, as long as or a little longer than the eye; canthus rostralis obtuse; loreal region oblique, more or less concave; nostril usually nearer the end of the snout than the eye; the distance between the nostrils greater than the interorbital width, which is much less than that of the upper eyelid; tympanum very distinct,  $\frac{1}{2}$  to  $\frac{2}{3}$  the diameter of the eye and 2 to 3 times its distance from the latter.

<sup>1</sup> Perak, Malacca, Borneo, the other extreme in a female from Ningpo, in which the teeth form two small oval groups close together and widely separated from the choanae. Stejneger did not seem to be aware of the great amount of variation in the vomerine teeth when he adduced the character of their more posterior position for placing *R. limnocharis* far away from *R. tigrina* in the system.

<sup>2</sup> Several specimens from the Nilgiris. Stejneger describes these groups of teeth in Japanese specimens as having the anterior extremities on a line with the posterior borders of the choanae.

<sup>3</sup> An acutely pointed snout, as figured by Annandale, is exceptional; the usual form is as in his figure of *R. wasi*.

Fingers obtusely pointed, first longer than the second, third as long as the snout or a little shorter or a little longer; subarticular tubercles well developed and very prominent.

Hind limb moderately long, the tibio-tarsal articulation reaching the tympanum, the eye, or the nostril, the heels more or less overlapping<sup>1</sup> when the limbs are folded at right angles to the body; tibia  $2\frac{3}{4}$  to  $3\frac{1}{2}$  times as long as broad,  $1\frac{1}{5}$  to  $2\frac{1}{2}$  times in length from snout to vent, as long as or a little longer than the foot, rarely a little shorter, usually a little shorter than the fore limb. Toes obtusely pointed or slightly swollen at the end, usually  $\frac{1}{2}$  webbed, three phalanges of fourth free, rarely  $\frac{2}{3}$  webbed,<sup>2</sup> only two phalanges of fourth free; outer metatarsals united in the basal half or third; subarticular tubercles rather small but very prominent; tarsal fold absent or reduced to the distal half; inner metatarsal tubercle oval or elliptical, blunt,  $\frac{1}{3}$  to  $\frac{2}{3}$  the length of the inner toe; a small outer metatarsal tubercle exceptionally very indistinct,<sup>3</sup> or confluent with the dermal fold of the outer toe.

Upper parts with more or less prominent warts, with or without longitudinal glandular folds on the back, which are usually short or much interrupted; a more or less distinct fold across the head, behind the eyes, and a strong, curved, glandular fold from the eye to above the shoulder. Lower parts smooth, or posterior part of belly and proximal part of thighs granulate.

Grey, brown, or olive above, sometimes suffused with bright carmine,<sup>4</sup> usually with more or less distinct dark markings, of which the following are the most characteristic, although by no means constant:—A **V**-shaped band from eye to eye; a **>--<**-shaped marking on the back between the fore limbs, the fork on each side embracing a light spot, which is sometimes continued as a band along the body;<sup>5</sup> this dark marking sometimes **W**-shaped or broken up into five spots; a straight or **V**-shaped band across the sacral region. A yellowish vertebral line or broad band often present, dividing the above markings. Lips with dark vertical bars, two of which usually proceed from the eye; limbs with complete or, more often, incomplete dark cross-bars; rarely a light line along the calf; sides of thighs yellow, marbled with black. Lower parts white, throat rarely mottled with brown.<sup>6</sup>

Male with a vocal sac on each side, forming loose folds on the throat, which is brown or blackish on the sides, more frequently with a large **M**-shaped black marking; fore limbs robust; a rather strong pad on the inner side of the first finger.

<sup>1</sup> Describing a female specimen from Japan, Stejneger says the heels only touch, without overlapping. I have never seen such a specimen; in the one with the shortest limbs (Shanghai) the heels slightly overlap. Stejneger however contradicts himself on this point, as in the key to the species of *Rana* (p. 94) he assigns to *R. limnocharis* "heels overlapping considerably."

<sup>2</sup> Several specimens from Malabar.

<sup>3</sup> A few specimens from Malabar, Sikkim, and Borneo.

<sup>4</sup> Cf. Boulenger, *P.Z.S.* 1890, p. 31.

<sup>5</sup> This light band is a remnant of that which is often better developed in *R. tigrina* and *R. cancrivora*.

<sup>6</sup> Specimens from the Nilgiris.

*Measurements in millimetres.*

|                    |    | 1.  | 2.  | 3.  | 4.  | 5. | 6.  | 7.  | 8.  | 9.  | 10. | 11. | 12. | 13. | 14. | 15. | 16. | 17. | 18. | 19. | 20. | 21. | 22. | 23. | 24. | 25. | 26. | 27. |
|--------------------|----|-----|-----|-----|-----|----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
|                    |    | ♀   | ♂   | ♂   | ♀   | ♂  | ♀   | ♀   | ♀   | ♀   | ♀   | ♀   | ♀   | ♀   | ♀   | ♀   | ♀   | ♀   | ♂   | ♂   | ♂   | ♂   | ♀   | ♂   | ♀   | ♀   | ♀   | ♀   |
| From snout to vent | .. | 40  | 49  | 48  | 50  | 37 | 43  | 39  | 46  | 42  | 35  | 39  | 39  | 46  | 40  | 45  | 40  | 54  | 40  | 39  | 39  | 34  | 41  | 43  | 64  | 51  | 45  | 39  |
| Head ..            | .. | 14  | 17  | 17  | 18  | 13 | 16  | 13  | 15  | 15  | 14  | 13  | 14  | 16  | 14  | 16  | 14  | 18  | 13  | 14  | 14  | 13  | 14  | 15  | 20  | 17  | 15  | 13  |
| Width of head      | .. | 14  | 17  | 17  | 18  | 13 | 16  | 13  | 15  | 15  | 14  | 13  | 14  | 16  | 14  | 16  | 14  | 18  | 13  | 14  | 14  | 13  | 14  | 15  | 20  | 18  | 15  | 12  |
| Snout              |    | 5   | 6   | 6   | 7   | 5  | 5   | 4.5 | 5   | 5   | 5   | 5   | 5   | 6   | 5   | 6   | 5   | 7   | 5   | 5   | 5   | 5   | 5   | 5   | 7   | 6   | 5   | 4   |
| Eye ..             | ∴  | 5   | 6   | 6   | 5   | 5  | 5   | 4.5 | 5   | 5   | 4   | 5   | 5   | 5   | 5   | 6   | 5   | 7   | 5   | 5   | 5   | 5   | 5   | 5   | 7   | 6   | 5   | 4   |
| Interorbital width |    | 2   | 2.5 | 2   | 2.5 | 2  | 2   | 2   | 2   | 2   | 2   | 2   | 2   | 2.5 | 2   | 2.5 | 2   | 2.5 | 2   | 2   | 2   | 2   | 2   | 2   | 3   | 2   | 2   | 2   |
| Tympanum ..        |    | 3   | 3.5 | 5   | 3.5 | 3  | 3   | 3   | 3   | 3   | 2.5 | 3   | 3   | 3.5 | 3   | 3   | 3   | 4   | 3   | 3   | 3   | 3   | 3   | 3   | 4   | 3.5 | 3   | 2.5 |
| Fore limb ..       |    | 19  | 29  | 26  | 27  | 18 | 20  | 19  | 23  | 21  | 19  | 20  | 21  | 23  | 21  | 26  | 22  | 28  | 21  | 20  | 22  | 18  | 20  | 24  | 30  | 29  | 26  | 20  |
| First finger       | .  | 5   | 6   | 5.5 | 6   | 4  | 4.5 | 4   | 5   | 5   | 4.5 | 5   | 5   | 5.5 | 5   | 6   | 5   | 6.5 | 5   | 5   | 5   | 4   | 5   | 4.5 | 7   | 6   | 6   | 5   |
| Second finger ..   | .. | 3.5 | 5   | 4.5 | 4   | 3  | 3.5 | 3   | 4   | 4   | 3.5 | 4   | 4   | 4   | 4   | 4.5 | 4   | 5   | 3.5 | 3   | 3.5 | 3   | 3.5 | 3.5 | 5   | 5   | 4   | 4   |
| Third finger ..    | .. | 5   | 6.5 | 5.5 | 6   | 5  | 5   | 4.5 | 5.5 | 5   | 5   | 5   | 5   | 5.5 | 5   | 6   | 5.5 | 7   | 5   | 5   | 5   | 4   | 5   | 5   | 7   | 7   | 7   | 5.5 |
| Fourth finger ..   | .. | 3.5 | 5   | 4   | 4   | 3  | 3   | 3   | 3.5 | 3.5 | 3   | 3   | 3   | 4   | 3.5 | 4.5 | 3.5 | 5   | 2.5 | 3   | 3   | 2.5 | 3   | 3   | 5   | 5   | 4   | 3   |
| Hind limb ..       | .. | 53  | 77  | 69  | 71  | 47 | 56  | 55  | 60  | 57  | 52  | 57  | 58  | 68  | 60  | 73  | 61  | 83  | 61  | 59  | 64  | 48  | 59  | 70  | 89  | 91  | 77  | 58  |
| Tibia ..           | .. | 17  | 24  | 21  | 22  | 15 | 17  | 16  | 18  | 17  | 17  | 18  | 18  | 21  | 19  | 23  | 19  | 27  | 19  | 19  | 21  | 15  | 19  | 21  | 28  | 27  | 24  | 19  |
| Foot ..            | .. | 20  | 25  | 23  | 24  | 17 | 21  | 19  | 21  | 21  | 17  | 19  | 19  | 23  | 21  | 23  | 20  | 28  | 19  | 19  | 21  | 15  | 20  | 24  | 28  | 30  | 27  | 19  |
| Third toe ..       | .. | 11  | 13  | 11  | 11  | 8  | 9   | 9   | 10  | 10  | 8   | 10  | 10  | 12  | 10  | 12  | 10  | 13  | 9   | 9   | 11  | 8   | 10  | 12  | 13  | 15  | 13  | 11  |
| Fourth toe ..      | .. | 15  | 20  | 17  | 17  | 13 | 15  | 14  | 16  | 15  | 13  | 15  | 15  | 18  | 17  | 18  | 16  | 21  | 15  | 15  | 17  | 11  | 15  | 18  | 21  | 25  | 20  | 16  |
| Fifth toe ..       |    | 9   | 13  | 10  | 11  | 7  | 9   | 9   | 10  | 10  | 7   | 10  | 10  | 11  | 10  | 12  | 9   | 14  | 9   | 9   | 10  | 7   | 9   | 12  | 13  | 17  | 14  | 10  |

1. Hiago, Japan. 2—3. Yoyeyoma, Loo Choo Ids. 4. Loo Choo Ids. 5—7. Shanghai. 8—9. Ningpo. 10. Da Laen San, S. W. of Ningpo. 11. Da Zeh Valley, Che Kiang. 12. Katang, Che Kiang. 13. Formosa. 14. Sze Chuen. 15—16. Hong Kong. 17. Hainan. 18—22. Man Son Mts., Tonkin. 23—26. Sikkim. 27. Nam Ting Pokhri, Darjiling.

|                       | 28. | 29. | 30. | 31. | 32. | 33. | 34. | 35. | 36. | 37. | 38. | 39. | 40. | 41. | 42. | 43. | 44. | 45. | 46. | 47. | 48. | 49. | 50. | 51. | 52. | 53. | 54. | 55. |
|-----------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
|                       | ♂   | ♀   | ♀   | ♀   | ♀   | ♀   | ♀   | ♀   | ♀   | ♀   | ♀   | ♀   | ♀   | ♀   | ♂   | ♂   | ♀   | ♀   | ♀   | ♂   | ♂   | ♀   | ♂   | ♀   | ♀   | ♂   | ♂   | ♀   |
| From snout to vent .. | 43  | 64  | 51  | 45  | 47  | 46  | 44  | 33  | 37  | 36  | 35  | 52  | 36  | 35  | 51  | 50  | 64  | 62  | 60  | 45  | 44  | 51  | 42  | 50  | 46  | 42  | 36  | 6   |
| Head ..               | 15  | 20  | 17  | 15  | 16  | 16  | 16  | 12  | 12  | 12  | 11  | 17  | 12  | 11  | 17  | 17  | 21  | 20  | 20  | 16  | 16  | 17  | 15  | 13  | 16  | 15  | 13  | 16  |
| Width of head ..      | 15  | 20  | 18  | 15  | 16  | 16  | 16  | 12  | 12  | 12  | 11  | 17  | 12  | 11  | 17  | 16  | 21  | 20  | 20  | 16  | 16  | 17  | 15  | 18  | 16  | 15  | 13  | 16  |
| Snout ..              | 5   | 7   | 6   | 5   | 6   | 6   | 6   | 4   | 4   | 4   | 4   | 6   | 4   | 4   | 6   | 6   | 8   | 7   | 8   | 6   | 6   | 6   | 5.5 | 6   | 6   | 5   | 5   | 6   |
| Eye ..                | 5   | 7   | 6   | 5   | 6   | 6   | 6   | 4   | 4   | 4   | 4   | 6   | 4   | 4   | 6   | 6   | 7   | 7   | 7   | 6   | 6   | 6   | 5.5 | 6   | 6   | 5   | 5   | 6   |
| Interorbital width .. | 2   | 3   | 2   | 2   | 2   | 2   | 2   | 2   | 1.5 | 1.5 | 1.5 | 2   | 2   | 2   | 2   | 2   | 2.5 | 2   | 2.5 | 2   | 2   | 2   | 2   | 2   | 2   | 1.5 | 1.5 | 2   |
| Tympanum ..           | 3   | 4   | 3.5 | 3   | 3.5 | 3   | 3   | 2.5 | 2.5 | 2.5 | 2.5 | 3   | 3   | 2.5 | 4   | 4   | 4.5 | 4   | 4   | 3.5 | 3.5 | 4   | 3.5 | 3.5 | 3   | 3   | 3   | 3.5 |
| Fore limb ..          | 24  | 30  | 29  | 26  | 24  | 24  | 23  | 17  | 20  | 19  | 20  | 28  | 20  | 18  | 28  | 26  | 32  | 30  | 32  | 26  | 23  | 27  | 22  | 26  | 26  | 22  | 21  | 23  |
| First finger ..       | 4.5 | 7   | 6   | 6   | 5   | 6   | 5   | 3.5 | 4   | 4   | 4   | 6   | 4   | 4   | 6   | 6   | 7   | 7   | 7   | 5   | 5   | 6   | 5   | 6   | 6   | 5   | 4   | 5   |
| Second finger ..      | 3.5 | 5   | 5   | 4   | 4   | 5   | 4   | 3   | 3   | 3   | 3   | 5   | 3   | 3   | 5   | 4   | 5   | 5   | 5   | 4   | 4   | 4   | 3.5 | 4.5 | 4   | 3.5 | 3   | 3.5 |
| Third finger ..       | 5   | 7   | 7   | 7   | 6   | 7   | 6   | 4   | 4   | 4   | 4   | 7   | 5   | 4   | 6   | 6   | 7   | 7   | 8   | 6   | 5   | 6   | 5   | 6   | 6   | 5   | 5   | 5   |
| Fourth finger ..      | 3   | 5   | 5   | 4   | 4   | 5   | 4   | 2.5 | 3   | 3   | 3   | 5   | 3   | 3   | 4   | 4   | 5   | 5   | 5   | 4   | 4   | 4   | 3   | 4   | 4   | 3   | 3   | 3   |
| Hind limb ..          | 70  | 89  | 91  | 77  | 75  | 77  | 75  | 53  | 53  | 53  | 55  | 78  | 59  | 52  | 75  | 71  | 95  | 85  | 91  | 70  | 68  | 70  | 61  | 73  | 77  | 65  | 58  | 67  |
| Tibia ..              | 21  | 28  | 27  | 24  | 23  | 23  | 23  | 16  | 16  | 15  | 16  | 24  | 19  | 16  | 24  | 23  | 32  | 28  | 30  | 22  | 22  | 23  | 19  | 24  | 26  | 21  | 18  | 22  |
| Foot ..               | 24  | 28  | 30  | 27  | 24  | 26  | 26  | 17  | 17  | 17  | 17  | 25  | 20  | 17  | 24  | 22  | 30  | 26  | 30  | 23  | 22  | 23  | 19  | 24  | 25  | 20  | 19  | 22  |
| Third toe ..          | 12  | 13  | 15  | 13  | 13  | 14  | 14  | 9   | 9   | 9   | 9   | 13  | 10  | 9   | 10  | 11  | 14  | 12  | 14  | 11  | 11  | 11  | 9   | 12  | 11  | 10  | 9   | 10  |
| Fourth toe ..         | 18  | 21  | 25  | 20  | 21  | 22  | 22  | 13  | 13  | 14  | 13  | 20  | 16  | 14  | 17  | 17  | 22  | 20  | 22  | 18  | 17  | 18  | 15  | 18  | 18  | 15  | 15  | 16  |
| Fifth toe ..          | 12  | 13  | 17  | 14  | 14  | 15  | 15  | 9   | 9   | 9   | 9   | 13  | 10  | 9   | 9   | 10  | 13  | 12  | 14  | 11  | 11  | 11  | 9   | 10  | 11  | 10  | 9   | 9   |

28—31. Nilguries. 32—34. Malabar. 35. Trivandrum. 36—38. Madras Presidency. 39. Ceylon. 40. Trincomalee. 41. Punduloya.  
 42—46. Toungoo. 47—49. Bangkok. 50—51. Takhamen, Siam. 52. Klong Bung Tai, Siam. 53—55. Chantabonn, Siam.

|                    |    | 56. | 57. | 58. | 59. | 60. | 61. | 62. | 63. | 64. | 65. | 66. | 67. | 68. | 69. | 70. | 71. | 72. | 73. | 74. | 75. | 76. | 77. | 78. | 79. | 80. | 81. |
|--------------------|----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
|                    |    | ♀   | ♂   | ♂   | ♂   | ♀   | ♂   | ♀   | ♀   | ♀   | ♂   | ♀   | ♀   | ♂   | ♀   | ♂   | ♀   | ♂   | ♀   | ♀   | ♀   | ♀   | ♀   |     | ♂   | ♀   | ♀   |
| From snout to vent |    | 47  | 40  | 47  | 39  | 50  | 44  | 67  | 60  | 57  | 38  | 60  | 57  | 43  | 59  | 35  | 40  | 46  | 50  | 42  | 62  | 60  | 56  | 57  | 42  | 56  | 40  |
| Head               | .. | 15  | 14  | 16  | 13  | 17  | 16  | 21  | 20  | 19  | 14  | 20  | 19  | 15  | 19  | 14  | 15  | 16  | 17  | 15  | 20  | 20  | 19  | 19  | 15  | 17  | 15  |
| Width of head      | .. | 15  | 14  | 16  | 13  | 17  | 16  | 21  | 20  | 19  | 14  | 20  | 19  | 15  | 19  | 14  | 15  | 16  | 17  | 15  | 20  | 20  | 19  | 19  | 15  | 17  | 14  |
| Snout              | .. | 6   | 5   | 6   | 5   | 7   | 6   | 8   | 8   | 7   | 5   | 8   | 7   | 5   | 7   | 5   | 5   | 6   | 6   | 5.5 | 8   | 8   | 8   | 8   | 5.5 | 7   | 5   |
| Eye                | .. | 5   | 5   | 6   | 5   | 6   | 6   | 7   | 7   | 6   | 5   | 7   | 6   | 5   | 6   | 4   | 5   | 5   | 6   | 5.5 | 6.5 | 6.5 | 6   | 6   | 5.5 | 6   | 5   |
| Interorbital width |    | 2   | 2   | 2   | 2   | 2   | 2   | 2.5 | 2   | 2   | 2   | 2   | 2   | 2   | 2.5 | 2   | 2   | 2   | 2   | 2   | 3   | 2.5 | 2.5 | 3   | 2   | 3   | 2   |
| Tympanum.          | .. | 3   | 3   | 3   | 3   | 3.5 | 4   | 5   | 4   | 4   | 3   | 4   | 4.5 | 3   | 4   | 2.5 | 3   | 3   | 3   | 3   | 4   | 4   | 3.5 | 4   | 3   | 4   | 3   |
| Fore limb          | .. | 24  | 21  | 25  | 21  | 25  | 24  | 32  | 32  | 30  | 21  | 32  | 29  | 23  | 31  | 20  | 21  | 26  | 27  | 25  | 33  | 33  | 31  | 31  | 20  | 27  | 22  |
| First finger ..    | .. | 6   | 5   | 6   | 5   | 6   | 5   | 7   | 7   | 7   | 5   | 7   | 7   | 5   | 6   | 4   | 5   | 5   | 6   | 6   | 7   | 7   | 6   | 8   | 5   | 7   | 5   |
| Second finger      | .. | 4   | 3.5 | 5   | 3.5 | 4   | 4   | 5   | 5   | 5   | 4   | 5   | 5   | 4   | 5   | 3.5 | 3.5 | 4   | 5   | 5   | 5   | 5   | 5   | 6   | 4   | 5   | 4   |
| Third finger..     | .. | 6   | 5   | 7   | 5   | 6   | 5   | 7   | 7   | 7   | 5   | 8   | 7   | 5   | 7   | 5   | 5.5 | 5   | 6   | 6   | 7   | 7   | 6   | 8   | 5   | 7   | 5   |
| Fourth finger      | .. | 3.5 | 3   | 4.5 | 3   | 4   | 3   | 4   | 4   | 4   | 3   | 5   | 4   | 3.5 | 4   | 3.5 | 3.5 | 4   | 4   | 4   | 5   | 5   | 5   | 5   | 3.5 | 4   | 4   |
| Hind limb          | .. | 73  | 59  | 69  | 59  | 78  | 65  | 92  | 89  | 86  | 58  | 93  | 87  | 66  | 92  | 53  | 60  | 70  | 79  | 69  | 96  | 92  | 86  | 90  | 70  | 83  | 65  |
| Tibia              | .. | 24  | 20  | 22  | 19  | 25  | 20  | 30  | 29  | 28  | 18  | 30  | 28  | 22  | 29  | 17  | 20  | 22  | 25  | 22  | 32  | 31  | 27  | 30  | 22  | 27  | 20  |
| Foot               | .. | 24  | 20  | 24  | 20  | 26  | 20  | 30  | 29  | 29  | 19  | 30  | 28  | 22  | 31  | 18  | 20  | 22  | 26  | 23  | 32  | 30  | 27  | 31  | 22  | 27  | 21  |
| Third toe          | .. | 12  | 9   | 12  | 10  | 13  | 10  | 14  | 14  | 13  | 9   | 15  | 14  | 10  | 14  | 9   | 10  | 10  | 13  | 12  | 14  | 14  | 13  | 13  | 10  | 15  | 11  |
| Fourth toe         | .. | 18  | 16  | 18  | 16  | 20  | 16  | 22  | 22  | 21  | 15  | 24  | 22  | 17  | 24  | 14  | 16  | 16  | 20  | 17  | 24  | 23  | 22  | 25  | 17  | 22  | 17  |
| Fifth toe          | .. | 12  | 9   | 11  | 10  | 13  | 10  | 14  | 14  | 13  | 8   | 15  | 14  | 10  | 14  | 8   | 9   | 10  | 13  | 11  | 15  | 14  | 13  | 15  | 11  | 14  | 11  |

56. Kedah. 57. Kuala Lipis, Pahang. 58. Larut hills, Perak. 59—60. Perak. 61—64. Malacca. 65—67. Singapore. 68—69. Deli, Sumatra. 70—71. Java. 72—74. Lombok. 75—77. Borneo. 78. Kuching, Sarawak (type of *R. wasi*). 79—80. Great Natuna. 81. Luzon.

Nasal bones large, in contact with each other, narrowly separated from the frontoparietals, only a small portion of the ethmoid remaining uncovered; frontoparietals narrow, flat; zygomatic process of squamosal moderately long. Omosternum forked at the base. Terminal phalanges obtusely pointed.

Tadpole with the tail attenuate to a rather obtuse point, about twice as long as the body. Beak white, edged with black; a long marginal series of upper labial teeth with a short series on each side; 3 long uninterrupted series of lower labial teeth, outer shortest; lower lip with two series of long papillae.

[Individuals from comparatively high altitudes in the Himalayas, Burma and the Western Ghats are usually small and at some spots in the Himalayas (e.g. Sitong Ridge in the Darjiling District) are of a peculiar grey colour with rounded dorsal warts. No definite structural differences, however, can be found to separate most of these mountain forms, except that in the race peculiar to the Western Ghats in Bombay the first and second fingers are usually almost equal or subequal in length. For this Bomby race I have recently proposed the varietal name *syhadrensis* (see *Rec. Ind. Mus.* XVI, p. 123; 1919). The Nilgiri race (*nilagirica*, Jerdon) is not dwarfed.

*Rana limnocharis* is, after *R. cyanophlyctis*, the commonest and most universally distributed of the Indian frogs. It frequents the edge of ponds and marshes and leaps into the water when disturbed, as a rule rapidly swimming ashore again. It cannot skip on the surface as *R. cyanophlyctis* does. In mountainous districts it undergoes a prolonged period of hibernation, during which it conceals itself. Individuals which have fallen into wells and been unable to escape or have been placed there in order to eat insect larvae (as I believe is a custom in some parts of India) float on the surface in cold weather in a semi-torpid condition.—N. A.]

*Habitat.* Eastern Asia, from Japan and China to India, Ceylon and the Malay Peninsula and Archipelago, eastward to the Philippines, Borneo and Lombok. Recorded from up to 7000 ft. in Sikkim.

I have placed the recently described *R. wasi*, Annand., from N. Borneo, the Nicobars, Burma, the Khasi Hills, and the extreme east of the Himalayan foothills, simply in the synonymy of *R. limnocharis*, as the short description does not give a single character to justify a separation, and the figure agrees perfectly well with an average specimen of the typical form. Dr. Annandale has favoured me with the loan of one of the type specimens, from Kuching, Sarawak.

#### Var. *nilagirica*, Jerdon.

Differs from the typical form in the longer hind limbs, the tibio-tarsal articulation reaching the tip of the snout. As however the specimens referred to *R. nilagirica* resemble very closely others, likewise from the Nilgiris, in which the limbs are not longer than in the typical form, and as Dr. Annandale has observed an

almost complete grading between the two, I am no longer in favour of reviving Jerdon's species.

The pale streak or spot between the eye and the commissure of the jaws, which Annandale points out as characteristic, is also to be seen in some of the other specimens from the Nilguries, as well as in a form from the Malay Peninsula.

[I have recently examined a very large series of specimens in the Nilguries. Individuals that conform more or less closely to the varietal type occur all over the plateau and also in the gorge of the Bhavani River at the base of the hills. With them are found individuals that could hardly be distinguished from the *forma typica*.

This frog lives at the edge of small springs and ditches and in patches of marshy ground on the hill-side. It breeds in stagnant water.—N. A.].

*Measurements in millimetres.*

|                       | 1.  | 2.  | 3.  |
|-----------------------|-----|-----|-----|
|                       | ♀   | ♀   | ♀   |
| From snout to vent    | 56  | 48  | 48  |
| Head .. .. .          | 25  | 18  | 17  |
| Width of head         | 20  | 18  | 17  |
| Snout .. .. .         | 7   | 7   | 6   |
| Eye .. .. .           | 6   | 6   | 5   |
| Interorbital width    | 2.5 | 2.5 | 2.5 |
| Tympanum .. .. .      | 4   | 3.5 | 3.5 |
| Fore limb .. .. .     | 31  | 27  | 27  |
| First finger .. .. .  | 7   | 6   | 6   |
| Second finger .. .. . | 5   | 5   | 5   |
| Third finger .. .. .  | 7   | 7   | 7   |
| Fourth finger .. .. . | 4   | 5   | 5   |
| Hind limb .. .. .     | 94  | 89  | 90  |
| Tibia .. .. .         | 30  | 28  | 28  |
| Foot .. .. .          | 30  | 30  | 30  |
| Third toe .. .. .     | 16  | 15  | 16  |
| Fourth toe .. .. .    | 24  | 23  | 24  |
| Fifth toe .. .. .     | 16  | 15  | 16  |

1. Nilguries. 2. Malabar. 3. Madras Presidency.

*Habitat.* Nilgiri and Shevaroy hills, Madras Presidency.

*Var. syhadrensis*, Annand.

Described as "a dwarfed race akin to the subsp. *nilagirica*, but of much smaller stature and with the hind limbs as a rule shorter. The first finger hardly extends beyond the second; the hind feet are as in the typical form except that the webbing is slightly less extensive and the tibio-tarsal articulation reaches the anterior border of the eye or a point between it and the tip of the snout. The dorsal surface is gray with black spots sometimes with a reddish suffusion; a narrow pale mid-dorsal line is often present; the ventral surface is white, with the whole of the throat black in the adult male."

*Measurements in millimetres.*

|                          | 1.   | 2.   |
|--------------------------|------|------|
|                          | ♂    | ♀    |
| From snout to vent .. .. | 27   | 31.5 |
| Head .. ..               | 11   | 12.5 |
| Width of head .. ..      | 9.5  | 11   |
| Snout .. ..              | 4.5  | 6    |
| Eye .. ..                | 3.4  | 3.4  |
| Interorbital width .. .. | 2.8  | 3    |
| Tympanum .. ..           | 1.7  | 2    |
| Fore limb .. ..          | 13.2 | 16   |
| First finger .. ..       | 4    | 5    |
| Second finger .. ..      | 3.8  | 4.5  |
| Hind limb .. ..          | 42.7 | 45.8 |

*Habitat.* Hills and elevated valleys of the middle region of the Bombay Presidency, between 2000 and 4000 feet altitude.

Since describing this form, Dr. Annandale has become acquainted with its tadpole, having received from Khandalla in the Western Ghats series which show the mouth disc to have normally only 3 rows of horny teeth (one upper and two lower). In two specimens examined, however, the rows are abnormal and asymmetrical. In one of those individuals five rows can be distinguished. Dr. Annandale thinks the tadpoles described by Ferguson (*Journ. Bomb. N.H. Soc.* XV, 1904, p. 501) from Travancore should be referred to this variety.

Var. *andamanensis*, Stoliczka.

Annandale has pointed out that this name is founded on examples of *R. doriae*, Blgr., and of a small form of *R. limnocharis* to which he proposes to restrict it.

"This form closely resembles the *forma typica* except in its small size and peculiar coloration. The dorsal surface of the head and body is of a rich chestnut-brown, while the sides are of a dark brown densely spotted with black. A narrow blackish line, sometimes running on a raised ridge or series of longitudinal folds, often separates the two areas; zigzag dark bars sometimes run across the back, and there is frequently a dark cross-bar between the posterior part of the eyes. The lips are more or less mottled and the throat feebly irrorated."

*Habitat.* Andamans and Tenasserim.

8. *Rana greenii*.

*Rana vittigera*, part., Günth., *Cat. Batr. Sal.* p. 9 (1858).

*Rana gracilis*, part., Günth., *Rept. Brit. Ind.* p. 409 (1864); Bouleng., *Cat.*

*Batr. Ecaud.* p. 28 (1882).

*Rana limnocharis*, part., Bouleng., *Faun. Ind., Rept.* p. 450 (1890).

*Rana greenii*, Bouleng., *Spol. Zeyl.* II, 1904, p. 74.

*Rana limnocharis*, subsp. *greenii*, Annand., *Mem. As. Soc. Beng.* VI, 1917, p. 134.

Vomerine teeth in rather strong oblique series between and extending posteriorly well beyond the choanae.

Head as long as broad, exceptionally slightly longer or slightly broader, moderately depressed; snout rounded or obtusely pointed, as long as or a little longer than the eye, projecting more or less beyond the mouth; canthus rostralis very obtuse; loreal region oblique, concave; nostril equidistant from the eye and the tip of the snout; the distance between the nostrils a little greater than the interorbital width, which is a little less than that of the upper eyelid; tympanum very distinct,  $\frac{1}{2}$  to  $\frac{2}{3}$  the diameter of the eye and about twice its distance from the latter.

Fingers obtusely pointed, first and second equal or first extending very slightly beyond the second, third as long as or a little longer than the snout; subarticular tubercles well developed and very prominent.

Hind limb moderately long, the tibio-tarsal articulation reaching the eye or the nostril, the heels strongly overlapping when the limbs are folded at right angles to the body; tibia 3 to 4 times as long as broad, about twice in length from snout to vent, as long as or a little shorter than the foot, as long as or a little shorter than the fore limb. Toes obtusely pointed, not quite  $\frac{1}{2}$  webbed, 3 phalanges of fourth free; outer metatarsals united in the basal third; subarticular tubercles rather small but very prominent; tarsal fold absent or reduced to the distal half; inner metatarsal tubercle very small, oval,  $\frac{1}{5}$  to  $\frac{1}{3}$  the length of the inner toe; outer metatarsal tubercle indistinct, or confluent with the dermal fold of the outer toe.

Skin smooth above, with 4 to 8 very prominent, continuous or interrupted glandular folds along the back, these folds usually straight and very regular; sides with granules and short glands; a rather indistinct fold usually present across the head, behind the eyes; a curved glandular fold from the eye to the shoulder. Lower parts smooth.

Brown above, with black spots on the body, dark vertical bars on the lips, and more or less regular cross-bars on the limbs; the dorsal folds sometimes edged with blackish; a narrow or broad yellowish vertebral streak constantly present. Lower parts white, throat sometimes spotted or marbled with brown.

Male with a vocal sac on each side, forming loose folds on the throat, the sides of which are greyish; minute granular excrescences on the back; fore limbs very robust; a strong pad on the inner side of the first finger.

*Measurements in millimetres (all type specimens).*

|                       | 1.  | 2.  | 3.  | 4.  | 5.  | 6.  | 7. | 8.  | 9.  |
|-----------------------|-----|-----|-----|-----|-----|-----|----|-----|-----|
|                       | ♂   | ♀   | ♀   | ♀   | ♂   | ♂   | ♀  | ♀   | ♀   |
| From snout to vent .. | 36  | 42  | 38  | 37  | 38  | 37  | 50 | 47  | 35  |
| Head ..               | 11  | 14  | 13  | 13  | 13  | 13  | 16 | 16  | 11  |
| Width of head         | 11  | 14  | 13  | 13  | 14  | 13  | 16 | 16  | 11  |
| Snout ..              | 4   | 5   | 5   | 5   | 4.5 | 4.5 | 6  | 5.5 | 4   |
| Eye ..                | 4   | 4   | 4   | 4   | 4.5 | 4.5 | 6  | 5.5 | 4   |
| Interorbital width    | 2.5 | 3   | 3   | 3   | 2.5 | 2.5 | 3  | 2.5 | 2.5 |
| Tympanum ..           | 2.5 | 2.5 | 2.5 | 2.5 | 2.5 | 2.5 | 3  | 3   | 2.5 |
| Fore limb ..          | 19  | 23  | 23  | 21  | 21  | 22  | 30 | 26  | 19  |

|                  | 1.  | 2. | 3. | 4.  | 5. | 6.  | 7.  | 8. | 9.  |
|------------------|-----|----|----|-----|----|-----|-----|----|-----|
|                  | ♂   | ♀  | ♀  | ♀   | ♂  | ♂   | ♀   | ♀  | ♀   |
| First finger     | 3.5 | 4  | 4  | 4.5 | 4  | 4   | 5.5 | 5  | 4   |
| Second finger .. | 3.5 | 4  | 4  | 4   | 4  | 4   | 5.5 | 5  | 3.5 |
| Third finger     | 5   | 6  | 6  | 5   | 5  | 5   | 7   | 7  | 5   |
| Fourth finger    | 3   | 4  | 4  | 4   | 4  | 3.5 | 4   | 4  | 3   |
| Hind limb        | 58  | 72 | 70 | 64  | 60 | 61  | 78  | 77 | 60  |
| Tibia ..         | 19  | 23 | 21 | 19  | 18 | 18  | 25  | 24 | 17  |
| Foot             | 19  | 23 | 23 | 22  | 20 | 20  | 26  | 26 | 19  |
| Third toe        | 10  | 12 | 12 | 11  | 11 | 11  | 14  | 14 | 11  |
| Fourth toe       | 16  | 19 | 19 | 17  | 17 | 17  | 22  | 22 | 16  |
| Fifth toe ..     | 10  | 13 | 12 | 11  | 11 | 11  | 15  | 14 | 10  |

1—2. Punduloya. 3—4. C. Ceylon. 5—9. Ceylon.

*Habitat.* Hills of Central Ceylon.

This frog is closely allied to *R. limnocharis*, but I have no hesitation in regarding it as entitled to specific rank. It is easily distinguished by a combination of characters: first and second fingers equal or nearly so, diameter of tympanum not greater than interorbital width, outer metatarsal tubercle absent or very indistinct, inner metatarsal tubercle usually smaller.

### 9. *Rana brevipalmata*.

*Rana brevipalmata*, Peters, *Mon. Berl. Ac.* 1871, p. 646; Bouleng., *Spol.*

*Zeyl.* II, 1904 p. 73; Annand., *Mem. As. Soc. Beng.* VI, 1917, p. 134.

*Rana gracilis*, part., Bouleng., *Cat. Batr. Ecaud.* p. 28 (1882).

Vomerine teeth in rather strong oblique series between and extending posteriorly beyond the choanae.

Head as long as broad or slightly longer than broad, moderately depressed; snout rounded or pointed, as long as or a little longer than the eye, projecting more or less beyond the mouth; canthus rostralis very obtuse; loreal region oblique, concave; nostril usually a little nearer the end of the snout than the eye; the distance between the nostrils greater than the interorbital width, which is less than that of the upper eyelid; tympanum very distinct,  $\frac{1}{2}$  to  $\frac{3}{5}$  the diameter of the eye and  $1\frac{1}{3}$  to  $1\frac{1}{2}$  times its distance from the latter.

Fingers obtusely pointed, first longer than the second, third as long as or a little longer than the snout; subarticular tubercles well developed and very prominent.

Hind limb very long, the tibio-tarsal articulation reaching the tip of the snout or a little beyond, the heels strongly overlapping when the limbs are folded at right angles to the body; tibia 4 to  $4\frac{1}{2}$  times as long as broad,  $1\frac{3}{5}$  to slightly less than 2 times in length from snout to vent, shorter than the foot, a little longer or a little shorter than the fore limb. Toes rather pointed, very slender, barely  $\frac{1}{3}$  webbed, the web not reaching the second phalanx; outer metatarsals separated nearly to the base; subarticular tubercles rather small, moderately prominent; tarsal fold absent or reduced to the distal half; inner metatarsal tubercle strong, elliptic, compressed,  $\frac{1}{2}$  to  $\frac{2}{3}$  the length of the inner toe; a rather indistinct outer metatarsal tubercle.

Back with elongate glandular warts or interrupted longi-  
tudi-

nal folds; a curved fold from the eye to the shoulder. Lower parts smooth.

Greyish or reddish-brown above, with blackish spots which may be confluent to form two or four bands along the back; dark vertical bars on the lips, two of which usually proceed from the eye; an oblique light streak from the eye to the shoulder; limbs with more or less regular dark cross-bars; hinder side of thighs yellow, marbled with black; a narrow or broad yellow vertebral streak constantly present; often a yellow line along the calf. Lower parts white.

Male with a vocal sac on each side, forming folds on the throat<sup>1</sup> the sides of which are black; minute granular excrescences on the back and sides and also, very crowded, on the throat and belly during the breeding season; fore limb rather robust; a strong pad on the inner side of the first finger.

Skull as in *R. limnocharis*.

*Measurements in millimetres.*

|                    |    | 1.  | 2.  | 3.  | 4. | 5.  | 6. | 7.  |
|--------------------|----|-----|-----|-----|----|-----|----|-----|
|                    |    | ♀   | ♂   | ♂   | ♀  | ♂   | ♂  | ♂   |
| From snout to vent | .. | 47  | 40  | 46  | 35 | 47  | 45 | 41  |
| Head               | .. | 17  | 15  | 15  | 12 | 17  | 16 | 15  |
| Width of head      |    | 17  | 15  | 15  | 11 | 17  | 16 | 15  |
| Snout              | .. | 6   | 5   | 5   | 4  | 7   | 6  | 5   |
| Eye                | .  | 6   | 5   | 5   | 4  | 6   | 5  | 5   |
| Interorbital width |    | 2.5 | 2.5 | 2.5 | 2  | 2.5 | 2  | 2   |
| Tympanum..         |    | 3   | 3   | 3   | 2  | 3   | 3  | 3   |
| Fore limb          | .. | 27  | 23  | 26  | 20 | 27  | 26 | 24  |
| First finger       | .. | 6   | 5   | 5   | 4  | 6   | 6  | 5   |
| Second finger      | .. | 5   | 4   | 4   | 3  | 5   | 5  | 4   |
| Third finger       | .. | 7   | 5   | 6   | 5  | 7   | 6  | 5.5 |
| Fourth finger      |    | 5   | 3   | 4   | 3  | 4   | 4  | 3.5 |
| Hind limb          |    | 90  | 73  | 88  | 60 | 87  | 82 | 71  |
| Tibia              |    | 29  | 22  | 27  | 19 | 26  | 25 | 21  |
| Foot               | .. | 32  | 25  | 30  | 22 | 30  | 29 | 24  |
| Third toe          |    | 17  | 14  | 15  | 11 | 16  | 16 | 13  |
| Fourth toe         | .. | 27  | 21  | 25  | 18 | 25  | 25 | 21  |
| Fifth toe          | .. | 18  | 14  | 15  | 11 | 16  | 16 | 13  |

1. Nilgiris. 2. Malabar. 3—4. Devicolum, Travancore. 5—7: Piermud, Travancore.

*Habitat.* Hills of Southern India. The type specimen, preserved in the Berlin Museum, is labelled as from Pegu, purchased of a dealer.

The longer hind limbs distinguish this species from the typical *R. limnocharis*, but not from the var. *nilagirica*; it differs however from both in the much shorter web between the toes, and, although one might feel inclined to regard *R. brevipalmata* as one of the local varieties of *R. limnocharis*, I am of opinion that it deserves the rank assigned to it by Peters.

<sup>1</sup> In one of the specimens (Malabar) there is a single, very strong fold, on each side, touching the lower border of the base of the arm, thus foreshadowing the condition of the cleft in the African *R. bibroni*.

10. *Rana grunniens*.

*Rana grunniens*, part., Daud., *Hist. Rain. Gren. Crap.* p. 65, pl. xxi (1803) and *Hist. Rept.* VIII, p. 127 (1803).

*Rana subsaltans*, Gravenh., *Delic. Mus. Vratisl.*, p. 35, pl. vii (1829).

*Rana hydromedusa* (Kuhl), Tschudi, *Class. Batr.* pp. 40, 80 (1838).

*Rana grunniens*, Dum. et Bibr., *Erp. Gén.* VIII, p. 380 (1841); Günth., *Cat. Batr. Sal.* p. 10 (1858); Bouleng., *Cat. Batr. Ecaud.* p. 23 (1882), *Tr. Zool. Soc.* XX, 1914, p. 239, and *Ann. and Mag. N.H.* (9) 1, 1918, p. 238.

? *Rana macrodon*, Van Kampen, *Nova Guinea*, IX (Zool.), p. 458 (1913).

Vomerine teeth in long and strong oblique series behind the level of the choanae. Tooth-like processes of lower jaw absent or very feebly developed.

Head a little broader than long, much depressed; snout rounded, feebly projecting beyond the mouth, as long as the eye or a little longer; canthus rostralis very obtuse; loreal region very oblique, scarcely concave; nostril nearer the tip of the snout than the eye; the distance between the nostrils equal to or a little less than the interorbital width, which equals that of the upper eyelid; tympanum very distinct,  $\frac{1}{2}$  to  $\frac{2}{3}$  the diameter of the eye and  $\frac{3}{4}$  to once its distance from the latter.

Fingers rather short, with slightly swollen tips, first much longer than the second, third as long as or a little longer than the snout; second and third fingers with a narrow dermal border; sub-articular tubercles moderately large, moderately prominent.

Hind limb moderately long; tibio-tarsal articulation reaching the eye; heels meeting when the limbs are folded at right angles to the body; tibia 3 to  $3\frac{1}{2}$  times as long as broad, a little over twice to  $2\frac{1}{2}$  times in length from snout to vent, a little shorter than the fore limb, as long as or a little longer than the foot.

Toes with the tips dilated into small discs, webbed to the discs; subarticular tubercles rather small, moderately prominent; a short tarsal fold; inner metatarsal tubercle narrow, feebly prominent,  $\frac{2}{3}$  to  $\frac{1}{2}$  the length of the inner toe; no outer tubercle.

Skin smooth above or with small scattered warts; a narrow, short, straight glandular fold, more or less distinct from behind the upper eyelid to the scapular region or the anterior part of the back; a stronger fold above the tympanum; posterior part of the upper eyelid with small warts. Lower parts smooth.

Brown above, uniform or with darker marblings; a yellowish cross-bar, edged with dark brown in front and behind, between the eyes; a dark canthal and temporal streak; lips with more or less distinct vertical dark bars; limbs with or without dark cross-bars. Lower parts white; throat sometimes spotted or marbled with brown.

Male without secondary sexual characters.

Nasals large and in contact with each other and with the frontoparietals, which bear a feeble sagittal crest posteriorly; ethmoid not exposed; zygomatic process of squamosal long, extending to below the eye. Omosternum forked at the base. Terminal phalanges feebly expanded at the end.

## Measurements in millimetres.

|                            | 1. | 2.  | 3.  | 4.  |
|----------------------------|----|-----|-----|-----|
|                            | ♂  | ♂   | ♀   | ♀   |
| From snout to vent         | 70 | 82  | 107 | 83  |
| Head .. .. .               | 23 | 29  | 36  | 28  |
| Width of head .. .. .      | 27 | 32  | 41  | 31  |
| Snout .. .. .              | 9  | 11  | 13  | 10  |
| Eye .. .. .                | 9  | 9   | 11  | 9   |
| Interorbital width .. .. . | 5  | 5   | 6   | 5   |
| Tympanum .. .. .           | 5  | 5   | 7   | 5   |
| Fore limb                  | 40 | 44  | 54  | 43  |
| First finger               | 9  | 9   | 11  | 9   |
| Second finger              | 7  | 7   | 9   | 7   |
| Third finger .. .. .       | 10 | 10  | 12  | 10  |
| Fourth finger .. .. .      | 7  | 7   | 9   | 7   |
| Hind limb .. .. .          | 98 | 125 | 154 | 122 |
| Tibia                      | 30 | 40  | 48  | 37  |
| Foot .                     | 31 | 40  | 48  | 41  |
| Third toe                  | 17 | 24  | 27  | 23  |
| Fourth toe .. .. .         | 26 | 35  | 38  | 33  |
| Fifth toe .. .. .          | 19 | 25  | 30  | 24  |

1. Java (?). 2—4. Mimika R., Dutch New Guinea.

The type, from Amboyna, preserved in the Paris Museum, measures 146 millim. from snout to vent.

*Habitat.* Amboyna and Dutch New Guinea. The occurrence of this frog in Java is very doubtful.

II. *Rana macrodon*.

*Rana macrodon* (Kuhl), Dum. et Bibr., *Exp. Gén.* VIII, p. 382 (1841); Günth., *Cal. Batr. Sal.* p. 8 (1858); Peters, *Mon. Berl. Ac.* 1871, p. 650; Blanf., *Proc. Zool. Soc.* 1881, p. 225, pl. xxi, fig. 4; Bouleng., *Cat. Batr. Ecaud.* p. 24 (1882), and *Faun. Ind., Rept.* p. 448 (1890); S. Flower, *Proc. Zool. Soc.* 1896, p. 898, pl. xlv, fig. 1, and 1899, pp. 888 and 916, pl. lix, fig. 1; Boettg., *Abh. Senck. Ges.* XXV, 1903, p. 366; A. L. Butler, *Journ. N. H. Soc. Bomb.* XV, 1903, p. 196; Isenschmid, *Mitth. Nat. Ges. Bern*, 1903, p. 6; Van Kampen, *Nat. Tijdschr. Ned. Ind.* LXIX, 1909, p. 32; Bouleng., *Faun. Mal. Pen., Rept.* p. 233 (1912).

*Rana fusca* (non Meyer), Blyth, *Journ. As. Soc. Beng.* XXIV, 1855, p. 719; Anders., *Proc. Zool. Soc.* 1871, p. 197; Stoliczka, *Journ. As. Soc. Beng.* XLII, 1873, p. 115; Anders., *Anat. Zool. Res. Yunnan*, p. 837 (1879).

*Ixalus aurifasciatus*, Peters, *Mon. Berl. Ac.* 1863, p. 455.

As pointed out by Blanford and by S. Flower, this species presents two extreme forms which one might think at first worthy of specific distinction. The comparison of a large material shows, however, that such a separation is not feasible. I have endeavoured to keep the two distinct, regarding as the typical form the 'broad-headed form' of Flower and bestowing the name var. *blythii* on Blyth's *R. fusca* (a name which is preoccupied) for Flower's "narrower-headed variety." I must say the definition of the latter is not very precise, as almost every character suffers individual exceptions and some specimens might as well be referred to the one form as to the other. Such are the characters of the shape of the head, of the size of the eye and of the tympanum, and especially of the extent of the web between the toes, the two

extremes being completely connected. The differences in the coloration on which Flower laid stress at first, have since been shown by himself to be inconstant.

### **Forma typica.**

Vomerine teeth in long and strong, straight or slightly curved, oblique series between the choanae and extending much beyond the level of their posterior borders; in young specimens often shorter, less oblique, and entirely behind the choanae. Lower jaw with two bony prominences in front, feebly developed and barely indicated in females, large, acutely pointed, directed backwards, and fitting into deep pits in the upper jaw, in adult males.

Head large, especially in males, much depressed, the sides of the occiput very swollen in males, broader than long; snout rounded or obtusely pointed, feebly or slightly projecting beyond the mouth, as long as or, usually, longer than the eye, which may be rather small in the adult; canthus rostralis very obtuse, sometimes very indistinct; loreal region very oblique, slightly concave; nostril much nearer the end of the snout than the eye; the distance between the nostrils equal to or less than the interorbital width in the adult; interorbital width 1 to  $1\frac{1}{2}$  times that of the upper eyelid, narrower in the young; tympanum very distinct,  $\frac{2}{3}$  to  $\frac{5}{8}$  the diameter of the eye and  $\frac{2}{3}$  to once its distance from the latter.

Fingers rather short or moderate, obtuse or slightly swollen at the end, first much longer than the second, third as long as or a little shorter than the snout; second and third usually with a more or less distinct dermal fold on each side; subarticular tubercles moderate, moderately prominent.

Hind limb moderately long, the tibio-tarsal articulation reaching the eye or between the eye and the tip of the snout, the heels more or less overlapping, sometimes very slightly, when the limbs are folded at right angles to the body; tibia 3 to 4 times as long as broad,  $1\frac{3}{4}$  to  $2\frac{1}{7}$  times in length from snout to vent, usually shorter than the fore limb, as long as or a little longer than the foot. Toes moderately long, the tips dilated into very small discs, entirely webbed, the web always reaching the discs but rather strongly emarginate and usually forming only a narrow border to the penultimate phalanx of the fourth; subarticular tubercles moderately large, moderately prominent; a short and feeble tarsal fold, sometimes indistinct; inner metatarsal tubercle narrow, feebly prominent,  $\frac{2}{3}$  to  $\frac{3}{5}$  the length of the inner toe; no outer tubercle.

Skin smooth or warty above; sometimes a transverse fold across the head, behind the eyes; a strong glandular fold from the eye to the shoulder, often forming an angle above the tympanum; posterior part of upper eyelids warty; young with a narrow glandular fold on each side of the back, beginning behind the upper eyelid, sometimes very short. Lower parts smooth.

*Measurements in millimetres.*

|                    |    |    | 1.  | 2.  | 3.  | 4.  | 5.  | 6.  | 7.  | 8.  | 9.  | 10. | 11. | 12. | 13. | 14. | 15. | 16. | 17. |
|--------------------|----|----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
|                    |    |    | ♂   | ♂   | ♂   | ♀   | ♀   | ♀   | ♀   | ♀   | ♀   | ♀   | ♀   | ♂   | ♂   | ♂   | ♂   | ♀   | ♀   |
| From snout to vent | .. | .. | 150 | 150 | 128 | 123 | 110 | 108 | 100 | 70  | 127 | 96  | 95  | 94  | 135 | 116 | 118 | 96  | 90  |
| Head               | .. | .. | 61  | 60  | 50  | 45  | 40  | 37  | 36  | 26  | 46  | 34  | 32  | 35  | 53  | 48  | 46  | 38  | 31  |
| Width of head.     | .. | .. | 76  | 75  | 61  | 57  | 47  | 43  | 40  | 30  | 55  | 38  | 35  | 40  | 60  | 49  | 54  | 42  | 33  |
| Snout              | .. | .. | 21  | 20  | 19  | 17  | 15  | 13  | 13  | 10  | 17  | 14  | 11  | 12  | 19  | 17  | 15  | 11  | 10  |
| Eye                | .. | .. | 14  | 14  | 13  | 12  | 12  | 11  | 11  | 8   | 12  | 12  | 10  | 10  | 12  | 14  | 12  | 11  | 10  |
| Interorbital width |    |    | 15  | 15  | 13  | 10  | 7   | 8   | 7   | 5   | 9   | 7   | 7   | 7   | 12  | 9   | 12  | 7   | 7   |
| Tympanum           | .. | .. | 10  | 10  | 9   | 9   | 7   | 7   | 7   | 5   | 10  | 7   | 7   | 7   | 10  | 9   | 8   | 7   | 6   |
| Fore limb          | .. | .. | 82  | 82  | 75  | 70  | 65  | 60  | 55  | 44  | 69  | 56  | 54  | 55  | 71  | 66  | 67  | 57  | 49  |
| First finger       | .. | .. | 20  | 17  | 18  | 18  | 14  | 13  | 12  | 9   | 16  | 12  | 12  | 11  | 18  | 15  | 16  | 14  | 12  |
| Second finger      | .. | .. | 14  | 13  | 13  | 12  | 10  | 10  | 9   | 7   | 12  | 8   | 9   | 9   | 13  | 12  | 13  | 11  | 9   |
| Third finger       | .. | .. | 20  | 18  | 18  | 18  | 14  | 14  | 12  | 9   | 17  | 13  | 13  | 12  | 18  | 16  | 16  | 14  | 13  |
| Fourth finger      | .. | .. | 14  | 12  | 13  | 11  | 9   | 9   | 8   | 6   | 10  | 8   | 8   | 8   | 11  | 10  | 11  | 11  | 9   |
| Hind limb          | .. | .. | 205 | 210 | 202 | 180 | 160 | 156 | 143 | 119 | 175 | 160 | 154 | 142 | 200 | 172 | 180 | 153 | 137 |
| Tibia              | .. | .. | 68  | 70  | 64  | 60  | 54  | 50  | 47  | 39  | 57  | 51  | 50  | 46  | 64  | 58  | 57  | 49  | 46  |
| Foot               | .. | .. | 62  | 64  | 60  | 55  | 51  | 47  | 43  | 36  | 54  | 47  | 47  | 45  | 58  | 56  | 56  | 49  | 45  |
| Third toe          | .. | .. | 33  | 32  | 30  | 27  | 25  | 22  | 22  | 18  | 27  | 23  | 24  | 22  | 28  | 31  | 29  | 25  | 21  |
| Fourth toe         | .. | .. | 52  | 52  | 49  | 42  | 40  | 38  | 36  | 28  | 45  | 40  | 38  | 36  | 47  | 47  | 46  | 43  | 35  |
| Fifth toe          | .. | .. | 37  | 35  | 33  | 28  | 27  | 25  | 23  | 19  | 31  | 27  | 27  | 24  | 32  | 34  | 31  | 30  | 25  |

1—8. Singapore. 9. Great Natuna Id. 10—11. Sandakan, N. Borneo. 12. Sarawak. 13—14. Java. 15. Lombok. 16—17. Flores.

Yellowish-red to chocolate red, brownish olive, or dark olive, with or without small darker spots; a dark chevron or a yellowish, dark-edged band sometimes present between the eyes, in young specimens; temporal fold dark-edged; a large black temporal spot in some young; lips usually with dark spots or vertical bars; two of these bars, from the eye to the mouth, usually very distinct in the young; sides sometimes speckled with blackish; limbs with or without more or less distinct dark bars; hinder sides of thighs speckled, spotted or marbled with black; a yellow or orange vertebral streak or fine line sometimes present; rarely a fine yellow line along the thigh and the inner side of the calf. Throat white or brown, belly and lower surface of limbs yellow or pale orange, uniform or spotted or speckled with brown.

Males without vocal sacs; the fore limbs neither thickened nor bearing nuptial excrescences; differing from females by the larger head and the tooth-like prominences in front of the lower jaw.

Nasals large, in contact with each other and with the frontoparietals, which may be fused behind and bear a strong sagittal crest in the adult, the crest bifurcate at the occipital extremity; ethmoid covered over; zygomatic branch of squamosal very long, reaching the eye. Omosternal style forked at the base. Terminal phalanges slightly expanded at the end.

Tadpole with the tail twice or more than twice as long as the body, acutely pointed or ending in a filament, the dorsal crest not extending to the base of the tail. Beak broadly edged with black; a long marginal series of upper labial teeth and a short series on each side; 3 series of lower labial teeth, outer short and uninterrupted, second long and uninterrupted, third interrupted in the middle. Light reddish-brown; a dark brown line through the eyes, sometimes other darker lines radiating from the eye; tail with irregular dark brown vertical bars.

[The tadpole lives in jungle streams in places where the bottom is sandy. The dark irregular bars on the tail aid greatly in concealing it in such places.—N. A.]

Eggs measuring 2 millim. in a female 135 millim. from snout to vent.

A specimen from Singapore, preserved in the Raffles Museum, measures 230 millim. from snout to vent, according to A. L. Butler, thus very nearly of the size of the African *R. goliath*, Blgr.

*Habitat*. Singapore, Natunas, Engano, Borneo, Java, Lombok, Flores, Halmaheira, Batjan.

#### Var. *blythii*.

Head narrower than usual in the typical form, often as long as broad or a little broader than long, rarely slightly longer than broad; eye usually larger, canthus rostralis more distinct, and loreal region less oblique; tympanum often smaller,  $\frac{2}{5}$  to  $\frac{3}{5}$  the diameter of the eye,  $\frac{1}{2}$  to once its distance from the latter. Tibio-tarsal articulation sometimes reaching the tip of the snout; tibia

*Measurements in millimetres.*

|                    |    | 1.  | 2.  | 3.  | 4.  | 5.  | 6.  | 7.  | 8.  | 9.  | 10. | 11. | 12. | 13. | 14. | 15. | 16. | 17. | 18. | 19. | 20. | 21. | 22. | 23. | 24. | 25. | 26. | 27. | 28. |
|--------------------|----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
|                    |    | ♀   | ♀   | ♀   | ♂   | ♂   | ♀   | ♀   | ♂   | ♀   | ♂   | ♀   | ♀   | ♀   | ♀   | ♀   | ♂   | ♂   | ♂   | ♀   | ♂   | ♂   | ♀   | ♂   | ♀   | ♀   | ♀   | ♂   | ♀   |
| From snout to vent | .. | 135 | 123 | 103 | 88  | 85  | 85  | 80  | 108 | 88  | 90  | 78  | 76  | 75  | 83  | 78  | 131 | 125 | 125 | 79  | 108 | 128 | 117 | 74  | 70  | 89  | 100 | 87  | 95  |
| Head               | .. | 48  | 44  | 33  | 36  | 32  | 31  | 28  | 43  | 31  | 36  | 30  | 27  | 27  | 29  | 30  | 52  | 52  | 51  | 26  | 40  | 50  | 40  | 27  | 26  | 34  | 37  | 33  | 32  |
| Width of head      | .. | 53  | 47  | 37  | 36  | 34  | 31  | 26  | 47  | 33  | 36  | 30  | 28  | 27  | 28  | 30  | 52  | 52  | 53  | 26  | 40  | 50  | 44  | 27  | 26  | 34  | 37  | 34  | 35  |
| Snout              | .. | 17  | 17  | 12  | 12  | 12  | 12  | 10  | 14  | 11  | 14  | 11  | 10  | 10  | 11  | 11  | 19  | 18  | 18  | 10  | 15  | 19  | 14  | 10  | 9   | 11  | 13  | 12  | 12  |
| Eye                | .. | 17  | 14  | 12  | 10  | 10  | 10  | 9   | 13  | 11  | 12  | 11  | 10  | 9   | 10  | 10  | 15  | 14  | 15  | 10  | 12  | 15  | 13  | 10  | 9   | 11  | 11  | 11  | 12  |
| Interorbital width |    | 9   | 8   | 6   | 6   | 7   | 5   | 5   | 9   | 5   | 7   | 5   | 4   | 4   | 5   | 5   | 10  | 10  | 10  | 4   | 8   | 10  | 6   | 5   | 4   | 6   | 6   | 6   | 6   |
| Tympanum           | .. | 8   | 7   | 6   | 6   | 5   | 6   | 6   | 8   | 5   | 7   | 6   | 5   | 5   | 5   | 5   | 7   | 8   | 7   | 4.5 | 7   | 8   | 8   | 5   | 5   | 5   | 6   | 5   | 5   |
| Fore limb          | .. | 73  | 67  | 57  | 47  | 49  | 51  | 42  | 55  | 50  | 50  | 45  | 45  | 42  | 45  | 44  | 70  | 69  | 69  | 43  | 60  | 70  | 60  | 40  | 40  | 47  | 58  | 51  | 53  |
| First Finger       | .. | 17  | 15  | 12  | 11  | 11  | 11  | 10  | 14  | 12  | 12  | 10  | 11  | 10  | 11  | 9   | 15  | 15  | 16  | 10  | 13  | 16  | 15  | 10  | 10  | 10  | 14  | 11  | 12  |
| Second finger      | .. | 13  | 12  | 10  | 8   | 8   | 8   | 8   | 12  | 9   | 9   | 8   | 8   | 7   | 9   | 7   | 13  | 12  | 12  | 7   | 9   | 13  | 12  | 8   | 8   | 8   | 11  | 10  | 11  |
| Third finger       | .. | 17  | 15  | 13  | 11  | 12  | 11  | 10  | 15  | 13  | 12  | 11  | 11  | 10  | 12  | 10  | 17  | 16  | 17  | 10  | 14  | 18  | 15  | 10  | 10  | 10  | 15  | 13  | 13  |
| Fourth finger      | .. | 11  | 10  | 9   | 7   | 8   | 7   | 7   | 10  | 8   | 8   | 7   | 7   | 6   | 8   | 6   | 12  | 11  | 13  | 7   | 10  | 13  | 10  | 7   | 7   | 7   | 11  | 9   | 10  |
| Hind limb          | .. | 216 | 208 | 172 | 143 | 143 | 143 | 127 | 180 | 151 | 142 | 130 | 127 | 123 | 125 | 118 | 215 | 202 | 218 | 126 | 190 | 213 | 177 | 114 | 113 | 123 | 160 | 146 | 148 |
| Tibia              | .. | 71  | 67  | 56  | 46  | 48  | 48  | 42  | 60  | 50  | 48  | 42  | 42  | 41  | 40  | 38  | 70  | 66  | 70  | 43  | 63  | 73  | 59  | 38  | 37  | 41  | 51  | 45  | 47  |
| Foot               | .. | 67  | 62  | 52  | 42  | 44  | 42  | 39  | 57  | 46  | 45  | 40  | 40  | 38  | 40  | 37  | 63  | 58  | 64  | 39  | 57  | 65  | 54  | 37  | 37  | 39  | 50  | 45  | 46  |
| Third toe          | .. | 37  | 34  | 26  | 23  | 25  | 23  | 22  | 33  | 25  | 24  | 22  | 21  | 21  | 22  | 19  | 36  | 31  | 35  | 22  | 35  | 37  | 29  | 19  | 18  | 20  | 28  | 24  | 23  |
| Fourth toe         | .. | 56  | 52  | 45  | 35  | 36  | 36  | 31  | 46  | 38  | 37  | 32  | 33  | 31  | 33  | 30  | 53  | 49  | 53  | 32  | 50  | 54  | 45  | 30  | 30  | 30  | 42  | 38  | 40  |
| Fifth toe          | .. | 43  | 40  | 33  | 26  | 27  | 24  | 23  | 33  | 28  | 27  | 23  | 23  | 22  | 24  | 22  | 41  | 37  | 41  | 25  | 37  | 42  | 32  | 22  | 20  | 23  | 33  | 27  | 28  |

1—3. Tenasserim. 4—5. Nakon si Tamarat, Siam. 6—7. Gunong Pahan, Johore. 8—9. Larut hills, Perak 10—13. Penang hills. 14—15. Nias. 16—19. Sarawak. 20. Bongon, N. Borneo. 21. Mt. Dulit, N. Borneo. 22. Merabak, N. Borneo. 23. Palawan. 24. Balabak. 25. Mindana. 26. Zamboango, Philippines. 27—28. Dinagat Island, Philippines.

often as long as or but slightly shorter than the fore limb; toes often less broadly webbed. Olive-brown or green above, rarely reddish; a yellow vertebral streak or broad band rarely present.

As stated above the distinction of this variety is rather vague and the naming of certain specimens is therefore arbitrary.

*Habitat.* Burma, Annam, Siam, Malay Peninsula, Sumatra, Borneo, Philippines.

## 12. *Rana magna*.

*Rana macrodon*, part., Bouleng., *Cat. Batr. Ecaud.*, p. 24 (1882).

*Rana magna*, Stejneger., *Smiths. Misc. Coll.* LII, 1909, p. 437.

*Rana modesta*, part., Roux, *Rev. Suisse Zool.* XXVI, 1918, p. 411.

Vomerine teeth in moderately long oblique series between the choanae and extending beyond the level of their posterior borders, or just behind them. Lower jaw with two bony prominences in front, feebly developed and obtuse in females, large and acutely pointed, directed backwards, in adult males.

Head large, especially in males, much depressed, the sides of the occiput very convex in males, broader than long; snout rounded or obtusely pointed, feebly projecting beyond the mouth, as long as or a little longer than the eye; canthus rostralis more or less distinct, sometimes rather strong; loreal region moderately oblique, concave; nostril much nearer the end of the snout than the eye; the distance between the nostrils equal to or less than the interorbital width in the adult; interorbital width equal to or a little greater than that of the upper eyelid, narrower in the young; tympanum very distinct,  $\frac{1}{4}$  to  $\frac{2}{3}$  the diameter of the eye,  $\frac{1}{3}$  to once its distance from the latter.

Fingers moderate, the tips dilated into very small discs, first longer than the second, third as long as or a little longer than the snout, second and third with a narrow dermal fold on each side; subarticular tubercles rather large, very prominent.

Hind limb moderately long, the tibio-tarsal articulation reaching the eye, the heels just meeting when the limbs are folded at right angles to the body; tibia 3 to  $3\frac{1}{2}$  times as long as broad, nearly 2 to  $2\frac{1}{4}$  times in length from snout to vent, shorter than the fore limb, as long as or a little shorter than the foot.

Toes moderately long, the tips dilated into rather large discs ( $\frac{1}{2}$  to  $\frac{2}{3}$  diameter of tympanum), very broadly webbed, the membrane reaching the discs of all the toes; subarticular tubercles moderately large, very prominent; a short and feeble tarsal fold; inner metatarsal tubercle narrow, feebly prominent, about  $\frac{1}{2}$  the length of the inner toe; no outer tubercle.

Upper parts with small tubercles or flat warts; sometimes a transverse fold across the head, behind the eyes; a strong glandular fold from the eye to the shoulder; young with a narrow glandular fold on each side of the back, beginning behind the upper eyelid. Lower parts smooth.

Brown above (in spirit), uniform or with ill-defined darker spots and a cross-bar between the eyes; limbs with dark cross-

bars; hinder side of thighs marbled with dark brown, or dark brown with small light spots; young with a light streak from below the eye to the shoulder, below a dark brown temporal spot. Lower parts white, uniform or, usually, spotted or mottled with brown.

Males with internal vocal sacs; other secondary sexual characters as in *R. macrodon*.

Egg small, vitelline sphere measuring 2 millim. in diameter in female 92 millim. long from snout to vent.

Skeleton as in *R. macrodon*, but extremity of last phalanx of toes with stronger transverse expansion.

*Measurements in millimetres.*

|                    |    | 1.  | 2.  | 3.  | 4.  | 5.  | 6.  |
|--------------------|----|-----|-----|-----|-----|-----|-----|
|                    |    | ♂   | ♂   | Hg. | ♂   | ♀   | ♀   |
| From snout to vent | .. | 113 | 108 | 56  | 120 | 79  | 92  |
| Head               | .. | 46  | 44  | 21  | 45  | 31  | 34  |
| Width of head      | .. | 52  | 48  | 22  | 50  | 33  | 36  |
| Snout              | .. | 15  | 14  | 8   | 16  | 11  | 12  |
| Eye                | .. | 13  | 12  | 8   | 13  | 11  | 11  |
| Interorbital width | .. | 11  | 11  | 4   | 11  | 6   | 7   |
| Tympanum           |    | 5   | 5   | 3   | 5   | 3   | 4   |
| Fore limb          | .. | 60  | 58  | 33  | 67  | 48  | 55  |
| First finger       | .. | 15  | 13  | 8   | 17  | 11  | 12  |
| Second finger      | .. | 11  | 11  | 6   | 13  | 9   | 11  |
| Third finger       | .. | 15  | 13  | 9   | 17  | 12  | 14  |
| Fourth finger      | .. | 11  | 10  | 5   | 13  | 8   | 11  |
| Hind limb          | .. | 165 | 157 | 85  | 168 | 127 | 141 |
| Tibia              | .. | 51  | 49  | 28  | 53  | 41  | 45  |
| Foot               | .. | 55  | 50  | 28  | 56  | 40  | 45  |
| Third toe          | .. | 28  | 27  | 13  | 29  | 21  | 26  |
| Fourth toe         | .. | 43  | 40  | 22  | 46  | 33  | 39  |
| Fifth toe          | .. | 30  | 30  | 15  | 35  | 25  | 30  |

1—3. Laguna del Bay, Luzon. 4—5. Negros. 6. S. Celebes, 2000 f.

*Habitat.* Philippines, Celebes. Stejneger records the species from Mindanao, Basilan, Mindoro and Luzon.

### 13. *Rana modesta*.

*Rana macrodon*, part., Dum. et Bibr., *Erp Gén.* VIII, p. 382 (1841).

*Rana modesta*, Bouleng., *Cat. Batr. Ecaud.* p. 25, pl. i, fig. 3 (1882);

F. Müll., *Verh. Nat. Ges. Basel.* X, 1894, p. 367; Bouleng., *Proc. Zool.*

*Soc.* 1897, p. 223; Boettg., *Abh. Senck. Ges.* XXV, 1903, p. 382; Van

Kampen, in M. Weber, *Zool. Ergebn.* IV, p. 385 (1907).

Vomerine teeth in moderately long, strong, oblique series originating between the choanae and extending beyond the level of their posterior borders, or entirely behind them. Lower jaw with two bony prominences in front, feebly developed in females, moderately large and acutely pointed in males.

Head moderate, much depressed, as long as broad or a little broader than long; snout rounded or obtusely pointed, feebly projecting beyond the mouth, as long as or slightly shorter than the eye; canthus rostralis distinct, rather obtuse; loreal region moderately oblique, concave; nostril a little nearer the end of the

*Measurements in millimetres.*

|                     |    |    | 1. | 2. | 3. | 4.  | 5.  | 6.  | 7.  | 8. | 9. | 10. | 11. | 12. | 13. | 14. | 15. | 16. |
|---------------------|----|----|----|----|----|-----|-----|-----|-----|----|----|-----|-----|-----|-----|-----|-----|-----|
|                     |    |    | ♂  | ♂  | ♂  | ♀   | ♀   | ♀   | ♀   | ♀  | ♀  | ♀   | ♂   | ♂   | ♂   | ♂   | ♀   | ♀   |
| From snout to vent  | .. |    | 70 | 65 | 55 | 70  | 66  | 64  | 62  | 59 | 57 | 51  | 53  | 72  | 46  | 46  | 59  | 58  |
| Head ..             | .  | .. | 26 | 23 | 20 | 24  | 22  | 21  | 22  | 21 | 21 | 20  | 21  | 28  | 18  | 18  | 20  | 20  |
| Width of head ..    |    | .  | 27 | 26 | 20 | 25  | 22  | 23  | 22  | 22 | 21 | 20  | 21  | 30  | 18  | 18  | 20  | 21  |
| Snout ..            | .. | .. | 9  | 7  | 7  | 8   | 7   | 7   | 7   | 7  | 6  | 6   | 7   | 9   | 6   | 6   | 7   | 7   |
| Eye ..              | .. | .. | 9  | 7  | 7  | 8   | 7   | 7   | 7   | 7  | 7  | 6   | 7   | 9   | 6   | 6   | 7   | 7   |
| Interorbital width. |    | .. | 4  | 4  | 3  | 4   | 3.5 | 4   | 3   | 3  | 3  | 3   | 3   | 5   | 3   | 3   | 3   | 3.5 |
| Tympanum            | .. | .. | 4  | 4  | 4  | 4   | 4   | 4   | 3.5 | 4  | 4  | 3   | 3   | 4   | 2.5 | 2.5 | 3   | 3   |
| Fore limb ..        | .. | .. | 37 | 37 | 33 | 39  | 37  | 40  | 37  | 35 | 35 | 31  | 32  | 45  | 29  | 29  | 35  | 33  |
| First finger        |    | .. | 9  | 8  | 7  | 8   | 8   | 9   | 8   | 7  | 8  | 7   | 7   | 9   | 7   | 7   | 8   | 7   |
| Second finger       | .. | .. | 7  | 7  | 6  | 7   | 7   | 8   | 7   | 6  | 7  | 6   | 6   | 8   | 6   | 6   | 7   | 6   |
| Third finger        |    | .. | 10 | 8  | 7  | 8   | 8   | 10  | 9   | 8  | 8  | 8   | 8   | 12  | 8   | 8   | 9   | 8   |
| Fourth finger       | .. | .. | 6  | 6  | 5  | 6   | 6   | 6   | 6   | 6  | 6  | 5   | 5   | 9   | 5   | 5   | 6   | 6   |
| Hind limb           | .. | .. | 95 | 96 | 84 | 105 | 96  | 106 | 97  | 93 | 87 | 83  | 85  | 122 | 75  | 75  | 88  | 88  |
| Tibia ..            | .. | .. | 31 | 32 | 27 | 34  | 31  | 34  | 32  | 29 | 27 | 26  | 27  | 37  | 24  | 24  | 29  | 29  |
| Foot ..             | .. | .. | 32 | 33 | 27 | 34  | 31  | 32  | 31  | 30 | 30 | 26  | 27  | 39  | 24  | 25  | 29  | 29  |
| Third toe           | .. | .. | 18 | 18 | 13 | 17  | 17  | 17  | 16  | 15 | 15 | 13  | 14  | 21  | 11  | 12  | 15  | 15  |
| Fourth toe          | .. | .. | 25 | 26 | 20 | 26  | 25  | 27  | 25  | 23 | 23 | 20  | 22  | 33  | 19  | 20  | 22  | 22  |
| Fifth toe           | .. | .. | 19 | 19 | 13 | 19  | 17  | 19  | 16  | 16 | 17 | 14  | 16  | 24  | 13  | 14  | 16  | 15  |

1—10. Gorontalo, types. 11. Manado, types. 12. Bonthain Peak, 6500 ft. 13.—16. S. Celebes.

snout than the eye; the distance between the nostrils equal to or greater than the interorbital width, which is nearly equal to or less than that of the upper eyelid; tympanum very distinct;  $\frac{2}{3}$  to  $\frac{3}{5}$  the diameter of the eye,  $\frac{2}{3}$  to  $1\frac{1}{2}$  times its distance from the latter.

Fingers moderate, the tips swollen or dilated into very small discs, first longer than the second, third as long as or a little longer than the snout; subarticular tubercles moderate, moderately prominent.

The tibio-tarsal articulation reaches the eye or between the eye and the tip of the snout; heels overlapping when the limbs are folded at right angles to the body; tibia 3 to  $3\frac{1}{2}$  times as long as broad, nearly 2 to  $2\frac{1}{4}$  times in length from snout to vent, shorter than the fore limb, as long as or a little longer or a little shorter than the foot. Toes moderately long, the tips dilated into very small discs, entirely or nearly entirely webbed; subarticular tubercles rather small, moderately prominent; a short and feeble tarsal fold, sometimes absent; inner metatarsal tubercle moderately prominent, narrow,  $\frac{2}{3}$  to  $\frac{1}{2}$  the length of the inner toe; no outer tubercle.

Upper parts smooth or with small warts or interrupted longitudinal folds; upper eyelids tubercular; sometimes a transverse fold behind the eyes; a glandular fold from the eye to the shoulder. Lower parts smooth.

Brown, grey-brown, or dark olive above, with or without rather indistinct darker spots; sometimes two lighter strips on the back and the canthi rostrales, meeting on the tip of the snout; sometimes a light vertebral stripe; a dark cross-band between the eyes often present; a black spot sometimes present on the tympanum; upper lip with dark vertical bars, two below the eye; limbs with dark cross-bands; hinder side of thighs dark brown, with light spots or marblings. Lower parts white, uniform or speckled or spotted with brown.

Males with internal vocal sacs; the head rather larger than in females.

Osteological characters as in *R. macrodon*.

Eggs rather large,  $2\frac{1}{2}$  millim. in diameter in female measuring 58 millim. from snout to vent.

*Habitat.* Celebes, Talaut Ids., Nusa Laut and Saleyer.

Closely allied to *R. macrodon*, but much smaller, vomerine teeth in shorter series, and males with vocal sacs. Although the latter character justifies its specific separation, it is not easy to distinguish it from young specimens of *R. macrodon* of the same size.

#### 14. *Rana microtympanum*.

*Rana microtympanum*, Van Kampen, in M. Weber, *Zool. Ergebn.* IV, p. 386 (1907).

Vomerine teeth in short, oblique series just behind the level of the choanae. Lower jaw with short, obtuse, tooth-like processes in front.

Head as long as broad; snout rather pointed, shorter than the orbit; canthus rostralis distinct; loreal region feebly oblique, concave; nostril equidistant from the eye and the tip of the snout; interorbital space as broad as or a little narrower than the upper eyelid; tympanum distinct,  $\frac{1}{3}$  the size of the eye.

Fingers rather swollen at the end, first as long as or a little shorter than the second.

Tibio-tarsal articulation reaching between the eye and the tip of the snout. Toes ending in small but distinct discs, entirely webbed; subarticular tubercles moderate; a tarsal fold; inner metatarsal tubercle narrow,  $\frac{1}{2}$  or rather more than  $\frac{1}{2}$  the length of the inner toe; no outer tubercle.

Back warty; a rather strong fold above the tympanum; posterior part of upper eyelid with small warts; a transverse fold across the head, behind the upper eyelids. Lower parts smooth.

Brown above, with ill-defined darker spots; a dark cross-bar, light-edged in front, between the eyes; limbs with dark cross-bands. Yellowish beneath, with or without brown marbling on the throat.

Tadpole with the tail less than twice the length of the body and with obtuse point. Beak narrowly edged with black; labial teeth in 2 upper and 2 lower series, the inner series interrupted.

*Habitat.* Celebes.

This species is founded on apparently young specimens, 32 millim. from snout to vent. The shorter first finger appears to distinguish the species from its allies.

Roux (*Rev. Suisse Zool.* XXVI, 1918, p. 412) may be right in regarding *R. microtympanum* as a synonym of *R. modesta*. However, I have examined a young *R. modesta* from Buol, Celebes, measuring 30 mm., and which has the first finger a little longer than the second.

### 15. *Rana doriae*.

*Rana gracilis*, var. *andamanensis*, part., Stoliczka, *Journ. As. Soc. Beng.* XXXIX, 1870, p. 142.

*Rana doriae*, Bouleng., *Ann. Mus. Genov.* (2) V, 1887 p. 482, pl. iii, fig. 1 and *Faun. Ind., Rept.*, p. 447 (1890); Annand., *Mem. As. Soc. Beng.* VI, 1917, p. 135.

*Rana doriae*, part., Bouleng., *Faun. Mal. Pen., Rept.* p. 231 (1912).

Vomerine teeth in oblique oval groups behind the level of the choanae. Lower jaw without bony prominences in front.

Head moderate, moderately depressed, a little broader than long; snout rounded, scarcely projecting beyond the mouth, as long as or a little longer than the eye; canthus rostralis obtuse; loreal region moderately oblique, slightly concave; nostril nearly equidistant from the eye and the end of the snout; the distance between the nostrils equal to or a little greater than the interorbital width, which is nearly equal to that of the upper eyelid; tympanum very distinct,  $\frac{1}{2}$  to  $\frac{2}{3}$  the diameter of the eye,  $1\frac{1}{3}$  to 2 times its distance from the latter.

Fingers moderate, the tips swollen into very small discs, first a little longer than the second, third as long as or a little longer than the snout; subarticular tubercles moderate.

The tibio-tarsal articulation reaches the eye or the tip of the snout; heels overlapping when the limbs are folded at right angles to the body; tibia 3 to 4 times as long as broad,  $1\frac{3}{4}$  to  $2\frac{1}{4}$  times in length from snout to vent, as long as or a little shorter than the fore limb, as long as or a little longer than the foot. Toes moderately long, the tips dilated into small but very distinct discs,  $\frac{3}{4}$  to nearly entirely webbed, 1 or 2 phalanges of fourth free; subarticular tubercles moderate; a feeble tarsal fold; inner metatarsal tubercle moderately prominent,  $\frac{3}{5}$  to  $\frac{2}{3}$  the length of the inner toe; no outer tubercle.

Skin smooth or with irregular glandules on the back; a more or less distinct fold across the head, behind the upper eyelids; a strong glandular fold from the eye to the shoulder.

Brown above, with small irregular darker spots; sometimes a yellowish vertebral stripe; a dark cross-band between the eyes, bordered with yellowish in front; lips with dark vertical bars; limbs with rather irregular dark cross-bands. Lower parts white, uniform or scantily spotted with brown.

Males without vocal sacs.

Nasals large, in contact with each other and with the frontoparietals; ethmoid covered over; zygomatic branch of squamosal long.

*Measurements in millimetres.*

|                       | 1.  | 2.  | 3.  | 4.  | 5.  | 6.  | 7.  | 8.  | 9.  |
|-----------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|
|                       | ♂   | ♂   | ♂   | ♀   | ♀   | ♀   | ♀   | ♂   | ♀   |
| From snout to vent    | 48  | 48  | 47  | 50  | 48  | 45  | 43  | 43  | 44  |
| Head. .               | 18  | 18  | 18  | 18  | 17  | 16  | 16  | 16  | 16  |
| Width of head         | 20  | 20  | 20  | 19  | 18  | 17  | 17  | 18  | 17  |
| Snout ..              | 6   | 6   | 6   | 7   | 6   | 5.5 | 5   | 6   | 6   |
| Eye ..                | 6   | 6   | 6   | 6   | 6   | 5.5 | 5   | 6   | 6   |
| Interorbital width .. | 4   | 5   | 4   | 4   | 3.5 | 3   | 3   | 4   | 4   |
| Tympanum              | 4   | 4   | 3.5 | 4   | 3   | 3   | 3   | 4   | 4   |
| Fore limb             | 27  | 28  | 27  | 27  | 26  | 25  | 26  | 25  | 25  |
| First finger          | 5.5 | 6   | 6   | 5.5 | 5.5 | 5   | 5.5 | 5.5 | 5.5 |
| Second finger         | 5   | 5   | 5.5 | 5   | 5   | 4.5 | 5   | 5   | 5   |
| Third finger          | 7   | 7   | 7   | 7   | 6.5 | 6   | 6   | 7   | 7   |
| Fourth finger ..      | 5   | 4.5 | 4   | 4.5 | 4.5 | 4   | 4   | 4.5 | 4   |
| Hind limb             | 84  | 82  | 80  | 84  | 74  | 67  | 78  | 76  | 78  |
| Tibia ..              | 27  | 26  | 26  | 27  | 23  | 21  | 23  | 23  | 25  |
| Foot                  | 26  | 25  | 25  | 25  | 23  | 21  | 23  | 21  | 24  |
| Third toe. .          | 13  | 12  | 12  | 13  | 12  | 11  | 12  | 11  | 12  |
| Fourth toe            | 19  | 18  | 18  | 19  | 17  | 16  | 18  | 17  | 19  |
| Fifth toe ..          | 12  | 12  | 11  | 12  | 11  | 11  | 12  | 11  | 12  |

1—6. Tenasserim, types. 7. King Id., Mergui. 8—9. Klong Bang Lai, Siam.

*Habitat.* Tenasserim, Siam, Malay Peninsula. Also the Andamans, as, according to Annandale, the largest of the types of Stoliczka's *R. gracilis*, var. *andamanensis* belongs undoubtedly to this species.

16. *Rana macrognathus*.

*Rana doriae*, part., Bouleng., *Ann. Mus. Genova*, (2) XIII, 1893, p. 328, pl. viii. fig. 1, and *Faun. Mal. Pen., Rept.* p. 231 (1912).

*Rana macrognathus*, Bouleng., *Ann. and Mag. N.H.*, (8) XX, 1917, p. 414.

I now regard as deserving specific distinction a frog from Upper Burma in which the males differ from those of *R. doriae* in the very large head with strong swellings formed on the lower surface of the mandible and on each side of the occiput, by the extraordinary development of the masseteric and depressor muscles, and in which a strong pointed tooth-like process is present on each side of the mandible near the symphysis, as in *R. macrodon* and *R. kuhlii*. In these males, when fully developed, the interorbital region is broad and very convex, the swelling produced posteriorly as in *Pelobates fuscus*; the frontoparietal bones are raised in their anterior half, rugose though free from the skin, and furnished with three strong longitudinal ridges which unite into a single one on the posterior part of the bones. The tympanum of these males is nearly or quite as large as or even larger than the eye. Females are hardly distinguishable from *R. doriae*. The length of the inner metatarsal tubercle is  $\frac{1}{2}$  to  $\frac{2}{3}$  the length of the inner toe. The warts on the back are often more prominent than in *R. doriae*.

*Measurements in millimetres.*

|                    | 1. | 2.  | 3. | 4.  | 5.  | 6.  |
|--------------------|----|-----|----|-----|-----|-----|
|                    | ♂  | ♂   | ♀  | ♂   | ♂   | ♀   |
| From snout to vent | 57 | 47  | 55 | 56  | 35  | 42  |
| Head               | 24 | 19  | 20 | 22  | 14  | 15  |
| Width of head      | 26 | 21  | 21 | 25  | 15  | 16  |
| Snout              | —  | 7   | —  | 8   | 4.5 | 5.5 |
| Eye                | 7  | 6   | 6  | 6.5 | 4.5 | 5.5 |
| Interorbital width | —  | 5   | —  | 5   | 3.5 | 3   |
| Tympanum           | 7  | 5   | 4  | 5.5 | 4.5 | 3   |
| Fore limb          | 31 | 25  | 29 | 32  | 21  | 24  |
| First finger       | —  | 5.5 | —  | 6.5 | 4   | 5   |
| Second finger      | —  | 5   | —  | 6   | 4   | 4.5 |
| Third finger       | —  | 7   | —  | 8   | 5   | 6   |
| Fourth finger      | —  | 4.5 | —  | 5   | 3.5 | 4   |
| Hind limb          | 85 | 70  | 86 | 80  | 54  | 65  |
| Tibia              | 28 | 22  | 28 | 25  | 17  | 21  |
| Foot               | 27 | 22  | 27 | 25  | 17  | 20  |
| Third toe          | —  | 11  | —  | 12  | 9   | 10  |
| Fourth toe         | —  | 17  | —  | 20  | 13  | 15  |
| Fifth toe          | —  | 11  | —  | 13  | 8   | 10  |

1—3. Karin hills (types). 4. Da Ban, S. Annam. 5. Ok Yam, S.E. Siam.  
6. Koh Chang Id., Siam.

This frog is intermediate between *R. doriae* and *R. pileata*.

The types are from the Karin Hills, 1300 to 1600 feet, and from the district of the Karin Bia-po. I have received from Dr. Malcolm Smith a specimen from Annam. Small specimens from Siam (Ok Yam, Koh Kut Id., and Koh Chang Id.) appear to belong to the same form, but the male, although showing the large tympanum and the tooth-like processes of the lower jaw, lacks the swelling on the interorbital region.

17. *Rana pileata*.

*Rana pileata*, Bouleng., *Journ. N.H. Soc. Siam*, I, 1916, p. 104, pl.—.

Vomerine teeth in rather short, strong, oblique series just behind the level of the choanae. Lower jaw with two large, fang-like bony prominences in front, in the males.

Head moderate in females, very large in males, moderately depressed, a little broader than long; in the males, strong swellings on the lower surface of the mandible and on each side of the occiput; snout rounded or obtusely pointed, scarcely projecting beyond the mouth, as long as or longer than the eye; canthus rostralis obtuse; loreal region moderately oblique, slightly concave; nostril nearer the tip of the snout than the eye; the distance between the nostrils equal to or a little greater than the interorbital width; interorbital region little broader than the upper eyelid in females and half-grown males, twice as broad and very convex in full-grown males; in these the frontoparietals form a swelling, as in *R. macrognathus* and *R. plicatella*; behind the interorbital region a large dermal flap in full-grown males, rounded and completely detached behind; in smaller males this flap is less developed and in females and young it is absent or represented by a faint semi-circular fold; tympanum distinct,  $\frac{3}{4}$  or  $\frac{4}{5}$  the diameter of the eye in females, as large as or a little larger than the eye in adult males.

Fingers moderate or rather short, blunt, first a little longer than the second, third a little longer than the snout; subarticular tubercles moderate.

Hind limb moderately long, the tibio-tarsal articulation reaching the eye, the heels overlapping when the limbs are folded at right angles to the body; tibia 3 to  $3\frac{1}{2}$  times as long as broad, 2 to  $2\frac{1}{2}$  times in length from snout to vent, shorter than the fore limb, as long as or a little longer than the foot. Toes moderate, the tips dilated into small discs,  $\frac{3}{4}$  to nearly entirely webbed; subarticular tubercles moderate; a feeble tarsal fold; inner metatarsal tubercle feebly prominent,  $\frac{1}{3}$  to  $\frac{1}{2}$  the length of the inner toe; no outer tubercle.

Skin with irregular, flat glandules on the back and small tubercles on the upper eyelids; a strong glandular fold from the eye to the shoulder. Lower parts smooth.

Green, olive, or brown above, young and half-grown often with a strong tinge of red, with darker spots or marblings, or with dark edges to the dorsal glandules; a more or less distinct yellowish angular band, dark-edged behind, between the eyes; lips with dark vertical bars; some specimens with a yellow median stripe from the tip of the snout to the vent; limbs with dark cross-bars. Lower parts white or pale yellow, throat sometimes spotted with brown. Iris golden-green, veined with black and with a black cross.

Males without vocal sacs.

Ripe ova measuring 3 millim. in diameter in female 52 millim. from snout to vent.

*Measurements, in millimetres, of type specimens.*

|                       | 1.  | 2.  | 3. | 4. | 5.  | 6.  | 7.  | 8.  | 9.  |
|-----------------------|-----|-----|----|----|-----|-----|-----|-----|-----|
|                       | ♂   | ♂   | ♂  | ♂  | ♀   | ♀   | ♀   | ♂   | ♂   |
| From snout to vent .. | 72  | 64  | 54 | 50 | 52  | 52  | 49  | 50  | 61  |
| Head .                | 31  | 27  | 20 | 19 | 19  | 19  | 18  | 21  | 26  |
| Width of head         | 33  | 30  | 23 | 22 | 20  | 21  | 20  | 23  | 29  |
| Snout                 | 11  | 10  | 8  | 7  | 7   | 7   | 6   | 8   | 10  |
| Eye ..                | 8   | 7   | 6  | 6  | 5   | 6   | 6   | 6   | 7   |
| Interorbital width    | 9   | 7   | 5  | 5  | 4.5 | 4   | 4   | 6   | 6   |
| Tympanum              | 8   | 7   | 5  | 5  | 4   | 4   | 4   | 6   | 7   |
| Fore limb             | 40  | 36  | 30 | 30 | 29  | 30  | 28  | 27  | 38  |
| First finger          | 7.5 | 7   | 7  | 6  | 6.5 | 6.5 | 6   | 6   | 8   |
| Second finger         | 7   | 6.5 | 6  | 6  | 6   | 6   | 5.5 | 5.5 | 7   |
| Third finger          | 10  | 9   | 8  | 8  | 7.5 | 8   | 7   | 7   | 9   |
| Fourth finger         | 6   | 5.5 | 5  | 5  | 5   | 5   | 5   | 4   | 5.5 |
| Hind limb ..          | 107 | 98  | 88 | 84 | 82  | 86  | 80  | 69  | 101 |
| Tibia                 | 35  | 32  | 28 | 27 | 26  | 27  | 26  | 23  | 31  |
| Foot ..               | 34  | 31  | 27 | 27 | 26  | 27  | 25  | 21  | 31  |
| Third toe.            | 17  | 15  | 14 | 14 | 13  | 15  | 14  | 11  | 16  |
| Fourth toe            | 27  | 24  | 22 | 21 | 19  | 21  | 19  | 15  | 24  |
| Fifth toe             | 17  | 16  | 15 | 14 | 13  | 15  | 14  | 11  | 17  |

1-7. Khao Sebab, Chantabun, S.E. Siam. 8. Hup Bon, Sriracha, S.E. Siam.  
9. Meh Song forest, near Prae, N. Siam.

*Habitat.* Siam, between 600 and 3000 feet altitude.

**18. *Rana plicatella*.**

*Rana plicatella*, Stoliczka, *Journ. As. Soc. Beng.* XLII, 1873, p. 116, pl. xi, fig. 1; Bouleng., *Cat. Batr. Ecaud.* p. 26 (1882); S. Flower, *Proc. Zool. Soc.* 1899, p. 890; Laidlaw, *Proc. Zool. Soc.* 1900, p. 885; A. L. Butler, *Journ. N.H. Soc. Bomb.* XV, 1903, p. 196; Bouleng., *Faun. Mal. Pen., Rept.* p. 231 (1912).

Vomerine teeth in rather short, strong, oblique series just behind the level of the choanae. Lower jaw with two fang-like bony prominences in front in the males.

Head large (male), moderately depressed, a little broader than long, sides of the occiput very convex; snout obtusely pointed, scarcely projecting beyond the mouth, as long as the eye; canthus rostralis very obtuse; loreal region moderately oblique, feebly concave; nostril equidistant from the eye and the tip of the snout; the distance between the nostrils equal to the interorbital width; interorbital region broader than the upper eyelid, convex and followed by a knob-like prominence; tympanum distinct, as large as or a little larger than the eye, 2 to 3 times its distance from the latter.

Fingers moderate, the tips dilated into very small but distinct discs, first slightly longer than the second, third as long as the snout; subarticular tubercles moderate.

Hind limb long, the tibio-tarsal articulation reaching the tip of the snout, or between the eye and the tip of the snout, the heels overlapping when the limbs are folded at right angles to the body; tibia 4 times as long as broad,  $1\frac{1}{5}$  to 2 times in length from snout to vent, a little shorter than the fore limb, as long as the foot. Toes moderate, the tips dilated into small but distinct discs,  $\frac{2}{3}$  to  $\frac{3}{4}$  webbed, 2 or 3 phalanges of fourth free; subarticular tubercles

rather small; a very slight tarsal fold; inner metatarsal tubercle narrow, prominent, about  $\frac{2}{3}$  the length of the inner toe; no outer tubercle.

Skin of back with 8 or 10 glandular longitudinal folds, sometimes with numerous small tubercles between them; a strong fold above the tympanum; upper eyelids tubercular.

Bronze above, in life, changing from bright yellowish red to dull brown shades, with or without a yellow vertebral stripe; some of the dorsal folds edged with black; a black chevron, pointing backwards, between the eyes; limbs with dark brown cross-bars. Belly bright sulphur yellow. Iris bronze, with a black cross, and a very narrow red ring round the pupil.

Males without vocal sacs.

*Measurements in millimetres.*

|                          | 1.  | 2.  |
|--------------------------|-----|-----|
|                          | ♂   | ♀   |
| From snout to vent       | 36  | 34  |
| Head ..                  | 15  | 14  |
| Width of head .. ..      | 17  | 16  |
| Snout ..                 | 5   | 4.5 |
| Eye ..                   | 5   | 4.5 |
| Interorbital width .. .. | 3.5 | 3.5 |
| Tympanum .. ..           | 4.5 | 4.5 |
| Fore limb .. ..          | 22  | 21  |
| Hind limb .. ..          | 67  | 59  |
| Tibia .. ..              | 20  | 18  |
| Foot .. ..               | 20  | 18  |

1. Penang. 2. Bukit Timah, Singapore.

*Habitat.* Penang, hills between Kedah and Perak, up to 4000 feet, Singapore.

**19. *Rana hascheana*.**

*Polypedates hascheanus*, Stoliczka, *Journ. As. Soc. Beng.*, XXXIX, 1870, p. 147, pl. ix, fig. 3.

*Rana gracilis*, var. *andamanensis*, part., Stoliczka, *t. c.* p. 142.

*Rana hascheana*, W. Sclater, *Proc. Zool. Soc.* 1892, p. 344; S. Flower,

*Proc. Zool. Soc.* 1899, p. 894; Laidlaw, *Proc. Zool. Soc.* 1900, p. 885;

A. L. Butler, *Journ. N.H. Soc. Bomb.* XV, 1903, p. 197; Bouleng.,

*Faun. Mal. Pen., Rept.* p. 232 (1912).

Vomerine teeth in oblique oval groups just behind the level of the choanae. No bony prominences in front of the lower jaw.

Head moderate, moderately depressed, as long as broad or a little broader than long; snout rounded, scarcely projecting beyond the mouth, as long as the eye; canthus rostralis obtuse; loreal region moderately oblique, slightly concave; nostril equidistant from the eye and the tip of the snout; the distance between the nostrils a little greater than the interorbital width, which equals that of the upper eyelid; tympanum distinct,  $\frac{1}{3}$  to  $\frac{2}{3}$  the diameter of the eye and  $1\frac{1}{2}$  to 2 times its distance from the latter.

Fingers rather short, the tips scarcely dilated, first as long as or slightly longer than the second, third as long as or slightly shorter than the snout; subarticular tubercles moderate.

Hind limb rather long, the tibio-tarsal articulation reaching the tip of the snout or between the eye and the tip of the snout, the heels overlapping when the limbs are folded at right angles to the body; tibia  $3\frac{1}{2}$  to 4 times as long as broad,  $1\frac{3}{8}$  to 2 times in length of head and body, as long as or a little shorter than the fore limb, as long as or a little longer than the foot. Toes moderate, the tips dilated into small but very distinct discs,  $\frac{1}{3}$  to  $\frac{1}{2}$  webbed, 3 phalanges of fourth free; subarticular tubercles moderate; a feeble tarsal fold; inner metatarsal tubercle feebly prominent,  $\frac{2}{5}$  to  $\frac{3}{8}$  the length of the inner toe; no outer tubercle.

Skin smooth or with small warts or feeble corrugations; a strong fold from the eye to the shoulder.

Rich yellow to orange brown above, in life, with dark brown spots, with or without a light vertebral streak; a dark brown cross-band between the eyes, edged with pale yellow in front, usually followed by a faint **W**-shaped marking, the ends of which extend behind the eyes; sides of body finely spotted with very dark brown and white; lips with more or less distinct dark vertical bars; limbs with dark cross-bands. Lower parts white, with pale purple and golden shades, with or without dark brown spots on the throat.

Males without vocal sacs.

Nasal bones large and in contact with each other and with the frontoparietals; ethmoid covered over; zygomatic branch of squamosal long, extending to the eye.

Eggs very large and few, unpigmented, 3 millim. in diameter, in a female measuring 35 millim. from snout to vent.

*Measurements in millimetres.*

|                       | 1.  | 2.  | 3. | 4.  | 5.  | 6.  |
|-----------------------|-----|-----|----|-----|-----|-----|
|                       | ♀   | ♀   | ♀  | ♂   | ♀   | ♀   |
| From snout to vent    | 24  | 37  | 24 | 25  | 35  | 27  |
| Head ..               | 9   | 14  | 9  | 10  | 12  | 10  |
| Width of head         | 9   | 16  | 9  | 10  | 13  | 10  |
| Snout                 | 3   | 5   | 3  | 3.5 | 4.5 | 3.5 |
| Eye ..                | 3   | 5   | 3  | 3.5 | 4.5 | 3.5 |
| Interorbital width .. | 2   | 3   | 2  | 2.5 | 2.5 | 2   |
| Tympanum              | 1.5 | 2.5 | 2  | 2   | 2.5 | 2.5 |
| Fore limb             | 13  | 22  | 14 | 16  | 19  | 16  |
| Hind limb ..          | 38  | 62  | 45 | 49  | 57  | 46  |
| Tibia                 | 12  | 20  | 14 | 16  | 18  | 15  |
| Foot                  | 12  | 20  | 14 | 15  | 7   | 15  |

1. Penang. 2. Larut hills, Perak. 3. Gunong Inas, Pahang. 4—5. Great Natuna. 6. Andamans (*R. gracilis*, var. *andamanensis*, Stol.).

*Habitat.* Higher forests of Penang, mountains of Malay Peninsula (Perak and between Perak and Kedah), Andamans,<sup>1</sup> Natuna Islands.

<sup>1</sup> One of the types of *R. gracilis* v. *andamanensis*, received from the Indian Museum in 1893, belongs to this species, whilst the others are stated by Annandale to be referable to *R. doriae* and *R. limnocharis*.

20. *Rana limborgii*.

*Rana limborgii*, W. Sclater, *Proc. Zool. Soc.* 1892, p. 344, pl. xxiv, fig. 3 ;  
Boulenger, *Ann. Mus. Genova* (2) XIII, 1893, p. 329, pl. x, fig. 1 ;  
Malcolm Smith, *Journ. N.H. Soc. Siam*, II, 1916, p. 165.

Vomerine teeth in oblique oval groups just behind the level of the choanae. Bony prominences in front of lower jaw barely indicated in females, rather large and pointed in males.

Head moderate, moderately depressed, as long as broad or a little broader than long, larger in males than in females ; snout rounded, scarcely projecting beyond the mouth, as long as the eye ; canthus rostralis obtuse ; loreal region moderately oblique, slightly concave ; nostril equidistant from the eye and the tip of the snout or a little nearer the latter ; the distance between the nostrils equal to or greater than the interorbital width, which equals or exceeds that of the upper eyelid ; tympanum distinct,  $\frac{3}{8}$  to  $\frac{3}{4}$  the diameter of the eye and  $1\frac{1}{2}$  to 2 times its distance from the latter.

Fingers rather short, the tips dilated into small discs, first as long as or slightly longer than the second, third as long as or slightly shorter than the snout ; subarticular tubercles moderate.

Hind limb rather long, the tibio-tarsal articulation reaching between the eye and the tip of the snout, the tip of the snout, or a little beyond, the heels overlapping when the limbs are folded at right angles to the body ; tibia  $3\frac{1}{3}$  to 4 times as long as broad,  $1\frac{2}{3}$  to 2 times in length of head and body, a little shorter or a little longer than the fore limb, as long as or a little longer than the foot. Toes rather short, the tips dilated into small but very distinct discs,  $\frac{1}{3}$  to  $\frac{1}{2}$  webbed, 3 phalanges of fourth free ; subarticular tubercles moderate ; a mere trace of a tarsal fold ; inner metatarsal tubercle large, very prominent, compressed, blunt-edged,  $\frac{2}{3}$  to  $\frac{3}{4}$  the length of the inner toe ; no outer tubercle.

Skin smooth, usually with more or less distinct traces of a narrow glandular dorso-lateral fold beginning behind the upper eyelid ; a strong fold from the eye to the shoulder.

Pale brown above, with small darker spots ; upper surface of snout sometimes pale greyish or yellowish ; a dark cross-bar between the eyes and often a **A**-shaped marking between the shoulders ; a blackish streak on each side of the head, passing through the eye ; lips with dark brown vertical bars ; a yellowish vertebral stripe sometimes present ; limbs with more or less regular dark cross-bands. Lower parts white, throat sometimes spotted or speckled with brown.

Males with internal vocal sacs, which may be indicated externally by strong folds on each side of the throat.

Nasal bones large and in contact with each other and with the frontoparietals ; ethmoid covered over ; zygomatic branch of squamosal long, extending to the eye.

Eggs very large and few, unpigmented, the vitalline sphere 3 millim. in diameter in a female measuring 32 millim. from snout to vent.

*Measurements in millimetres.*

|                    | 1.  | 2.  | 3.  | 4.  | 5.  |
|--------------------|-----|-----|-----|-----|-----|
|                    | ♂   | ♂   | ♀   | ♀   | ♀   |
| From snout to vent | 33  | 32  | 31  | 32  | 26  |
| Head ..            | 13  | 12  | 11  | 11  | 10  |
| Width of head ..   | 14  | 13  | 11  | 11  | 10  |
| Snout              | 4.5 | 4.5 | 4   | 4   | 3.5 |
| Eye ..             | 4.5 | 4.5 | 4   | 4   | 3.5 |
| Interorbital width | 3.5 | 3   | 2.5 | 2.5 | 2   |
| Tympanum ..        | 3   | 3.5 | 2   | 2.5 | 2   |
| Fore limb          | 19  | 18  | 17  | 18  | 15  |
| First finger       | 3.5 | 3.5 | 3   | 3.5 | 2.5 |
| Second finger      | 3   | 3   | 3   | 3   | 2.5 |
| Third finger       | 4   | 4   | 4   | 4   | 3   |
| Fourth finger      | 2.5 | 2.5 | 2.5 | 2.5 | 2   |
| Hind limb          | 53  | 51  | 59  | 52  | 43  |
| Tibia ..           | 17  | 16  | 19  | 17  | 14  |
| Foot               | 16  | 16  | 18  | 16  | 14  |
| Third toe ..       | 8   | 8   | 10  | 8   | 7   |
| Fourth toe         | 13  | 12  | 14  | 12  | 10  |
| Fifth toe ..       | 8   | 8   | 9   | 8   | 6   |

1—2. N. of Utradit, N. Siam. 3. Nakon si Tamarat, Siam. 4. Karin Bia-po, Upper Burma. 5. Tenasserim.

*Habitat.* Tenasserim, Upper Burma, Siam.

Very closely allied to *R. hascheana*, from which it is distinguished by the larger and more prominent inner metatarsal tubercle and by the presence of tooth-like prominences in front of the lower jaw as well as of vocal sacs in the males.

**21. *Rana microdisca*.**

*Rana microdisca*, Boettg., *Ber. Offenb. Ver. Nat.* 1892, p. 137; F. Müll., *Verh. Nat. Ges. Basel*, X, 1894, p. 839; Boettg. in Semon, *Zool. Forsch. Austral.* V, p. 113, pl. v, fig. 2 (1894); Bouleng., *Ann. Mus. Genova* (2) XIV, 1894, p. 616, *Proc. Zool. Soc.* 1897, p. 230, and *Ann. and Mag. N.H.* (6) XIX, 1897, p. 508; Van Kampen, *Zool. Jahrb., Syst.* XXII, 1905, p. 702.

*Rana leytenensis*, Boettg., *Zool. Anz.* 1893, p. 365; Bouleng., *Proc. Zool. Soc.*, 1897, p. 229.

Vomerine teeth in moderately long or rather short, strong, oblique series originating between the choanae and extending beyond the level of their posterior borders, or entirely behind them. Bony prominences in front of lower jaw barely indicated in females, rather small and pointed in males.

Head moderate, moderately depressed, as long as broad or a little broader than long; snout rounded, scarcely projecting beyond the mouth, as long as the eye; canthus rostralis distinct; loreal region moderately or feebly oblique, concave; nostril equidistant from the eye and from the end of the snout or a little nearer the latter; the distance between the nostrils equal to or greater than the interorbital width, which is equal to or less than that of the upper eyelid; tympanum distinct,  $\frac{1}{2}$  to  $\frac{3}{4}$  the diameter of the eye and  $1\frac{1}{2}$  to 3 times its distance from the latter.

Fingers moderate, the tips swollen or dilated into very small discs, first as long as or a little longer than the second, third as long as or a little longer than the snout; subarticular tubercles moderate.

Hind limb long or very long, the tibio-tarsal articulation reaching the nostril, the tip of the snout, or considerably beyond, the heels strongly overlapping when the limbs are folded at right angles to the body; tibia  $4\frac{1}{2}$  to 5 times as long as broad,  $1\frac{1}{2}$  to  $1\frac{5}{8}$  times in length from snout to vent, as long as or shorter than the fore limb, a little longer than the foot. Toes moderately long, the tips dilated into small but very distinct discs,  $\frac{2}{3}$  to  $\frac{3}{4}$  webbed, 2 or 3 phalanges of fourth free; subarticular tubercles moderate; no tarsal fold; inner metatarsal tubercle moderately or feebly prominent,  $\frac{2}{3}$  to  $\frac{1}{2}$  the length of the inner toe; no outer tubercle.

Upper parts with small warts which may form interrupted longitudinal folds; a dorso-lateral fold, beginning behind the upper eyelid, if present, not extending beyond the scapular region; a glandular fold from the eye to the shoulder. Lower parts smooth.

Coloration very variable. Brown or olive above, with darker spots on the back and a dark bar between the eyes, sometimes with a yellowish cross-bar in front of it; upper surface of snout sometimes entirely yellowish; lips with dark vertical bars; two yellowish dorsal stripes, or a yellowish vertebral stripe, sometimes present; limbs with dark cross-bands. Yellowish white beneath, throat and breast often spotted, marbled, or mottled with brown.

Males without vocal sacs.

Nasal bones moderately large, separated on the median line; a small portion of the ethmoid uncovered; zygomatic branch of squamosal moderately long. Omosternum forked at the base.

*Measurements in millimetres.*

|                       | 1.  | 2.  | 3.  | 4.  | 5.  | 6.  | 7.  | 8.  | 9.  | 10. |
|-----------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
|                       | ♂   | ♂   | ♂   | ♀   | ♀   | ♂   | ♀   | ♂   | ♀   | ♀   |
| From snout to vent .. | 50  | 48  | 44  | 56  | 43  | 29  | 29  | 34  | 36  | 42  |
| Head ..               | 17  | 17  | 16  | 19  | 16  | 11  | 11  | 13  | 14  | 15  |
| Width of head         | 20  | 18  | 18  | 21  | 17  | 11  | 11  | 13  | 14  | 15  |
| Snout ..              | 7   | 6.5 | 6   | 6   | 6   | 4   | 4   | 4.5 | 5   | 5   |
| Eye ..                | 7   | 6.5 | 6   | 7   | 6   | 4   | 4   | 4.5 | 5   | 5   |
| Interorbital width .. | 4   | 3.5 | 3   | 3.5 | 2.5 | 2.5 | 2.5 | 3   | 3   | 3   |
| Tympanum              | 3.5 | 3.5 | 3.5 | 4   | 3.5 | 2.5 | 2   | 2.5 | 3   | 3   |
| Fore limb             | 35  | 30  | 30  | 33  | 28  | 19  | 19  | 23  | 21  | 25  |
| First finger          | 7   | 6   | 6   | 7   | 5   | 4   | 4   | 5.5 | 5.5 | 5.5 |
| Second finger         | 6   | 5.5 | 5   | 5.5 | 4.5 | 4   | 4   | 5   | 4.5 | 5   |
| Third finger          | 8   | 7   | 7   | 8   | 6   | 5   | 5   | 6.5 | 6   | 6.5 |
| Fourth finger         | 5   | 5   | 5   | 5.5 | 4   | 3.5 | 3.5 | 4.5 | 3.5 | 4   |
| Hind limb             | 101 | 89  | 84  | 94  | 91  | 50  | 52  | 58  | 62  | 78  |
| Tibia ..              | 31  | 30  | 27  | 30  | 29  | 16  | 17  | 20  | 21  | 27  |
| Foot                  | 30  | 26  | 25  | 28  | 27  | 15  | 16  | 17  | 18  | 25  |
| Third toe             | 16  | 13  | 13  | 14  | 12  | 8   | 8   | 10  | 10  | 12  |
| Fourth toe            | 26  | 21  | 20  | 20  | 22  | 12  | 13  | 14  | 15  | 20  |
| Fifth toe ..          | 16  | 14  | 14  | 14  | 14  | 8   | 8   | 9   | 9   | 14  |

1—4. Flores. 5. Tomohon, Celebes. 6—7. S. Celebes. 8. Tawi-Tawi, Sooloo Ids. 9. Sandakan, N. Borneo. 10. Tjibodas, Java, 4700—6500 ft. (*Ind. Mus.*).

*Habitat.* Originally described from the mountains of Java, this small frog has since been found in the Philippines (*R. leytenensis*), in Borneo, Sumatra, Mentawi, the Sooloo Islands, Celebes and Flores.

22. *Rana palavanensis*.

*Rana palavanensis*, Bouleng., *Ann. and Mag. N.H.* (6) XIV, 1894, p. 85, and *Proc. Zool. Soc.*, 1897, p. 230.

Vomerine teeth in short oblique series just behind the level of the choanae. Bony prominences in front of lower jaw absent.

Head moderate, moderately depressed, as long as broad, or slightly broader than long; snout rounded, scarcely projecting beyond the mouth, as long as the eye; canthus rostralis distinct; loreal region moderately oblique, slightly concave; nostril equidistant from the eye and from the end of the snout; the distance between the nostrils equal to or greater than the interorbital width, which is equal to or a little less than that of the upper eyelid; tympanum distinct,  $\frac{1}{2}$  to  $\frac{2}{3}$  the diameter of the eye,  $1\frac{1}{3}$  to  $1\frac{1}{2}$  times its distance from the latter.

Fingers moderate, the tips swollen or dilated into very small discs, first as long as or slightly longer than the second, third longer than the snout; subarticular tubercles moderate.

Hind limb long, the tibio-tarsal articulation reaching the tip of the snout or beyond, the heels strongly overlapping when the limbs are folded at right angles to the body; tibia 4 to  $4\frac{1}{2}$  times as long as broad  $1\frac{2}{3}$  to  $1\frac{10}{11}$  times in length from snout to vent, as long as or slightly longer or slightly shorter than the fore limb, as long as or longer than the foot. Toes moderate, the tips dilated into small but very distinct discs,  $\frac{2}{3}$  webbed, 2 or 3 phalanges of fourth free; subarticular tubercles moderate; no tarsal fold; inner metatarsal tubercle elliptical, flat,  $\frac{2}{3}$  to  $\frac{1}{2}$  the length of the inner toe; no outer tubercle.

Skin nearly smooth; posterior half of upper eyelids warty; a glandular fold from the eye to the shoulder; a narrow glandular dorso-lateral fold, beginning behind the upper eyelid.

Brown or greyish-brown above; sides of snout below the canthi blackish or dark grey, with some more or less distinct dark vertical bars on the lip; supratemporal and dorso-lateral folds edged with dark brown or black on the outer side; a dark cross-bar between the eyes and a dark  $\Lambda$ -shaped interscapular marking usually present; limbs with regular dark cross-bands. Lower parts whitish, uniform, or throat and breast spotted with brown.

Males with internal vocal sacs.

Nasal bones moderately large, separated on the median line; a small portion of the ethmoid uncovered; zygomatic branch of squamosal moderately long.

Eggs large, 8 millims. in diameter in female 36 millim. long from snout to vent.

*Measurements in millimetres.*

|                    | 1. | 2. | 3. | 4. | 5.  | 6.  | 7.  | 8. | 9. | 10. |
|--------------------|----|----|----|----|-----|-----|-----|----|----|-----|
|                    | ♀  | ♀  | ♀  | ♀  | ♀   | ♀   | ♂   | ♂  | ♀  | ♂   |
| From snout to vent | 33 | 33 | 31 | 35 | 35  | 36  | 38  | 40 | 42 | 33  |
| Head               | .. | 12 | 12 | 11 | 13  | 13  | 13  | 15 | 16 | 13  |
| Width of head      | .. | 12 | 12 | 11 | 14  | 14  | 14  | 15 | 16 | 13  |
| Snout              | .. | 4  | 4  | 4  | 4.5 | 4.5 | 4.5 | 5  | 5  | 4.5 |

|                    | 1.  | 2.  | 3.  | 4.  | 5.  | 6.  | 7.  | 8.  | 9.  | 10. |
|--------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
|                    | ♀   | ♀   | ♀   | ♀   | ♀   | ♀   | ♂   | ♂   | ♀   | ♂   |
| Eye ..             | 4   | 4   | 4   | 4.5 | 4.5 | 4.5 | 5   | 5   | 5   | 4.5 |
| Interorbital width | 3   | 3   | 3   | 3   | 3.5 | 4   | 3   | 3   | 2.5 | 3   |
| Tympanum ..        | 2.5 | 2.5 | 2.5 | 2.5 | 2.5 | 3   | 2.5 | 2.5 | 3   | 3   |
| Fore limb          | 20  | 20  | 20  | 20  | 21  | 21  | 23  | 24  | 23  | 20  |
| First finger       | 3.5 | 4   | 3.5 | 4   | 5   | 5   | 5   | 5   | 5   | 4   |
| Second finger      | 3.5 | 3.5 | 3.5 | 4   | 4.5 | 5   | 5   | 4.5 | 4.5 | 3.5 |
| Third finger       | 5   | 5   | 5   | 5   | 5.5 | 6   | 6   | 7   | 6   | 4.5 |
| Fourth finger      | 3   | 3   | 3   | 3.5 | 3.5 | 3.5 | 5   | 4   | 3.5 | 3.5 |
| Hind limb          | 58  | 58  | 60  | 61  | 64  | 67  | 75  | 67  | 68  | 59  |
| Tibia              | 20  | 20  | 21  | 21  | 22  | 22  | 24  | 22  | 22  | 18  |
| Foot ..            | 17  | 17  | 17  | 18  | 19  | 20  | 22  | 21  | 20  | 18  |
| Third toe ..       | 9   | 9   | 9   | 10  | 11  | 11  | 12  | 11  | 10  | 9   |
| Fourth toe ..      | 13  | 13  | 12  | 14  | 14  | 15  | 17  | 16  | 16  | 14  |
| Fifth toe ..       | 8   | 9   | 9   | 9   | 10  | 10  | 11  | 11  | 9   | 9   |

1—3. Palawan (type). 4. Matang, Sarawak. 5. Penrissen Mt., Sarawak. 6. Kina Baloo, N. Borneo. 7. Loka, Celebes. 8. Matinang, Celebes. 9. Rurukan, Celebes. 10. Tasosso, Celebes, 4000 f.

*Habitat.* Palawan, Borneo, Celebes.

### 23. *Rana narina*.

*Rana narina*, Stejneger, *Proc. Biol. Soc. Washington*, XVI, 1901, p. 189 and *Herp. Jap.* p. 134, fig. (1907).

Vomerine teeth in nearly transverse series on a level with the posterior borders of the choanae, a little nearer to each other than to the latter.

Head slightly longer than broad; snout nearly squarish, vertically truncate; canthus rostralis distinct; loreal region subvertical, very concave; nostrils close to the end of the snout; interorbital region narrower than the upper eyelid; tympanum very distinct,  $\frac{1}{2}$  the diameter of the eye, only a little longer than its distance from the latter.

Fingers rather long, first longer than the second, terminating in very small discs; subarticular tubercles large.

Tibio-tarsal articulation extending considerably beyond the tip of the snout; heels overlapping when the limbs are folded at right angles to the body; tibia  $1\frac{3}{4}$  times in length from snout to vent, shorter than the fore limb, much shorter than the foot. Toes nearly entirely webbed, terminating in very small discs; outer metatarsals separated nearly to the base; subarticular tubercles strong; no tarsal fold; inner metatarsal tubercle but slightly prominent, about  $\frac{1}{3}$  the length of the inner toe; no outer tubercle.

Skin smooth.

Brownish above; a narrow whitish line from under the eye to behind the commissure of the jaws; sides and posterior surface of the thighs coarsely marbled with dark brown. Whitish beneath, chin and throat clouded with dusky.

From snout to vent 66 millim.

*Habitat.* Loo Choo Islands (Okinawa Shima).

The single species is preserved in the Science Collection, Tokyo.

The position of this species is doubtful, but there seems to be no better place for it than not far from *R. doriae* and *R. microdisca*.

#### 24. *Rana corrugata*.

*Rana kuhlii*, part., Günth., *Cat. Batr. Sal.* p. 7 (1858), and *Rept. Brit. Ind.* p. 404, pl. xxvi, fig. B (1864).

*Rana corrugata*, Peters, *Mon. Berl. Ac.*, 1863, p. 412; Bouleng., *Cat. Batr. Écaud.* p. 19 (1882). *Ann. and Mag. N.H.* (5) XIV, 1884, p. 587, and *Faun. Ind., Rept.* p. 443 (1890); Annand., *Mem. As. Soc. Beng.* VI, 1917, p. 149, fig.

Vomerine teeth in small oblique groups close together behind the level of the choanae. Lower jaw with two acutely pointed tooth-like prominences in front, strongly developed and fitting into pits in the upper jaw in adult males.

Form stout, toad-like. Head broader than long, much depressed; snout rounded, not projecting, as long as or a little shorter than the eye; no canthus rostralis; loreal region oblique, not concave; nostril a little nearer the eye than the end of the snout; the distance between the nostrils equals the interorbital width, which exceeds the very narrow upper eyelid, the eye being obliquely directed upwards; tympanum hidden, distant from the eye and about  $\frac{2}{3}$  its diameter.

Fingers rather short, obtuse, without dermal margin, first usually a little shorter than the second, third longer than the snout; subarticular tubercles moderately large, moderately prominent.

Hind limb short and thick; tibio-tarsal articulation reaching the temple or the posterior border of the eye; heels separated when the limbs are folded at right angles to the body; tibia 2 to  $2\frac{1}{2}$  times as long as broad,  $2\frac{1}{3}$  to  $2\frac{1}{2}$  times in length from snout to vent, as long as the foot, much shorter than the fore limb. Toes short, fully and broadly webbed, terminating in rather large round discs; subarticular tubercles rather small, moderately prominent; a narrow fold along the inner side of the first toe and of the tarsus, interrupted by the feebly prominent, narrow inner metatarsal tubercle, which measures about  $\frac{1}{2}$  the length of the inner toe; no outer tubercle.

Upper parts with very crowded linear rugosities, which form transverse folds on the body; round warts on the upper eyelids; a feeble fold from the eye to the shoulder; lower parts smooth.

Brown above, uniform or with darker spots; a yellow, dark-edged cross-bar between the eyes, and another below the dark temporal fold; a yellow vertebral streak sometimes present; lower parts white, throat sometimes spotted with brown.

Males without secondary sexual characters except the greater development of the tooth-like processes of the lower jaw.

Skeleton as in *R. kuhlii*.

The tadpole has been described and figured by Annandale. Tail only about  $1\frac{1}{2}$  times as long as head and body. Beak extremely massive and prominent, entirely black, a large papillose lobe on each side of the mouth; only a single, long, marginal series

of upper labial teeth, and two, uninterrupted, long series of lower labials.

*Measurements in millimetres.*

|                       | 1. | 2.  | 3.  | 4.  |
|-----------------------|----|-----|-----|-----|
|                       | ♂  | ♂   | ♂   | ♀   |
| From snout to vent    | 65 | 40  | 52  | 54  |
| Head ..               | 22 | 14  | 19  | 19  |
| Width of head ..      | 25 | 16  | 21  | 21  |
| Snout ..              | 5  | 4   | 5   | 5   |
| Eye ..                | 7  | 5   | 5   | 6   |
| Interorbital width .. | 4  | 3   | 3.5 | 3   |
| Fore limb ..          | 35 | 21  | 30  | 29  |
| First finger ..       | 6  | 4.5 | 5   | 5.5 |
| Second finger ..      | 7  | 4.5 | 6   | 6   |
| Third finger ..       | 8  | 5.5 | 8   | 7.5 |
| Fourth finger ..      | 6  | 3.5 | 5.5 | 5.5 |
| Hind limb ..          | 82 | 54  | 72  | 74  |
| Tibia ..              | 26 | 17  | 21  | 22  |
| Foot ..               | 26 | 17  | 22  | 22  |
| Third toe ..          | 15 | 9   | 12  | 14  |
| Fourth toe ..         | 21 | 15  | 19  | 19  |
| Fifth toe ..          | 15 | 10  | 14  | 14  |

1. Punduloya, 4000 f. 2. S. Ceylon. 3—4. Ceylon.

*Habitat.* Ceylon.

## 25. *Rana kuhlii*.

? *Houlema obscura*, Gray, *Zool. Misc.* p. 38 (1831).

*Rana kuhlii*, Dum. and Bibr., *Erp. Gén.* VIII, p. 384 (1841); Anders, *Anat. Zool. Res. Yunn.*, p. 838 (1879); Bouleng., *Ann. Mus. Genova* (2) V, 1887, p. 482, *Faun. Ind., Rept.* p. 443 (1890), *Ann. and Mag. N.H.* (6) VII, 1891, p. 344, and *Proc. Zool. Soc.* 1899, p. 166; S. Flow., *Proc. Zool. Soc.* 1899, p. 887; Bouleng., *Ann. and Mag. N.H.* (8) IV, 1909, p. 495, and *Faun. Mal. Pen., Rept.* p. 229 (1912); Annand., *Mem. As. Soc. Beng.* VI, 1917, p. 147; Malcolm Smith, *Journ. N.H., Soc. Siam*, II, 1917, p. 262, pl. — fig. 1.

*Rana kuhlii*, part., Günth., *Cat. Batr. Sal.* p. 8 (1858), and *Rept. Brit. Ind.* 404 (1864); Bouleng., *Cat. Batr. Ecaud.* p. 20 (1882).

*Rana conspicillata*, Günth., *Proc. Zool. Soc.* 1872, p. 597, pl. xl, fig. A.

*Nyctibatrachus sinensis*, Peters, *Sitzb. Ges. Naturf. Fr. Berl.* 1882, p. 146.

*Rana paradoxa* (non L.) Mocquard, *Le Natur.* 1890, p. 155, *N. Arch. Mus.* (3) II, 1890, p. 148, pl. x, fig. 3, and *Mém. Soc. Zool. France*, 1892, p. 198.

*Rana namiyei*, Stejneger, *Proc. Biol. Soc. Washington* XIV, 1901, p. 190, and *Herp. Japan*, p. 136, fig. (1907); Van Denburgh, *Proc. Calif. Acad.* (4) III, 1909, p. 55 and 1912, p. 194; Annand., *Mem. As. Soc. Beng.* VI, 1917, p. 145.

Vomerine teeth in oblique series just behind the level of the choanae. Lower jaw with two tooth-like prominences in front, feebly developed in females, large, obtuse and fitting into deep pits in the upper jaw in adult males.

Head larger in males than in females, much depressed, the occipital region more convex in males, broader than long; snout rounded or obtusely pointed, feebly projecting beyond the mouth, as long as or slightly longer or slightly shorter than the eye; no canthus rostralis; loreal region oblique, slightly concave; eye.

*Measurements in millimetres.*

|                           |    |    |    | 1.  | 2.  | 3.  | 4.  | 5.  | 6.  | 7.  | 8.  | 9.  | 10. | 11. | 12. | 13. | 14. | 15. | 16. | 17. | 18. | 19. | 20. | 21. | 22. | 23. |
|---------------------------|----|----|----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
|                           |    |    |    | ♂   | ♂   | ♂   | ♀   | ♀   | ♀   | ♀   | ♂   | ♀   | ♀   | ♂   | ♂   | ♂   | ♂   | ♂   | ♀   | ♀   | ♀   | ♀   | ♂   | ♀   | ♂   | ♀   |
| From snout to vent        | .. | .. | .. | 50  | 52  | 76  | 67  | 65  | 65  | 53  | 58  | 60  | 51  | 53  | 61  | 55  | 60  | 54  | 75  | 62  | 52  | 48  | 62  | 55  | 54  | 61  |
| Head                      | .. | .. | .. | 18  | 20  | 27  | 22  | 20  | 21  | 18  | 23  | 21  | 17  | 22  | 23  | 22  | 22  | 20  | 24  | 21  | 18  | 15  | 24  | 19  | 21  | 21  |
| Width of head             | .. | .. | .. | 21  | 24  | 32  | 26  | 24  | 24  | 20  | 25  | 25  | 21  | 26  | 26  | 26  | 26  | 23  | 30  | 24  | 20  | 18  | 28  | 21  | 23  | 23  |
| Snout                     | .. | .. | .. | 6   | 7   | 9   | 8   | 7   | 7   | 6   | 7   | 6   | 5   | 6   | 7   | 6   | 7   | 6   | 8   | 7   | 6   | 5   | 7   | 6   | 6.5 | 6   |
| Eye                       | .. | .. | .. | 6   | 7   | 8   | 8   | 7   | 7   | 6   | 7   | 7   | 6   | 6   | 7   | 6   | 7   | 6   | 8   | 7   | 6   | 5   | 8   | 6   | 6.5 | 7   |
| Interorbital width        | .. | .. | .. | 3   | 4   | 7   | 4   | 4   | 4   | 3.5 | 5   | 3.5 | 3   | 5   | 5   | 5   | 5   | 4   | 5   | 4   | 3   | 3   | 4   | 3   | 3   | 3   |
| Fore limb                 | .. | .. | .. | 31  | 29  | 42  | 38  | 36  | 37  | 30  | 33  | 34  | 31  | 32  | 36  | 33  | 35  | 29  | 45  | 33  | 28  | 26  | 36  | 31  | 30  | 35  |
| First finger              | .. | .. | .. | 6.5 | 6   | 9   | 8   | 8   | 9   | 7   | 7   | 8   | 7   | 7   | 8   | 8   | 8   | 7   | 9   | 7.5 | 7   | 6   | 6   | 7   | 7   | 7.5 |
| Second finger             | .. | .. | .. | 6.5 | 5.5 | 8   | 7   | 7   | 7   | 6   | 6   | 7   | 7   | 7   | 7   | 7.5 | 7   | 6   | 8   | 6.5 | 6   | 6   | 6   | 6   | 6   | 6.5 |
| Third finger              | .. | .. | .. | 8   | 7   | 10  | 9   | 9   | 10  | 7.5 | 9   | 9   | 8   | 8   | 9   | 9   | 9   | 8   | 12  | 8.5 | 7.5 | 7   | 9   | 8   | 8   | 8   |
| Fourth finger             | .. | .. | .. | 5.5 | 6   | 7   | 6.5 | 6.5 | 7   | 5.5 | 5   | 6   | 5.5 | 6   | 6   | 6   | 6   | 5   | 8   | 6   | 5   | 5   | 6   | 7   | 6   | 5   |
| Hind limb                 | .. | .. | .. | 76  | 75  | 110 | 97  | 97  | 94  | 75  | 86  | 79  | 76  | 83  | 90  | 81  | 89  | 78  | 115 | 81  | 73  | 67  | 83  | 77  | 82  | 89  |
| Tibia                     | .. | .. | .. | 23  | 24  | 34  | 31  | 30  | 30  | 23  | 26  | 25  | 24  | 26  | 28  | 25  | 28  | 24  | 37  | 26  | 23  | 21  | 26  | 24  | 26  | 29  |
| Foot                      | .. | .. | .. | 23  | 24  | 34  | 31  | 31  | 30  | 23  | 28  | 25  | 24  | 26  | 28  | 25  | 28  | 24  | 37  | 26  | 23  | 21  | 26  | 25  | 26  | 28  |
| Third toe                 | .. | .. | .. | 12  | 13  | 16  | 14  | 14  | 15  | 12  | 13  | 11  | 11  | 12  | 15  | 14  | 15  | 13  | 17  | 14  | 12  | 11  | 13  | 14  | 12  | 13  |
| Fourth toe                | .. | .. | .. | 18  | 19  | 26  | 24  | 25  | 24  | 19  | 21  | 21  | 18  | 20  | 22  | 20  | 22  | 19  | 28  | 20  | 18  | 16  | 20  | 20  | 20  | 21  |
| Fifth toe                 | .. | .. | .. | 13  | 14  | 20  | 18  | 18  | 17  | 14  | 15  | 15  | 14  | 14  | 17  | 15  | 17  | 14  | 20  | 15  | 13  | 12  | 14  | 14  | 14  | 14  |
| First toe                 | .. | .. | .. | 7   | 7   | 9   | 8   | 8   | 7.5 | 6   | 7.5 | 7   | 7   | 7   | 7.5 | 7   | 8   | 7   | 9   | 7   | 6.5 | 6   | 6   | 7   | 6   | 7   |
| Inner metatarsal tubercle | .. | .. | .. | 3   | 3.5 | 5.5 | 5   | 4.5 | 5   | 3   | 3.5 | 3   | 3.5 | 4   | 4.5 | 4   | 3   | 3.5 | 5   | 3.5 | 3   | 3   | 4   | 3   | 3   | 4   |

1. Java. 2. Celebes. 3—7. Matang, Borneo (types of *R. conspicillata*). 8. Penrissen Mt., Sarawak. 9—10. Lawas, Brunei. 11. Gunong Kalawal, N. Borneo. 12—13. Bongon, N. Borneo. 14—18. Kina Balu, N. Borneo. 19. Kina Balu (type of *R. paradoxa*). 20. Siolak Daras, Korinchi, Sumatra. 21. Sungei Kumbang, Korinchi, Sumatra. 22—23. Sereinu, Mentawai.

|                           | 24. | 25. | 26. | 27. | 28. | 29. | 30. | 31. | 32. | 33. | 34. | 35. | 36. | 37. | 38. | 39. | 40. | 41. | 42. | 43. |
|---------------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
|                           | ♂   | ♀   | ♂   | ♂   | ♂   | ♂   | ♀   | ♂   | ♂   | ♀   | ♂   | ♂   | ♀   | ♀   | ♂   | ♂   | ♂   | ♂   | ♂   | ♀   |
| From snout to vent        | 81  | 44  | 82  | 87  | 57  | 73  | 65  | 72  | 58  | 47  | 60  | 56  | 54  | 51  | 62  | 56  | 52  | 61  | 53  | 59  |
| Head ..                   | 27  | 17  | 31  | 32  | 21  | 32  | 22  | 22  | 16  | 20  | 22  | 21  | 17  | 17  | 23  | 21  | 20  | 24  | 22  | 20  |
| Width of head             | 32  | 20  | 35  | 42  | 25  | 37  | 25  | 25  | 19  | 24  | 25  | 25  | 20  | 19  | 29  | 26  | 23  | 27  | 25  | 23  |
| Snout                     | 9   | 5   | 9   | 9   | 6   | 9   | 8   | 7   | 5   | 7   | 7   | 6   | 6   | 6   | 7   | 6   | 6   | 7   | 6   | 6   |
| Eye ..                    | 9   | 6   | 9   | 9   | 6   | 9   | 8   | 7   | 5   | 7   | 7   | 6   | 6   | 6   | 7   | 6   | 6   | 7   | 6   | 7   |
| Interorbital width        | 5   | 3.5 | 5   | 6   | 4   | 5   | 3   | 4   | 2.5 | 4   | 4   | 3.5 | 3   | 3   | 5   | 4   | 4   | 4   | 4   | 3   |
| Fore limb                 | 51  | 27  | 44  | 47  | 29  | 41  | 32  | 32  | 25  | 29  | 31  | 29  | 25  | 22  | 32  | 30  | 28  | 31  | 27  | 31  |
| First finger              | 10  | 5   | 9   | 9   | 7   | 8   | 7   | 5   | 4   | 6   | 5   | 5   | 4   | 4   | 5   | 4.5 | 5   | 6   | 5   | 6   |
| Second finger             | 9   | 5   | 8   | 9   | 6   | 8   | 6.5 | 5   | 4   | 5.5 | 5   | 5   | 4   | 4   | 5   | 4.5 | 5   | 6   | 5   | 6   |
| Third finger ..           | 12  | 7   | 10  | 10  | 8   | 10  | 8   | 6.5 | 6   | 7   | 6.5 | 6.5 | 6.5 | 5.5 | 8   | 7   | 7   | 7   | 7   | 7   |
| Fourth finger ..          | 9   | 4   | 7   | 6   | 6   | 7   | 6   | 4.5 | 4   | 6   | 4   | 3.5 | 4   | 3.5 | 5   | 4   | 4   | 5   | 4   | 4   |
| Hind limb                 | 119 | 69  | 115 | 112 | 77  | 100 | 84  | 84  | 68  | 75  | 80  | 77  | 74  | 68  | 81  | 75  | 70  | 80  | 79  | 77  |
| Tibia                     | 36  | 22  | 34  | 36  | 23  | 31  | 26  | 26  | 22  | 24  | 25  | 23  | 23  | 21  | 26  | 25  | 23  | 25  | 24  | 25  |
| Foot                      | 40  | 22  | 36  | 37  | 25  | 32  | 26  | 26  | 22  | 24  | 25  | 23  | 24  | 21  | 28  | 25  | 23  | 26  | 26  | 25  |
| Third toe                 | 20  | 10  | 19  | 19  | 14  | 15  | 14  | 14  | 10  | 13  | 12  | 12  | 12  | 11  | 14  | 12  | 11  | 14  | 12  | 12  |
| Fourth toe                | 32  | 16  | 28  | 29  | 19  | 26  | 22  | 20  | 18  | 19  | 19  | 18  | 18  | 15  | 21  | 19  | 18  | 21  | 20  | 19  |
| Fifth toe                 | 24  | 11  | 22  | 21  | 14  | 18  | 15  | 15  | 12  | 14  | 12  | 11  | 12  | 11  | 14  | 12  | 12  | 14  | 13  | 13  |
| First toe                 | 11  | 5   | 10  | 11  | 7   | 8   | 6   | 7   | 6   | 7   | 6   | 5.5 | 6   | 5   | 6   | 6   | 5.5 | 6   | 6   | 6   |
| Inner metatarsal tubercle | 6   | 3   | 5   | 4   | 3   | 4   | 3.5 | 3.5 | 2.5 | 3.5 | 3   | 3   | 3   | 2.5 | 4   | 3.5 | 3   | 3.5 | 3   | 3.5 |

24—25. Gunong Tahan, Pahang. 26. Larut hills, Perak. 27—28. Plapoo, Tenasserim. 29—30. Tenasserim. 31. Man Son Mts., Tonkin.  
32—33. Ponsee, Yunnan. 34—37. Kuatun, Fokien. 38—40. Fuhosho, Formosa. 41. Alikang, Formosa. 42—43. Kanshire, Formosa.

obliquely directed upwards, the upper eyelid often very narrow; nostril a little nearer the end of the snout than the eye; the distance between the nostrils not or but little greater than the interorbital width, which usually nearly equals or (in large males) exceeds that of the upper eyelid; tympanum usually hidden, rarely slightly distinct,  $\frac{1}{3}$  to  $\frac{2}{3}$  the diameter of the eye and widely separated from the latter.

Fingers short or moderate, obtuse or slightly swollen at the end, first and second equal or first the longer, third as long as or longer than the snout, second and third often with a dermal fold on each side; subarticular tubercles large, moderately prominent.

Hind limb short or rather short, the tibio-tarsal articulation reaching the temple or the eye, the heels meeting or failing to meet, when the limbs are folded at right angles to the body; tibia  $2\frac{1}{3}$  to 3 times as long as broad, 2 to  $2\frac{1}{2}$  times in length from snout to vent, as long as or a little shorter than the foot, shorter than the fore limb. Toes short or rather short, the tips dilated into small but very distinct discs, fully webbed or the web strongly emarginate and not reaching beyond the penultimate phalanx of the fourth; subarticular tubercles rather large, moderately prominent; a narrow tarsal fold; inner metatarsal tubercle narrow, moderately prominent,  $\frac{2}{3}$  to  $\frac{3}{4}$  the length of the inner toe; no outer tubercle.

Skin smooth above, except on the calves and on the posterior part of the upper eyelids, which are nearly always warty, or with short longitudinal glandular folds or roundish tubercles; a glandular fold from the eye to the shoulder; sometimes a distinct fold across the head, behind the eyes. Lower parts smooth.

Brown above, uniform or with small darker spots on the back and more or less irregular cross-bars on the limbs; usually a dark bar, light-edged in front, between the eyes, and dark vertical bars on the lips; a dark canthal and temporal streak often present; a yellow vertebral streak rarely present (specimens from Matang, Bongo, Kina Balu, and Kuatun). Lower parts white, throat and breast often mottled with brown, sides of belly and lower surface of legs sometimes speckled with brown.

Males without vocal sacs, the fore limbs neither thickened nor bearing nuptial excrescences; differing from the female by the larger, often much larger, head, which may be more triangular in shape, and by the larger bony prominences in front of the lower jaw.

Nasals large, in contact with each other and with the frontoparietals, which cover the ethmoid; zygomatic branch of squamosal very long, curved, reaching the lower border of the eye. Omosternal style slender, forked at the base; sternal style short. Terminal phalanges transversely expanded at the end.

The vitellus of eggs ready to be laid measures 2 millim. in diameter, the mother measuring 51 millim. from snout to vent.

Tadpoles from Hong Kong Peak, referred by Annandale to *R. kuhlii*, and said to resemble those of *R. macrodon*, have since

(*Rec. Ind. Mus.*, XIV, 1918, p. 68) been regarded as incorrectly identified.

Siamese tadpoles, described by Malcolm Smith, on the correct identification of which there can be no doubt, have the beak broadly edged with black; upper lip with a long, continuous row of teeth, followed by a second, broadly interrupted; lower lip with three continuous rows of teeth, or the innermost narrowly interrupted. Body considerably flattened; tail nearly twice as long as the body, 4 times as long as deep, tip bluntly pointed, crests rather low, upper a little deeper than lower, not extending on to the back. Olive above, speckled with blackish.

*Habitat.* Southern China, Loo Choo Islands and Formosa to the Malay Peninsula and Archipelago (Sumatra, Borneo, Java, Celebes).

This species varies much individually, but I am unable to find characters by which to define geographical races. Full-grown males (105 millim. from snout to vent) from Tenasserim have an enormously large head, nearly as long as and broader than the body; the head is also remarkably large in some adult males from Borneo (*R. paradoxa*, Mocquard), the Loo Choo Islands (*R. namiyei*, Stejneger), and Formosa. Such males have also a very broad interorbital region, broader than the upper eyelid, and thus contrast very strikingly with females from the same localities, in which the head is not larger in proportion than in *R. limnocharis*, and the interorbital region may be even narrower than the upper eyelid. The toes are usually webbed to the terminal discs, except in the specimens from Kuatun and Formosa, and in some from Borneo, in which the last phalanx of the fourth is free, or very narrowly bordered, the web being more strongly emarginate; but other specimens are intermediate. The fingers vary in length, being very short in the specimens from Kuatun and Formosa; but here again the difference is bridged over by specimens from other localities, as may be seen from the table of measurements.

The following 'species' is doubtfully distinct from *R. kuhlii* and I should have been inclined to regard it as identical but for the disposition ascribed to the vomerine teeth.

### *Rana khasiana.*

*Pyxicephalus khasiensis*, Anders., *Journ. As. Soc. Beng.* XL, 1871, p. 23.  
*Rana khasiana*, Bouleng., *Cat. Batr. Ecaud.* p. 34 (1882).

"Body short and thick, legs of moderate length. Head short and broad. Snout short and rounded; no canthus rostralis; nostrils directed upwards and backwards, almost on the upper surface and halfway between the eye and the snout. Eyes rather large and prominent. Occiput much swollen. Tympanum invested by the skin, but faintly visible, small, one half the diameter of the eye. Skin in the groin full, smooth throughout, no trace of tubercles; fingers quite free; three small tubercles on the palmar aspect, the inner one the largest, elongated and simulating the shovel-like

tubercle of the metatarsus. The first and second fingers of nearly equal length, about half shorter than the third; the fourth about one-third shorter than the third. Thigh rather short, lower leg little shorter than the thigh. Tarsus and foot the length of the thigh and one half of the tibial portion. The body very little longer than the distance between the vent and the heel. The shovel-shaped (metatarsal) prominence laterally compressed, but not prominent. Two apophyses on the lower jaw. The choanae are round, more distinctly defined, but rather smaller, than the eustachian tubes; vomerine prominences placed transversely behind the choanae and separated from each other by a narrow interval. Tongue rather small, cordate and notched behind. Uniform brown above, faintly barred on the thighs; spotted with brown on the sides, chin, thorax, and under surface of limbs."

*Habitat.* Khasi Hills.

## 26. *Rana laticeps*.

*Rana laticeps*, Bouleng., *Cat. Batr. Ecaud.* p. 20, pl. i, fig. 1 (1882), and *Faun. Ind., Rept.* p. 444 (1890); S. Flower, *Proc. Zool. Soc.* 1896, p. 897; Bouleng., *Faun. Mal. Pen., Rept.* p. 230 (1912).

Vomerine teeth in strong oblique groups or series just behind the level of the choanae. Lower jaw with two bony prominences in front, feebly developed in females, large, acute and directed backwards in adult males.

Head larger in males than in females, much depressed, broader than long; snout rounded or obtusely pointed, feebly projecting beyond the mouth, as long as or a little shorter than the eye; canthus rostralis obtuse; loreal region more or less oblique, slightly concave; nostril a little nearer the end of the snout than the eye; the distance between the nostrils not or but little greater than the interorbital width, which equals or exceeds that of the upper eyelid; tympanum feebly distinct,  $\frac{3}{5}$  to  $\frac{2}{3}$  the diameter of the eye and 1 to  $1\frac{1}{2}$  times its distance from the latter.

Fingers moderate, obtuse or slightly swollen at the end, first and second equal or first slightly the longer, third longer than the snout; subarticular tubercles moderate, moderately prominent.

Hind limb rather long, the tibio-tarsal articulation reaching between the eye and the tip of the snout, the heels overlapping when the limbs are folded at right angles to the body; tibia  $2\frac{1}{2}$  to  $3\frac{1}{2}$  times as long as broad,  $1\frac{1}{3}$  to 2 times in length from snout to vent, as long as or slightly longer than the foot, a little shorter than the fore limb. Toes with the tips dilated into small discs,  $\frac{2}{3}$  to  $\frac{3}{4}$  webbed, the last or last two phalanges on the fourth free (narrowly bordered); subarticular tubercles moderate, moderately prominent; a narrow tarsal fold; inner metatarsal tubercle narrow, feebly prominent,  $\frac{2}{5}$  to  $\frac{3}{5}$  the length of the inner toe; no outer tubercle.

Skin often corrugated above, with small elongate warts and rounded tubercles; a fold above the tympanum; lower parts smooth, throat sometimes corrugated.

Brown above, indistinctly marbled with darker; a dark bar, light edged in front, between the eyes; usually a dark and light chevron-shaped band on the anterior part of the back; a more or less distinct dark canthal and temporal streak and dark vertical bars on the lips; limbs with more or less distinct dark cross-bars. Lower parts white, throat often spotted with brown.

Males without vocal sacs, distinguished by a larger head and stronger tooth-like prominences in the lower jaw.

Skull as in *R. kuhlii*.

*Measurements in millimetres.*

|                    | 1.  | 2.  | 3.  | 4.  | 5.  | 6.  | 7.  | 8.  |
|--------------------|-----|-----|-----|-----|-----|-----|-----|-----|
|                    | ♂   | ♀   | ♀   | ♀   | ♀   | ♀   | ♂   | ♂   |
| From snout to vent | 47  | 41  | 36  | 35  | 34  | 35  | 51  | 29  |
| Head ..            | 19  | 15  | 13  | 13  | 13  | 13  | 20  | 12  |
| Width of head ..   | 22  | 17  | 15  | 15  | 15  | 15  | 24  | 14  |
| Snout ..           | 5   | 4   | 4   | 4   | 4   | 4   | 6   | 4   |
| Eye ..             | 5   | 5   | 4   | 4   | 4   | 4   | 6   | 4   |
| Interorbital width | 5   | 3.5 | 3   | 3   | 3   | 3   | 5   | 3   |
| Tympanum           | 3.5 | 3   | 2.5 | 2.5 | 2.5 | 2.5 | 3.5 | 2.5 |
| Fore limb ..       | 28  | 25  | 22  | 22  | 21  | 20  | 31  | 19  |
| First finger       | 5   | 4.5 | 4.5 | 4   | 4   | 4   | 7   | 3.5 |
| Second finger      | 5   | 4.5 | 4.5 | 4   | 4   | 4   | 6.5 | 3.5 |
| Third finger ..    | 7   | 6   | 5.5 | 5.5 | 5   | 5   | 8   | 4.5 |
| Fourth finger ..   | 4   | 3.5 | 3.5 | 4   | 4   | 3.5 | 6   | 3   |
| Hind limb          | 70  | 69  | 59  | 60  | 60  | 58  | 80  | 50  |
| Tibia ..           | 24  | 22  | 20  | 20  | 19  | 18  | 26  | 16  |
| Foot               | 22  | 21  | 19  | 19  | 19  | 18  | 26  | 16  |
| Third toe ..       | 12  | 10  | 9   | 9   | 9   | 10  | 12  | 8   |
| Fourth toe         | 17  | 16  | 14  | 14  | 14  | 14  | 18  | 12  |
| Fifth toe ..       | 11  | 10  | 8   | 8   | 9   | 10  | 12  | 8   |

1—5. Khasi hills (types). 6. Bengal, type. 7. Malacca. 8. Gunong Kledong, Perak.

*Habitat.* Bengal, Khasi hills, and Malay Peninsula.

## 27. *Rana feae*.

*Rana feae*, Bouleng., *Ann. Mus. Genova* (2) V, 1887, p. 418, pl. iii, and *Faun. Ind., Rept.* p. 446 (1890).

Vomerine teeth in small oblique groups between the choanae and extending beyond the level of their posterior borders.

Head much broader than long, much depressed; snout rounded, scarcely projecting beyond the mouth, shorter than the eye; no canthus rostralis; loreal region oblique, concave; nostril a little nearer the eye than the end of the snout; the distance between the nostrils greater than the interorbital width, which is a little less than that of the upper eyelid; tympanum distinct,  $\frac{2}{3}$  the diameter of the eye, not more than its distance from the latter.

Fingers obtuse, first a little longer than the second, third longer than the snout; subarticular tubercles moderate.

Hind limb moderately long, the tibio-tarsal articulation reaching the eye; tibia twice in length from snout to vent. Toes rather short, with obtuse tips, entirely webbed; subarticular tubercles moderate; a narrow tarsal fold; inner metatarsal tubercle narrow, feebly prominent,  $\frac{2}{3}$  the length of the inner toe; no outer tubercle.

Sides of body warty, large elongate smooth warts being intermixed with small round ones, posterior part of upper eyelid warty; a glandular fold from the eye to the shoulder.

Olive brown above, with rather indistinct darker spots and a blackish, white-edged ocellus at the hip-joint; interrupted dark cross-bands on the limbs; lower parts dirty white.

Males with internal vocal sacs; arms extremely thickened; a patch of black spines on each side of the breast and others on the inner side of the first and second fingers.

From snout to vent 92 millim.

Described from a single specimen, from the Kakhien hills, Burma, forming part of the collection made by the late L. Fea for the Genoa Museum. A second specimen, from Hotha, Yunnan, is stated by Mr. W. Sclater to be preserved in the Indian Museum.

Distinguished from *R. liebighii* by the distinct tympanum, the longer inner finger, the shorter hind limb, the presence of a tarsal fold, and the absence of dorso-lateral folds.

## 28. *Rana yunnanensis*.

*Rana yunnanensis*, Anders., *Anat. Zool. Res. Yunnan*, p. 839, pl. lxxviii, fig. 2 (1879).

This species rests on Anderson's description and figure; the types, Dr. Annandale informs me, are not to be found in the Indian Museum, and are probably lost.

Anderson's description is here reproduced:—

"Head broader than long; the snout rounded and somewhat pointed; nostril nearer the snout than the eye; canthus rostralis feeble; tympanum visible, but indistinct, half the size of the eye; a glandular fold from the eye over the tympanum to the shoulder; vomerine teeth but little developed and in two short oblique ridges on the inner side of the choanae, convergent behind, but separated from each other by a wide interval. Openings of the internal nostrils small, round, those of the eustachian tubes very small. Tongue free, cordate, deeply notched. A feeble fold along the metatarsus and along the first toe enclosing a small but strong laterally compressed sharp-edged crescentic tubercle, a fold along the fifth toe. Fingers tapering, tips not enlarged; the first, second and fourth subequal in size, the third slightly longer than the second; a few minute horny spines on the upper surface of the thumb. Toes incompletely webbed, the membrane emarginate, reaching to the extremities of all the toes but the fourth; fourth toe one-third longer than the third. Upper surface densely covered with round warty tubercles, each surmounted by a small black horny granule. Smooth beneath. Uniform greenish olive-brown, with obscure dark bands from the orbit to the lip and on the upper surface of the limbs; under surface brownish-yellow, reticulately spotted with deep brown. From the vent to the metatarsal tubercle is rather more than the length of the body."

From snout to vent 73 millim.

*Habitat*. Hotha, Yunnan, altitude 5000 feet.

29 *Rana tibetana*.

*Rana tibetana*. Bouleng., *Ann. and Mag. N.H.* (8) XX, 1917, p. 414.

Vomerine teeth in small oblique groups between the choanae and extending a little beyond the level of their posterior borders.

Head much broader than long, much depressed; snout rounded, scarcely projecting beyond the mouth, shorter than the eye; canthus rostralis distinct; loreal region very oblique, concave; nostril nearer the eye than the end of the snout; the distance between the nostrils greater than the interorbital width, which is much less than that of the upper eyelid; tympanum distinct,  $\frac{3}{5}$  the diameter of the eye and twice its distance from the latter.

Fingers obtuse, first slightly longer than the second, third longer than the snout; subarticular tubercles moderately large, moderately prominent.

Hind limb moderately long, the tibio-tarsal articulation reaching the anterior border of the eye, the heels strongly overlapping when the limbs are folded at right angles to the body; tibia  $3\frac{1}{2}$  times as long as broad, twice in length from snout to vent, a little longer than the foot, a little shorter than the fore limb. Toes with the tips swollen into small discs, entirely webbed; subarticular tubercles moderately large, moderately prominent; a very distinct tarsal fold; inner metatarsal tubercle narrow, feebly prominent,  $\frac{5}{7}$  the length of the inner toe; no outer tubercle.

Upper parts rough with granules and numerous round or oval warts tipped with black horny spinules; a feeble fold across the head, behind the eyes; a strong glandular fold from the eye to the shoulder; lower parts smooth.

Brown above with numerous ill-defined dark spots on the back and cross-bars on the limbs, the larger warts lighter; a light cross-bar between the eyes; lips with dark vertical bars. Lower parts brownish, throat and limbs mottled with brown.

Male with internal vocal sacs; arms thick, breast with black horny spines; similar spines, but more crowded, on the inner metacarpal tubercle and on the upper surface of the two inner fingers.

*Measurements in millimetres.*

|                    |    |    |    |    | ♂   |
|--------------------|----|----|----|----|-----|
| From snout to vent | .. | .. | .. |    | 61  |
| Head               |    | .. | .. |    | 18  |
| Width of head ..   | .. | .. | .. |    | 25  |
| Snout ..           |    | .. | .. | .. | 5   |
| Eye ..             |    |    | .. | .. | 7   |
| Interorbital width |    |    | .. | .. | 3.5 |
| Tympanum ..        |    |    | .. | .. | 4   |
| Fore limb ..       |    |    |    | .. | 33  |
| First finger       |    |    | .. |    | 6   |
| Second finger ..   |    | .  | .. | .. | 5.5 |
| Third finger       |    |    | .. | .. | 9   |
| Fourth finger      |    |    |    | .. | 6   |
| Hind limb          | .. | .. | .. | .. | 92  |
| Tibia ..           |    | .. | .. | .. | 30  |
| Foot               |    |    |    | .. | 28  |
| Third toe          |    | .. |    | .. | 14  |
| Fourth toe         | .. |    | .. | .. | 20  |
| Fifth toe ..       | .. |    | .. | .. | 14  |

A single specimen from Yin tsin wan, Wassu State, Tibet, preserved in the British Museum.

Distinguished from *R. gammiei* by the distinct tympanum, the presence of a tarsal fold, the larger metatarsal tubercle, and the presence of vocal sacs; from *R. jeae*, by the swollen tips of the toes and the distinct canthus rostralis; from *R. yunnanensis*, by the less prominent metatarsal tubercle.

### 30. *Rana sternosignata*.

*Rana sternosignata*, J. A. Murray, *Ann. and Mag. N.H.* (5) XVI, 1885, p. 120; Bouleng., *Faun. Ind., Rept.* p. 445, (1890); Annand., *Mem. As Soc. Beng.* VI, 1917, p. 139.

Vomerine teeth in small oblique groups between the choanae and extending a little beyond the level of their posterior borders.

Head much broader than long, much depressed; snout rounded, scarcely projecting beyond the mouth, a little shorter than the eye; no canthus rostralis; loreal region very oblique, slightly concave; nostril a little nearer the eye than the end of the snout; the distance between the nostrils greater than the interorbital width, which is less than that of the upper eyelid; tympanum not very distinct, not quite half the diameter of the eye and equal to the distance from the latter.

Fingers obtuse, first as long as or a little shorter than the second; subarticular tubercles small, moderately prominent.

Hind limb rather short, the tibio-tarsal articulation reaching the temple or the posterior border of the eye, the heels not overlapping when the limbs are folded at right angles to the body; tibia 3 to  $3\frac{1}{2}$  times as long as broad,  $2\frac{1}{5}$  to  $2\frac{1}{3}$  times in length from snout to vent, as long as or a little shorter than the foot, shorter than the fore limb. Toes obtuse or very slightly swollen at the tips, entirely webbed; subarticular tubercles very small, moderately prominent; a feeble tarsal fold; inner metatarsal tubercle narrow, feebly prominent,  $\frac{2}{5}$  to  $\frac{1}{2}$  the length of the inner toe; no outer tubercle.

Upper parts smooth or with small warts, which may be tipped with black horny spines; a feeble fold across the head, behind the eyes; a glandular fold from the eye to the shoulder; lower parts smooth.

Olive-brown above, uniform or freckled with darker; limbs without transverse bands. Lower parts whitish, mottled or marbled with dark brown, at least on the throat and limbs.

Males with internal vocal sacs, arms much thickened; breast with black horny spines; similar spines, but more crowded, on the inner metacarpal tubercle and on the upper surface of the two inner fingers.

Nasals large and in contact with each other and with the frontoparietals, which entirely cover the ethmoid; zygomatic branch of squamosal long and curved, extending to below the eye. Omosternal style entire.

The large tadpoles (up to 90 millim. long), from Quetta, 5700 ft., for which I am indebted to Dr. Annandale, are remarkable for the very strongly marked lines of sensory canals, which are black (preservation in formalin). Tail 2 to  $2\frac{1}{4}$  times as long as body, 3 to  $3\frac{1}{2}$  times as long as deep, obtusely pointed, the dorsal crest not extending on to the body. Nostrils much nearer the eyes than the tip of the snout. Lip moderately developed, bordered with rounded or conical papillae on the sides and below; a marginal series of upper labial horny teeth and 4 series on each side; 3 series of lower labial teeth, the innermost narrowly interrupted in the middle; back entirely black.

*Measurements in millimetres.*

|                    | 1.  | 2.  | 3.  | 4.  |
|--------------------|-----|-----|-----|-----|
|                    | ♂   | ♂   | ♂   | ♂   |
| From snout to vent | 76  | 84  | 70  | 68  |
| Head ..            | 24  | 27  | 23  | 22  |
| Width of head ..   | 31  | 34  | 30  | 28  |
| Snout              | 8   | 9   | 8   | 7   |
| Eye ..             | 9   | 10  | 9   | 8   |
| Interorbital width | 3   | 4   | 3.5 | 3   |
| Tympanum ..        | 3.5 | 4   | 3.5 | 3.5 |
| Fore limb          | 42  | 47  | 41  | 38  |
| First finger ..    | 7   | 8   | 6   | 7   |
| Second finger      | 8   | 9   | 7   | 7   |
| Third finger       | 10  | 12  | 8   | 10  |
| Fourth finger      | 7   | 9   | 6   | 7   |
| Hind limb          | 112 | 115 | 98  | 93  |
| Tibia              | 34  | 37  | 32  | 29  |
| Foot ..            | 36  | 37  | 33  | 30  |
| Third toe          | 20  | 19  | 17  | 16  |
| Fourth toe         | 27  | 28  | 24  | 23  |
| Fifth toe          | 20  | 20  | 18  | 17  |

1. Muller, nr. Karachi, type. 2. Quetta, type. 3—4. Quetta.

*Habitat.* Sind, Baluchistan, Kashmir.

Distinguished from *R. feae* by the shorter hind limbs and the shorter first finger.

[Owing to the looseness of its skin and its peculiar coloration this frog has in life a very different appearance from its allies. The skin falls naturally into irregular folds and when the head is held in the natural position forms a prominent transverse wrinkle behind the eyes. The dorsal surface is dull clay-colour or olivaceous with conspicuous orange spots or blotches of variable size and number sparsely scattered on the back. The head is speckled with black in some individuals. The ventral surface is white with a black reticulation more or less well developed. The pupil of the eye is reduced to a narrow slit in normal circumstances and a transverse dark streak runs across the iris at both ends. A similar streak runs vertically downwards across the iris above and below the pupil, giving the whole eye a most peculiar appearance. This feature also occurs in the tadpole. The iris itself is golden brown.

*R. sternosignata* is extremely common, with *R. cyanophlyctis*, in pools and water-channels in the Quetta and Pishin districts of Baluchistan between 5000 and 6000 feet. Mr. Kemp and I did

not see it in the Nushki desert or in Seistan, where we could hardly have failed to observe it if it occurred.

*R. sternosignata* is the most completely aquatic Indian frog with which I am acquainted. It usually rests, at any rate in winter, on the bottom, sometimes in as much as ten feet of water, and rarely or never comes on dry land. Although somewhat sluggish in very cold weather it does not hibernate but remains exposed and alert even under ice. The secondary sexual characters of the male are well developed in winter. The tadpoles, which reach a very large size, as a rule spend the winter in the larval state, but few were observed in November that seemed to be about to undergo their final metamorphosis. *N. A.*]

### 31. *Rana phrynoides*.

*Rana phrynoides*, Bouleng., *Ann. and Mag. N.H.* (8) XX, 1917, p. 413.

Vomerine teeth in small oblique groups commencing on a line with and extending back beyond the level of the posterior borders of the choanae.

Head much broader than long, much depressed; snout rounded, scarcely projecting beyond the mouth, as long as the eye; canthus rostralis indistinct; loreal region very oblique, slightly concave; nostril nearer the eye than the end of the snout; the distance between the nostrils greater than the interorbital width, which is less than that of the upper eyelid; tympanum hidden or very indistinct,  $\frac{1}{2}$  to  $\frac{2}{3}$  the diameter of the eye.

Fingers obtuse, first longer than the second, third longer than the snout; subarticular tubercles small, moderately prominent.

Hind limb short, the tibio-tarsal articulation reaching the shoulder or the temple, the heels just meeting when the limbs are folded at right angles to the body; tibia  $2\frac{1}{2}$  times as long as broad;  $2\frac{1}{8}$  to  $2\frac{1}{2}$  times in length from snout to vent, a little shorter than the foot, much shorter than the fore limb. Toes short, with obtuse tips, entirely webbed; subarticular tubercles small, moderately prominent; a feeble tarsal fold; inner metatarsal tubercle narrow, feebly prominent,  $\frac{1}{2}$  the length of the inner toe; no outer tubercle.

Upper parts granulate, with numerous small warts on the back, some of which may be elongate; these granules and warts may bear black horny spinules; a strong fold across the head behind the eyes, and a very strong glandular fold from the eye to the shoulder; lower parts smooth.

Dark olive above, uniform or with rather indistinct darker spots; lips with or without dark vertical bars; dark cross-bars on the limbs very irregular, if present. Lower parts whitish, uniform, or throat and hind limbs spotted or marbled with blackish.

Males with internal vocal sacs; during the breeding-season the arms are remarkably thickened and black horny spines form two patches on the breast and more crowded patches on the inner metacarpal tubercle and on the upper side of the two inner fingers;

similar spines may also be scattered on the palmar and plantar surfaces.

Nasals large and in contact with each other and with the frontoparietals, which entirely cover the upper surface of the ethmoid; zygomatic branch of squamosal short. Omosternal style entire. Terminal phalanges slightly expanded at the end.

*Measurements, in millimetres, of the type specimens.*

|                       | ♂   | ♂   | ♂   | ♀   | ♀   | ♀   |
|-----------------------|-----|-----|-----|-----|-----|-----|
| From snout to vent .. | 109 | 91  | 70  | 110 | 90  | 75  |
| Head                  | 30  | 28  | 21  | 31  | 25  | 21  |
| Width of head         | 40  | 35  | 27  | 40  | 32  | 28  |
| Snout .               | 10  | 9   | 7   | 10  | 9   | 7   |
| Eye ..                | 10  | 9   | 7   | 10  | 9   | 7   |
| Interorbital width    | 5.5 | 5   | 3   | 5   | 4   | 3   |
| Fore limb             | 68  | 53  | 41  | 59  | 50  | 43  |
| First finger          | 11  | 9   | 8   | 10  | 9   | 8   |
| Second finger ..      | 10  | 8   | 7.5 | 9   | 8   | 7.5 |
| Third finger          | 15  | 12  | 9   | 12  | 13  | 10  |
| Fourth finger         | 10  | 8   | 7   | 9   | 8   | 7   |
| Hind limb             | 143 | 126 | 100 | 137 | 125 | 114 |
| Tibia                 | 46  | 38  | 30  | 44  | 38  | 34  |
| Foot                  | 48  | 40  | 35  | 46  | 42  | 38  |
| Third toe ..          | 22  | 18  | 18  | 22  | 21  | 19  |
| Fourth toe            | 33  | 29  | 24  | 30  | 31  | 27  |
| Fifth toe ..          | 24  | 19  | 18  | 23  | 22  | 19  |

*Habitat.* Yunnan at Tongchuan fu, where this large frog was found in great numbers by Messrs. Graham and Dymond. The types preserved in the British Museum.

This and the following species are intermediate between *R. sternosignata* and *R. liebigii*, but nearer the former.

### 32. *Rana spinosa*.

*Rana kuhlii*, part., Günth., *Cat. Batr. Sal.* p. 8 (1858), and *Rept. Brit. Ind.* p. 404, pl. xxvi, fig. A (1864); Bouleng., *Cat. Batr. Ecaud.* p. 20 (1882).

*Rana latrans* (non Steff.), David, *N. Arch. Mus.* VIII, 1872, *Bull.* p. 85, and *Fourn. 3<sup>e</sup> Voy. Emp. Chin.* II, p. 250 (1875).

*Rana spinosa*, David, *op. cit.* p. 253.

*Rana boulengeri*, Günth., *Ann. and Mag. N.H.* (6) IV, 1889, p. 222; Bouleng., *Proc. Zool. Soc.* 1899, p. 166.

Vomerine teeth in small oblique groups commencing on a line with and extending back beyond the level of the posterior borders of the choanae.

Head much broader than long, much depressed; snout rounded, scarcely projecting beyond the mouth, as long as the eye; canthus rostralis very obtuse; loreal region very oblique, slightly concave; nostril nearer the eye than the end of the snout; the distance between the nostrils greater than the interorbital width; which is a little less than that of the upper eyelid; tympanum hidden or very indistinct,  $\frac{1}{2}$  to  $\frac{3}{5}$  the diameter of the eye.

Fingers feebly swollen at the tips, first longer than the second, third longer than the snout; subarticular tubercles moderately large, moderately prominent.

Hind limb moderately long, the tibio-tarsal articulation reaching the eye, the heels overlapping when the limbs are folded at right angles to the body; tibia  $2\frac{2}{3}$  to  $3\frac{1}{2}$  times as long as broad, twice in length from snout to vent, or a little more or a little less, as long as or a little shorter than the foot, shorter than the fore limb. Toes with the tips swollen into small discs, entirely webbed; subarticular tubercles moderately large, moderately prominent; a feeble tarsal fold; inner metatarsal tubercle narrow, feebly prominent,  $\frac{2}{3}$  the length of the inner toe; no outer tubercle.

Upper parts granulate or shagreened, with numerous warts, which may be small and subconical or large and elongate on the back; these warts may bear black horny spinules; a strong fold across the head behind the eyes, and a very strong glandular fold from the eye to the shoulder; lower parts smooth.

Dark olive or blackish brown above; lips with darker vertical bars; limbs with more or less distinct black cross-bars; hinder side of thighs black, with more or less distinct lighter marblings. Lower parts whitish, throat and lower surface of limbs spotted or marbled with blackish.<sup>1</sup>

Males with internal vocal sacs; during the breeding-season the arms are remarkably thickened, and black horny spines are present, more or less scattered, on the whole breast and, closer together, on the inner metacarpal tubercle and on the upper side of the two or three inner fingers.

The skull is very similar to that of the preceding species, but the zygomatic branch of the squamosal is longer. Omosternal style entire.

*Measurements in millimetres.*

|                    | 1.  | 2.  | 3.  | 4.  | 5.  | 6.  | 7.  | 8.  |
|--------------------|-----|-----|-----|-----|-----|-----|-----|-----|
|                    | ♂   | ♂   | ♂   | ♂   | ♂   | ♀   | ♀   | ♂   |
| From snout to vent | 105 | 103 | 101 | 69  | 87  | 102 | 104 | 67  |
| Head ..            | 31  | 30  | 30  | 22  | 27  | 29  | 29  | 20  |
| Width of head ..   | 45  | 42  | 42  | 28  | 35  | 39  | 40  | 26  |
| Snout ..           | 10  | 10  | 10  | 8   | 9   | 10  | 10  | 7   |
| Eye ..             | 10  | 10  | 10  | 8   | 9   | 10  | 10  | 7   |
| Interorbital width | 5   | 6   | 6   | 4   | 5   | 6   | 6   | 4   |
| Fore limb ..       | 68  | 68  | 60  | 41  | 51  | 61  | 57  | 36  |
| First finger       | 14  | 11  | 11  | 8   | 9   | 11  | 11  | 8   |
| Second finger      | 13  | 10  | 9   | 7   | 8   | 10  | 9   | 7   |
| Third finger       | 16  | 14  | 13  | 10  | 11  | 13  | 13  | 10  |
| Fourth finger      | 11  | 10  | 9   | 7   | 8   | 9   | 9   | 7   |
| Hind limb ..       | 165 | 164 | 151 | 115 | 143 | 163 | 150 | 103 |
| Tibia ..           | 51  | 52  | 48  | 36  | 46  | 51  | 49  | 35  |
| Foot               | 55  | 52  | 50  | 36  | 45  | 51  | 49  | 34  |
| Third toe .        | 27  | 25  | 24  | 18  | 22  | 23  | 24  | 18  |
| Fourth toe         | 39  | 38  | 35  | 25  | 33  | 36  | 34  | 25  |
| Fifth toe          | 25  | 25  | 24  | 17  | 22  | 26  | 23  | 18  |

1—2. Ichang, types. 3—4. Kuatun. 5—6. Pingho. 7. Ningpo. 8. Man Son Mts., Tonkin.

<sup>1</sup> The coloration is thus described by David: Dessus brun olive, marqué de taches noirâtres rondes ou allongées et de pustules; cuisses et jambes avec sept raies noires; intérieur des cuisses noir marbré de blanc. Dessous blanchâtre; haut de la gorge marbré de brun. Iris brun doré.

*Habitat.* China, south of the Yangtse Kiang (Mountains of Kiangsi and between Kiangsi and Fokien<sup>1</sup>, Ningpo, Pingho) and Tonkin (Man-Son Mts., 3000–4000 ft.).

Closely allied to the preceding species, but distinguished by the shorter tibia and the dilated tips of the toes.

### 33. *Rana gammiei*.

*Rana gammii*, part., Anders., *Journ. As. Soc. Beng.* XL, 1871, p. 21.

*Rana gammiei*, Annand., *Mem. As. Soc. Beng.* VI, 1917, p. 138.

Vomerine teeth in rather long oblique series originating between the choanae and extending far behind them.

Head a little broader than long, much depressed; snout rounded, as long as the eye; canthus rostralis indistinct; loreal region very oblique, concave; nostril equidistant from the eye and from the tip of the snout; interorbital space a little narrower than the upper eyelid; tympanum hidden.

Fingers obtuse, first longer than the second, third longer than the snout; subarticular tubercles moderate.

The tibio-tarsal articulation reaches the posterior border of the eye; heels overlapping when the limbs are folded at right angles to the body; tibia  $1\frac{3}{4}$  to nearly 2 times in length from snout to vent, as long as or a little shorter than the foot. Toes not quite entirely webbed, the tips swollen into small discs; subarticular tubercles moderate; no tarsal fold; inner metatarsal tubercle  $\frac{1}{4}$  the length of the inner toe; no outer tubercle.

Back with small scattered warts, each of which bears a minute spinule; a short, almost linear glandular fold above the tympanum.

Male without vocal sacs; arms thick; black horny spinules on the fore limbs and on the breast, as in *R. liebighii*.

#### *Measurements in millimetres.*

|                    |    | ♂ (type) | ♀  |
|--------------------|----|----------|----|
| From snout to vent |    | 55       | 45 |
| Head               | .. | 20       | 14 |
| Width of head      | .. | 22       | 16 |
| Snout              | .. | 8        | 8  |
| Eye                | .. | 6        | 7  |
| Interorbital width | .. | 5        | 5  |
| Fore limb          | .. | ?        | 26 |
| First finger       |    | 8        | 8  |
| Second finger      | .. | 6        | 7  |
| Third finger       |    | 10       | 9  |
| Fourth finger      | .. | 8        | 6  |
| Hind limb          | .. | 94       | 88 |
| Tibia              |    | 37       | 27 |
| Foot               | .. | 31       | 27 |
| Third toe          | .. | 19       | 17 |
| Fourth toe         | .. | 23       | 21 |
| Fifth toe          | .. | 20       | 15 |

<sup>1</sup> The types of *R. latrans* and *R. boulengeri* are from the same locality, Ichang, so that no doubt can be entertained as to their specific identity; *R. spinosa* is from the mountains between the provinces Kiangsi and Fokien.

*Habitat.* Darjeeling, between 4000 and 6000 feet.

I have not seen specimens of this species. The above description is drawn up from notes kindly supplied to me by Dr. Annandale.

### 34. *Rana annandalii*, sp. n.

Vomerine teeth in short oblique series close together, originating between the choanae and extending beyond the level of their posterior borders.

Head a little broader than long, much depressed; snout rounded, scarcely projecting beyond the mouth, as long as or shorter than the eye; canthus rostralis obtuse; loreal region moderately oblique, concave; nostril equidistant from the eye and from the end of the snout; the distance between the nostrils greater than the interorbital width, which is  $\frac{2}{3}$  that of the upper eyelid; tympanum feebly distinct or hidden,  $\frac{1}{4}$  the diameter of the eye,  $\frac{2}{3}$  its distance from the latter.

Fingers obtuse, first and second equal, third a little longer than the snout; subarticular tubercles small, feebly prominent.

Hind limb rather long, the tibio-tarsal articulation reaching the nostril, the heels strongly overlapping when the limbs are folded at right angles to the body; tibia  $3\frac{1}{2}$  times as long as broad,  $1\frac{3}{4}$  to  $1\frac{1}{2}$  times in length from snout to vent, a little shorter than the fore limb, as long as the foot. Toes with the tips swollen into small discs,  $\frac{3}{4}$  webbed, 2 phalanges of fourth free or only narrowly bordered by the web; outer metatarsals separated nearly to the base; subarticular tubercles rather small, moderately prominent; no tarsal fold; inner metatarsal tubercle narrow, feebly prominent  $\frac{1}{3}$  or  $\frac{2}{3}$  the length of the inner toe; no outer tubercle.

Upper parts smooth or with granules and small warts, which may be spinulose; a strong glandular fold from the eye to the shoulder; glandular dorso-lateral fold distinct only in front, from behind the eye to the scapular region, converging towards its fellow; lower parts smooth.

Olive above with darker marblings and small light spots; a dark cross-bar between the eyes; limbs with numerous dark cross-bars; white beneath, throat and breast spotted with brown.

Males without vocal sacs; fore limbs very strong; a patch of large black spines on each side of the breast and on the inner side of the first finger and on the metacarpal tubercle; smaller spines on the inner side of the fore limb and of the second finger.

Tadpole with very obtusely pointed tail about twice as long as the body. Buccal disc  $\frac{2}{5}$  to  $\frac{1}{2}$  the width of the body; upper lip with a series of papillae on the sides, lower with two complete series; beak entirely black; 4 or 5 series of upper labial teeth, only the outer continuous; 3 series of lower labial teeth, continuous or innermost narrowly interrupted. Tail with dark brown spots, some of which are large. Total length up to 45 millimetres.

## Measurements in millimetres.

|                    |    |    | 1.  | 2.  | 3.  | 4.  |
|--------------------|----|----|-----|-----|-----|-----|
|                    |    |    | ♂   | ♂   | ♀   | ♀   |
| From snout to vent | .. |    | 41  | 52  | 46  | 45  |
| Head               | .. | .. | 14  | 17  | 14  | 15  |
| Width of head      |    |    | 15  | 18  | 15  | 16  |
| Snout              | .. | .. | 4   | 5.5 | 4.5 | 5   |
| Eye                | .. | .. | 5   | 5.5 | 5   | 5   |
| Interorbital width |    | .. | 3   | 3   | 2   | 2.5 |
| Fore limb          |    |    | 25  | 28  | 27  | 27  |
| First finger       | .. | .. | 3.5 | 5   | 5   | 5   |
| Second finger      | .. | .. | 3.5 | 5   | 5   | 5   |
| Third finger       |    | .. | 5   | 8   | 7   | 7.5 |
| Fourth finger      | .. |    | 3.5 | 5   | 5   | 5   |
| Hind limb          | .. | .. | 73  | 91  | 80  | 27  |
| Tibia              | .. | .. | 23  | 30  | 26  | 25  |
| Foot               | .. | .. | 23  | 29  | 25  | 24  |
| Third toe          |    | .. | 11  | 16  | 15  | 14  |
| Fourth toe         | .. | .. | 16  | 25  | 20  | 20  |
| Fifth toe          |    | .. | 11  | 16  | 14  | 14  |

1. Sureil. 2—3. Ghoom. 4. Pashok.

Two specimens, male and young, also tadpoles, from Sureil, Darjeeling district, 5500 ft., collected by Dr. Annandale. A male and two females, from the Suchal Waterworks, near Ghoom, in the same district, collected by Mr. S. W. Kemp, and a female from Pashok, alt. 4500 feet, together with tadpoles and young, collected by Dr. Annandale, are also preserved in the Indian Museum. They differ from the description of *R. gammiei* in the shorter snout, the shorter fingers, the first and second equal, the tibio-tarsal articulation reaching nearly the tip of the snout, and the presence of a short glandular fold from behind the eye to the scapular region.

[The Sureil specimens were taken, with others of *R. assamensis*, amongst dense herbage at the edge of a small jungle-stream in October. N. A.]

35. *Rana liebighii*.

*Megalophrys gigas*, Blyth, *Fourn. As. Soc. Beng.* XXIII, 1854, p. 299.

*Rana liebighii*, Günth., *Proc. Zool. Soc.* 1860, p. 157, pl. xxviii, fig. A, and *Rept. Brit. Ind.* p. 407 (1864); Anders., *Proc. Zool. Soc.* 1871, p. 198; Stoliczka, *Proc. As. Soc. Beng.* 1872, p. 103; Theob., *Proc. As. Soc. Beng.* 1873, p. 111; Günth., *Proc. Zool. Soc.* 1875, p. 567; Bouleng., *Cat. Batr. Ecaud.* p. 21, fig. (1882) and *Faun. Ind., Rept.* p. 445 (1890); W. Sclater, *Proc. Zool. Soc.* 1892, p. 343; Annand., *Fourn. As. Soc. Beng.* (2) II, 1906, p. 290. *Rec. Ind. Mus.* VIII, 1912, p. 21, and *Mem. As. Soc. Beng.* VI, 1917, p. 136.

*Rana sikkimensis*, Jerdon, *Proc. As. Soc. Beng.* 1870, p. 83; Stoliczka, *l. c.*

*Rana gigas* (non Laur.), Peters, *Sitzb. Ges. Nat. Fr. Berl.* 1881, p. 87.

Vomerine teeth in feeble groups or oblique series between the choanae and extending beyond the level of their posterior borders.

Head much broader than long, much depressed; snout rounded, scarcely projecting beyond the mouth, as long as or shorter than the eye; canthus rostralis indistinct; loreal region oblique, concave; nostril a little nearer the eye than the end of the snout; the distance between the nostrils a little greater

than the interorbital width, which equals or nearly equals that of the upper eyelid; tympanum small, hidden or very indistinct.

Fingers obtuse, first as long as or slightly shorter than the second, third longer than the snout, subarticular tubercles moderately large, moderately prominent.

Hind limb long, the tibio-tarsal articulation reaching the tip of the snout or a little beyond, the heels strongly overlapping when the limbs are folded at right angles to the body; tibia 3 to 4 times as long as broad,  $1\frac{2}{3}$  to 2 times in length from snout to vent, longer than the foot, nearly as long as or shorter than the fore limb. Toes with the tips swollen into small discs, entirely webbed, the web almost rectilinear or more or less notched, subarticular tubercles moderately large, moderately prominent; no tarsal fold; inner metatarsal tubercle oval or elliptical, feebly prominent,  $\frac{2}{3}$  to  $\frac{1}{2}$  the length of the inner toe; no outer tubercle.

Smooth above, or with granules and small warts; a more or less distinct fold across the head behind the eyes and a strong glandular fold from the eye to the shoulder; a moderately broad but usually very prominent dorso-lateral glandular fold, exceptionally very indistinct or broken up into a chain of warts, slightly converging towards its fellow on the anterior part of the back, where the distance between the two is  $5\frac{1}{2}$  to 7 times in the length of head and body; lower parts smooth.

Olive or brown above, uniform or with small darker spots, sides with large dark marblings, the dorso-lateral folds often edged with blackish; a blackish streak on the canthus rostralis and a blackish temporal spot; limbs usually with irregular dark cross-bars. Lower parts brownish, or whitish marbled with brown.

Males with internal vocal sacs; during the breeding season the arms are remarkably thickened and groups of black horny spines are present on each side of the breast, on the inner side of the arm and on the upper side of the three inner fingers. After the nuptial period, the male has but moderately strong forelimbs, without spines, but may be distinguished from the female by the large and very prominent inner carpal tubercle; the dorsal warts and granules may bear minute horny spinules (male from Ghoom near Darjeeling, from Mrs. Kemp's collection in the Indian Museum).

Skeleton very similar to that of *R. temporaria*. Nasals rather small and separated on the median line; ethmoid uncovered in front, zygomatic process of squamosal moderately long. Omosternal style entire. Terminal phalanges with short transverse expansion at the end.

The tadpole is known from Darjeeling specimens. Tail pointed,  $2\frac{1}{2}$  to 3 times as long as head and body. Lips large, the upper with a series of papillae on the sides only, the lower with two complete series; beak entirely black; 7 or 8 series of upper labial teeth, the 2 or 3 outer continuous; 3 series of lower labial teeth, the 2 outer continuous, the inner narrowly interrupted.

*Measurements in millimetres.*

|                    | 1.  | 2.  | 3.  | 4.  | 5.  | 6.  | 7.  | 8.  | 9.  | 10. |
|--------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
|                    | ♂   | ♂   | ♂   | ♂   | ♀   | ♀   | ♀   | ♀   | ♀   | ♂   |
| From snout to vent | 67  | 123 | 97  | 79  | 97  | 94  | 85  | 78  | 78  | 90  |
| Head               | 22  | 35  | 29  | 23  | 27  | 27  | 25  | 23  | 25  | 29  |
| Width of head.     | 27  | 49  | 40  | 31  | 39  | 39  | 33  | 27  | 35  | 37  |
| Snout              | 7   | 13  | 10  | 8   | 10  | 11  | 8   | 7   | 9   | 10  |
| Eye                | 8   | 13  | 10  | 8   | 11  | 11  | 9   | 9   | 9   | 10  |
| Interorbital width | 4.5 | 8   | 6   | 5   | 6   | 6   | 5   | 5   | 7   | 6   |
| Fore limb          | 40  | 73  | 58  | 47  | 60  | 57  | 52  | 47  | 50  | 51  |
| First finger       | 7   | 11  | 10  | 8   | 10  | 10  | 9   | 7   | 10  | 10  |
| Second finger      | 7   | 11  | 18  | 8   | 10  | 10  | 9   | 8   | 10  | 10  |
| Third finger       | 11  | 16  | 15  | 12  | 15  | 14  | 13  | 12  | 13  | 13  |
| Fourth finger      | 8   | 11  | 11  | 9   | 11  | 11  | 10  | 9   | 9   | 11  |
| Hind limb          | 117 | 180 | 160 | 126 | 155 | 164 | 146 | 137 | 147 | 157 |
| Tibia              | 39  | 64  | 55  | 40  | 52  | 55  | 45  | 43  | 47  | 50  |
| Foot               | 37  | 55  | 50  | 38  | 50  | 51  | 45  | 42  | 45  | 48  |
| Third toe          | 18  | 33  | 26  | 20  | 25  | 28  | 23  | 21  | 24  | 24  |
| Fourth toe         | 27  | 41  | 37  | 29  | 35  | 37  | 34  | 33  | 34  | 35  |
| Fifth toe          | 18  | 31  | 25  | 19  | 25  | 27  | 23  | 22  | 23  | 23  |

1. Sikkim (type). 2—6. Darjiling. 7—8. Lialing, Sikkim, 8500 f. 9. Simla.  
10. Nepal (type).

*Habitat.* Himalayas, between 4000 and 10,000 feet, chiefly at altitudes near the snow-line in Sikkim. The locality Tavoy. Tenasserim, recorded by W. Sclater, seems very doubtful.

**36. *Rana assamensis*.**

*Rana gammii*, part., Anders., *Journ. As. Soc. Beng.* XL, 1871, p. 21.

*Rana assamensis*, W. Sclater, *Proc. Zool. Soc.* 1892, p. 343, pl. xxiv, fig. 2.

*Rana vicina*, part., Annand., *Mem. As. Soc. Beng.* VI, 1917, p. 137, fig.

Vomerine teeth in short oblique series exactly between the choanae.

Head a little broader than long, much depressed; snout rounded, but slightly projecting, as long as or slightly longer than the eye; canthus rostralis distinct; loreal region feebly oblique, concave; nostril equidistant from the eye and from the end of the snout; the distance between the nostrils greater than the interorbital width, which equals or is a little less than that of the upper eyelid; tympanum very distinct, barely half the diameter of the eye,  $\frac{2}{3}$  to once its distance from the latter.

Fingers obtuse, first as long as the second, third as long as or longer than the snout; subarticular tubercles well developed.

Hind limb long, the tibio-tarsal articulation reaching a little beyond the tip of the snout, the heels strongly overlapping when the limbs are folded at right angles to the body; tibia 4 times as long as broad,  $1\frac{3}{5}$  to  $1\frac{3}{4}$  times in length from snout to vent, longer than the foot. Toes with swollen tips, entirely webbed; outer metatarsals separated nearly to the base; subarticular tubercles well developed; tarsal fold present; inner metatarsal tubercle narrow, feebly prominent,  $\frac{1}{2}$  to  $\frac{3}{5}$  the length of the inner toe; no outer metatarsal tubercle.

Skin smooth; a narrow, feebly prominent, sometimes interrupted, dorso-lateral glandular fold, converging towards its fellow

on the anterior part of the back, where the distance between the two is  $\frac{1}{6}$  to nearly  $\frac{1}{10}$  the length of head and body ; a strong glandular fold from the eye to the shoulder ; lower parts smooth.

Brown above, with blackish canthal and temporal band, the latter involving the tympanum ; a dark cross-band between the eyes ; lips with dark vertical bars ; dorso-lateral fold sometimes whitish, edged with blackish on the outer side, limbs with dark cross-bands. Whitish beneath, with dark mottling on the sides of the throat.

Tadpoles, obtained at Kurseong by Dr. Annandale, are very similar to those of *R. liebigii*. Tail pointed,  $2\frac{1}{4}$  to  $2\frac{1}{2}$  times as long as the body. Lips large, the upper with a series of papillae on the sides, the lower with two complete series ; beak entirely black ; 7 series of upper labial teeth, only the outer continuous ; 3 series of lower labial teeth, all continuous or the inner or the 2 inner very narrowly interrupted. Total length up to 58 millimetres.

*Measurements in millimetres.*

|                    | 1.  | 2. | 3.  |
|--------------------|-----|----|-----|
| From snout to vent | 74  | 75 | 55  |
| Length of head     | 24  | 16 | 20  |
| Width of head      | 26  | 17 | 21  |
| Snout              | 10  | 5  | 7   |
| Eye                | 9   | 5  | 6   |
| Interorbital width | 5   | 3  | 3.5 |
| Tympanum           | 3.5 | 2  | 3   |
| Fore limb          | 42  | 28 | 33  |
| First finger       | 8   | 5  | 7   |
| Second finger      | 8   | 5  | 7   |
| Third finger       | 10  | 7  | 8.5 |
| Fourth finger      | 7   | 5  | 7   |
| Hind limb.         | 125 | 84 | 104 |
| Tibia              | 45  | 29 | 35  |
| Foot               | 38  | 24 | 30  |
| Third toe          | 18  | 12 | 15  |
| Fourth toe         | 31  | 20 | 24  |
| Fifth toe          | 23  | 14 | 18  |

1—2. Pashok. 3. Kurseong.

*Habitat.* Khasi hills and Eastern Himalayas.

[This frog is very common amongst dense herbage in low bushes at the edge of shady jungle streams in the Eastern Himalayas at altitudes between 4 and 6000 ft. *N. A.*]

This species was established on a single female specimen, then in the Indian Museum, procured by the late Dr. Jerdon in the Khasi hills. I took notes on the specimen before its return to the Indian Museum, from which, I am informed by Dr. Annandale, it has now disappeared. I have also examined two female specimens from Pashok, Darjiling district, 3500 ft., and a third from Kurseong in the same district, preserved in the Indian Museum ; the above measurements are taken from these specimens.

Dr. Annandale united *R. assamensis* with *R. vicina*, but the former differs from the latter in three important characters :—The position of the vomerine teeth, which do not extend at all beyond the level of the posterior borders of the choanae ; the distinct

tympanum ; and the presence of a glandular dorso-lateral fold, which, in my notes, I mention to be certainly present, contrary to the statement of Mr. Sclater.

Dr. Annandale has since informed me that he agrees with the suggestion I made to him that what he took to be the male of *R. vicina* is the male of *R. assamensis*, which had already been alluded to by Anderson in his description of *R. gammiei*.

In the breeding male there is no thickening of the arms and inner finger, there are no spines either on the fore limbs or on the chest ; but a very peculiar secondary sexual character is the presence of a cutaneous flap of almost circular outline, covered with small papillae, each of which bears a short retroverted spine.

### 37. *Rana vicina*.

*Rana vicina*, Stoliczka, *Proc. As. Soc. Beng.* 1872, p. 130; W. Sclater, *Proc. Zool. Soc.* 1892, p. 342, pl. xxiv, fig. 1.

*Rana liebigii*, part., Annand., *Rec. Ind. Mus.* III, 1909, p. 282.

*Rana vicina*, part., Annand., *Mem. As. Soc. Beng.* VI, 1917, p. 137, fig.

Vomerine teeth in small oblique groups between the choanae and extending a little beyond the level of their posterior borders.

Head a little broader than long, much depressed; snout rounded, scarcely projecting beyond the mouth, as long as the eye; canthus rostralis obtuse; loreal region oblique; nostril a little nearer the eye than the end of the snout; the distance between the nostrils greater than the interorbital width, which equals that of the upper eyelid; tympanum hidden.

Fingers obtuse, first as long as the second, third a little longer than the snout; subarticular tubercles well developed.

Hind limb long, the tibio-tarsal articulation reaching nearly the tip of the snout, the heels overlapping when the limbs are folded at right angles to the body; tibia 4 times as long as broad,  $1\frac{2}{3}$  times in length from snout to vent, a little longer than the foot. Toes with swollen tips, entirely webbed; subarticular tubercles well developed; inner metatarsal tubercle narrow, feebly prominent, about half the length of the inner toe; no outer metatarsal tubercle.

Skin smooth, with a few tubercles on the flanks; a feebly marked transverse fold across the head behind the eyes, and a glandular fold from the eye to the shoulder.

Male without secondary sexual characters.

The above description is taken from the type specimen, which Mr. W. Sclater allowed me to examine in 1892.

The coloration of the same specimen is thus described by Stoliczka:—

Above ashy olive, with the tubercles on the body whitish; a narrow dusky band between the eyes; a black, somewhat interrupted stripe from the pale tip of the snout to the eye, skirting the edges of the eye and continuing as a broader band to the shoulder; lips black; hind limbs, above, with numerous trans-

verse dark bands ; front and hinder side of both limbs, involving the fingers and toes, very distinctly variegated with black ; lower lip spotted with black ; chin and breast dusky, rest of lower side yellowish white.

From snout to vent 57 millim.

The type specimen was procured by Stoliczka at Murree, Punjab, Western Himalayas, altitude 6000 feet. The second specimen from near Simla, mentioned by Sclater, is now in the British Museum, and has been dealt with under *R. liebigii*.

### 38. *Rana blanfordii*.

*Rana blanfordii*, Bouleng., *Cat. Batr. Ecaud.* p. 23, pl. i, fig. 2 (1882), and *Ann. and Mag. N.H.* (7) XVI, 1905, p. 640; Annand., *Rec. Ind. Mus.* III, 1909, p. 283, and *Mem. As. Soc. Beng.* VI, 1917, p. 139.  
*Rana vicina* (non Stol.), Bouleng., *Rec. Ind. Mus.* I, 1907, p. 150; Annand., *Rec. Ind. Mus.* II, 1908, p. 346.

Vomerine teeth in feeble groups or oblique series between the choanae and extending beyond the level of their posterior borders.

Head a little broader than long, rather strongly depressed ; snout rounded, scarcely projecting beyond the mouth, as long as the eye ; canthus rostralis obtuse ; loreal region oblique, concave ; nostril a little nearer the eye than the end of the snout ; the distance between the nostrils greater than the interorbital width, which equals or is a little less than that of the upper eyelid ; tympanum rather distinct or very indistinct, about  $\frac{1}{2}$  the diameter of the eye, only a little longer than its distance from the latter.

Fingers obtuse, first shorter than the second, third longer than the snout ; subarticular tubercles moderately large, very prominent.

Hind limb rather long, the tibio-tarsal articulation reaching the nostril or the tip of the snout, the heels strongly overlapping when the limbs are folded at right angles to the body ; tibia  $3\frac{1}{2}$  to 4 times as long as broad, twice in length from snout to vent or a little more or a little less, as long as or a little longer than the foot, shorter than the fore limb. Toes with the tips swollen into small discs,  $\frac{2}{3}$  to  $\frac{3}{4}$  webbed, the web deeply emarginate and extending only as a fringe to the tip of the fourth ; outer metatarsals separated nearly to the base ; subarticular tubercles moderately large, moderately prominent ; no tarsal fold ; inner metatarsal tubercle narrow, feebly prominent, about half the length of the inner toe ; no outer metatarsal tubercle.

Skin smooth above or with small granules and elongate flat glands ; a glandular fold from the eye to the shoulder ; lower parts smooth.

Olive above, with small blackish spots which may have a light centre ; a blackish cross-bar between the eyes and a blackish streak on the canthus rostralis and on the temporal region ; limbs with interrupted dark cross-bars. Lower parts white, throat of male brownish or marbled with brown. According to Annandale

the throat and thighs of the breeding male are suffused with a bright claret-colour.

Males without secondary sexual characters.

Nasal bones small, separated from each other and from the frontoparietals; ethmoid largely uncovered in front.

The eggs are very large: in the female specimen measuring 50 millim. from snout to vent the uterine eggs have a diameter of 3 millim., exactly in the same proportion as in *Alytes obstetricans*.

Tadpoles from Bim Tal, E. Himalayas, 4,450 ft., received under the name of *R. blanfordii* from the Indian Museum in 1915, reach a large size: 60 millim., in which the tail enters for 43. Tail obtusely pointed. Beak black; 5 series of upper labial teeth, the outermost uninterrupted, the second narrowly interrupted, the following broadly interrupted and gradually shorter; 3 series of lower labial teeth, the innermost narrowly interrupted, the two others uninterrupted. Identical specimens from near Phagu, Simla district, 7000 ft., were received from the Indian Museum in 1909 under the name of *R. vicina*.

*Measurements in millimetres.*

|                       |    | 1. | 2.  | 3.  | 4.  | 5.  |
|-----------------------|----|----|-----|-----|-----|-----|
|                       |    | ♂  | ♀   | ♂   | ♂   | ♂   |
| From snout to vent .. |    | 39 | 50  | 35  | 32  | 32  |
| Head ..               | .. | 13 | 14  | 12  | 11  | 11  |
| Width of head ..      | .. | 14 | 15  | 13  | 12  | 12  |
| Snout ..              | .. | 4  | 5   | 4   | 4   | 3.5 |
| Eye ..                | .. | 4  | 5   | 4   | 4   | 3.5 |
| Interorbital width .. | .. | 3  | 3   | 3   | 2.5 | 2.5 |
| Tympanum ..           | .. | 2  | 2.5 | 2   | 2   | 2   |
| Fore limb. ..         | .. | 26 | 27  | 21  | 18  | 19  |
| First finger ..       | .. | 4  | 4   | 4   | 4   | 4   |
| Second finger ..      | .. | 5  | 5.5 | 4.5 | 4.5 | 4.5 |
| Third finger ..       | .. | 6  | 6.5 | 5   | 5   | 5   |
| Fourth finger ..      | .. | 5  | 5.5 | 4.5 | 4   | 4   |
| Hind limb ..          | .. | 75 | 77  | 63  | 55  | 57  |
| Tibia ..              | .. | 23 | 24  | 19  | 16  | 17  |
| Foot ..               | .. | 21 | 23  | 19  | 16  | 17  |
| Third toe ..          | .. | 10 | 13  | 10  | 9   | 9   |
| Fourth toe ..         | .. | 15 | 18  | 15  | 13  | 13  |
| Fifth toe ..          | .. | 10 | 13  | 10  | 9   | 9   |

1—2. Darjiling (types). 3. Mussoorie, 6000—7000 ft. 4—5. Balaya Valley, near Naini Tal, 5000 ft.

*Habitat.* The Himalayas. The types are almost certainly from the Darjiling district. According to Annandale this species is very common in the Western Himalayas, at altitudes from 6000 to 10,000 feet. "It is largely aquatic in its habits, at any rate during the daytime. Specimens taken at the beginning of October appeared to be breeding; the females contained large ova" (Annandale, 1907). "In wet weather and in places where there is a plentiful water-supply it is aquatic in habits. In the neighbourhood of Simla, however, it conceals itself during the dry season. Large tadpoles are common in the W Himalayas in mountain streamlets and in wells both in May and September."

**39. *Rana plancyi*.**

*Rana plancyi*, Lataste, *Le Naturaliste*, 1880, p. 210, and *Bull. Soc. Zool France*, 1880, p. 64; Boulenger, *Cat. Batr. Ecaud.* p. 37 (1882); Stejneger, *Herp. Jap.* p. 101 (1907).

Vomerine teeth in more or less oblique groups or short series between the choanae, or extending little beyond the level of their posterior borders, equally distant from each other and from the choanae or nearer each other.

Head rather depressed, as long as broad; snout rounded or obtusely pointed, scarcely projecting beyond the mouth, as long as or slightly longer than the eye; canthus rostralis very obtuse; loreal region oblique, slightly concave; nostril equidistant from the eye and from the tip of the snout; distance between the nostrils greater than the interorbital width, which is much less than that of the upper eyelid; tympanum very distinct,  $\frac{2}{3}$  to once the diameter of the eye, close to it or narrowly separated.

Fingers moderate, pointed, first longer than the second, third longer than the snout; subarticular tubercles rather small, moderately prominent.

Hind limb moderate, the tibio-tarsal articulation reaching the tympanum or the eye, the heels meeting or narrowly separated when the limbs are folded at right angles to the body; tibia 3 to  $3\frac{1}{2}$  times as long as broad, 2 to  $2\frac{3}{5}$  times in length from snout to vent, much shorter than the fore limb or than the foot. Toes pointed, fully webbed or last phalanx of fourth free; outer metatarsals separated nearly to the base; subarticular tubercles small, moderately prominent; no tarsal fold; inner metatarsal tubercle compressed, more or less oblique,  $\frac{2}{5}$  to  $\frac{2}{3}$  the length of the inner toe; a small, rather indistinct outer tubercle.

Skin smooth; a prominent glandular dorso-lateral fold, from above the tympanum to the hip, broad or rather broad, often as broad as the upper eyelid.

Olive above (green in life?), uniform or with small dark spots; a more or less distinct dark streak on the canthus rostralis; dorso-lateral fold and tympanum bronzy; a light vertebral streak sometimes present; a blackish band along the hinder side of the thigh and another, sometimes indistinct, along each side of the belly. Lower parts white, uniform or with small brown spots on the throat and breast.

Males with internal vocal sacs and a moderately large pad on the inner side of the first finger.

Nasal bones large, in contact with each other and with the frontoparietals. Omosternal style entire. Terminal phalanges pointed.

*Habitat.* China and Formosa.

[Very abundant at the edge of the T'ai-Hu (Great Lake) inland from Shanghai. *N. A.*]

This species is very closely allied to *R. esculenta*, but less specialized, and constitutes a link with the American frogs allied to *R. catesbiana*.

*Measurements in millimetres.*

|                           |    |    | 1.  | 2.  | 3.  | 4.  | 5.  | 6.  | 7.  | 8.  | 9.  | 10. | 11. | 12. | 13. | 14. | 15. | 16. |
|---------------------------|----|----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
|                           |    |    | ♀   | ♀   | ♀   | ♀   | ♀   | ♀   | ♀   | ♀   | ♀   | ♂   | ♂   | ♀   | ♀   | ♂   | ♂   | ♀   |
| From snout to vent        | .. |    | 49  | 48  | 54  | 44  | 42  | 56  | 55  | 48  | 45  | 44  | 41  | 45  | 45  | 47  | 45  | 45  |
| Head                      | .. |    | 17  | 16  | 19  | 16  | 14  | 19  | 19  | 17  | 15  | 17  | 16  | 16  | 16  | 17  | 17  | 16  |
| Width of head             | .. | .. | 17  | 16  | 19  | 16  | 14  | 19  | 19  | 17  | 15  | 17  | 16  | 16  | 16  | 17  | 17  | 16  |
| Snout                     | .. | .. | 6   | 6   | 6.5 | 5.5 | 5   | 7   | 6.5 | 6   | 5.5 | 6   | 6   | 6   | 6   | 6   | 6   | 6   |
| Eye                       | .. | .. | 6   | 5   | 6.5 | 5.5 | 5   | 6   | 6.5 | 6   | 5.5 | 6   | 6   | 6   | 6   | 6   | 6   | 6   |
| Interorbital width        | .. | .. | 2.5 | 2   | 2.5 | 2   | 2   | 2.5 | 2   | 2   | 2   | 2   | 2   | 2   | 2.5 | 2   | 2   | 2   |
| Tympanum                  | .. | .. | 5   | 4   | 5.5 | 4   | 3.5 | 6   | 5   | 4   | 4   | 5   | 4   | 4   | 4   | 4   | 4   | 4   |
| Fore limb                 | .. | .. | 29  | 28  | 31  | 25  | 23  | 31  | 30  | 27  | 25  | 26  | 24  | 25  | 26  | 28  | 26  | 26  |
| First finger              | .. | .. | 6   | 6   | 7   | 6   | 5.5 | 7   | 7   | 6   | 6   | 6.5 | 6   | 6   | 6   | 7   | 6   | 6   |
| Second finger             | .. | .. | 5   | 5   | 5.5 | 5   | 4.5 | 6   | 6   | 5   | 5   | 5.5 | 5   | 5   | 5   | 6   | 5   | 5   |
| Third finger              | .. | .. | 7   | 7   | 7.5 | 6.5 | 6   | 8   | 8   | 7   | 7   | 7.5 | 7   | 7   | 7   | 8   | 7   | 7   |
| Fourth finger             | .. | .. | 5   | 5   | 5   | 5   | 4   | 4.5 | 5   | 5   | 5   | 5.5 | 5   | 5   | 5   | 5   | 5   | 5   |
| Hind limb                 | .. | .. | 73  | 71  | 80  | 65  | 59  | 80  | 77  | 69  | 63  | 76  | 67  | 72  | 67  | 71  | 73  | 72  |
| Tibia                     | .. | .. | 21  | 20  | 23  | 18  | 17  | 22  | 21  | 19  | 18  | 21  | 20  | 22  | 20  | 20  | 21  | 21  |
| Foot                      | .. | .. | 27  | 26  | 31  | 25  | 23  | 30  | 27  | 25  | 23  | 28  | 23  | 26  | 25  | 26  | 24  | 25  |
| Third toe                 | .. | .. | 16  | 15  | 17  | 14  | 12  | 17  | 16  | 15  | 12  | 16  | 13  | 15  | 14  | 16  | 14  | 15  |
| Fourth toe                | .. | .. | 24  | 23  | 26  | 21  | 18  | 26  | 24  | 21  | 19  | 24  | 20  | 22  | 21  | 22  | 20  | 21  |
| Fifth toe                 | .. | .. | 18  | 16  | 20  | 16  | 14  | 21  | 19  | 17  | 15  | 17  | 15  | 18  | 16  | 17  | 16  | 16  |
| First toe                 | .. | .. | 5.5 | 5   | 5.5 | 5   | 4   | 6   | 5.5 | 5   | 5   | 6   | 5   | 6   | 6   | 6   | 5.5 | 5.5 |
| Inner metatarsal tubercle | .. | .. | 3.5 | 3.5 | 3.5 | 3   | 2.5 | 4   | 3.5 | 3.5 | 3   | 3   | 2.5 | 3   | 3   | 3   | 2.5 | 2.5 |

1—2. Pekin, types. 3—5. Shanghai. 6. Chusan. 7—9. Ningpo. 10—13. Taiwanfoo, Formosa. 14—16. Formosa.

40. *Rana esculenta*.

*Rana esculenta*, Linn., *Syst. Nat.* 1, p. 357 (1766): Bouleng., *Proc. Zool. Soc.* 1891, p. 604, and *Ann. and Mag. N.H.* (9) II, 1918, p. 241, figs.

This widely distributed species, of which the typical form is exclusively European, is represented within the limits assigned to this monograph by two varieties, the most remote from each other in the series, and easily defined when the European forms are left out of consideration.

Var. *ridibunda*.

*Rana ridibunda*, Pallas, *Reise*, I, p. 458 (1771).

*Rana esculenta*, Blanford, *Zool. E. Pers.* p. 432 (1876).

*Rana esculenta*, var. *ridibunda*, Bouleng., *Proc. Zool. Soc.* 1885, p. 666, pl. xl, and *Taill. Batr. Eur.* p. 270, pl. xvi (1898); Nikolsky, Fetschenko's *Reise*, *Zool.* II, vii, p. 71 (1899).

*Rana esculenta*, var. *susana*, Bouleng., *Ann. and Mag. N.H.* (7) XVI, 1905, p. 552.

Vomerine teeth in short transverse or more or less oblique series between the choanae or extending slightly beyond their posterior borders, close together or nearer to each other than to the latter, rarely equally distant from both.

Head as long as broad or, usually, a little broader than long, rather strongly depressed; snout rounded or obtusely pointed, as long as or longer than the eye, more or less projecting beyond the mouth; canthus rostralis obtuse or very indistinct; loreal region very oblique; nostril equally distant from the eye and from the end of the snout, or nearer the former; distance between the nostrils greater than the interorbital width, which is  $\frac{1}{3}$  to  $\frac{2}{3}$  that of the upper eyelid; tympanum very distinct,  $\frac{3}{8}$  to  $\frac{3}{4}$  the diameter of the eye.

Fingers obtusely pointed, first as long as or a little longer than the second, third longer than the snout; second and third fingers with a more or less distinct dermal border; subarticular tubercles small, moderately prominent.

Hind limb moderately long, the tibio-tarsal articulation reaching the tympanum, the eye, or between the eye and the tip of the snout, the heels usually overlapping when the limbs are folded at right angles to the body; tibia 3 to 4 times as long as broad,  $1\frac{1}{3}$  to slightly over twice in the length from snout to vent, a little shorter than the foot. Toes obtuse, usually nearly entirely webbed, rarely only  $\frac{3}{4}$ <sup>1</sup>; outer metatarsals separated nearly to the base; subarticular tubercles small; inner metatarsal tubercle moderately prominent, oval or elliptical,  $\frac{1}{3}$  to nearly  $\frac{1}{2}$  the length of the inner toe; a small outer tubercle; tarsal fold feeble or absent.

Skin of back smooth or more or less warty; a glandular dorso-lateral fold from above the tympanum to the hip, sometimes interrupted posteriorly, sometimes very feebly prominent, its width

<sup>1</sup> I have examined several specimens, from Wadi-Sukerier, Palestine, in the Indian Museum, the two last phalanges of the fourth toe of which are free from the web.

equal to or less than that of the upper eyelid. Lower parts smooth, or posterior part of belly feebly granulate.

Green, olive, brown, or grey above, with dark olive or blackish spots, which are sometimes transversely dilated; dorso-lateral fold bronzy or of the same colour as the back, the spots often extending over it; sometimes a pale green vertebral streak or broad band; limbs with or without dark cross-bands; hinder side of thighs olive, or whitish marbled with olive or blackish. Lower parts white, often speckled, spotted or marbled with blackish.

Males with grey or blackish external vocal sacs, retractile into a slit behind the commissure of the jaws; fore limb strong; a pad-like swelling at the base of the inner finger, covered, during the breeding season, with a grey layer of minute horny granules.

Nasal bones moderately large, transverse or more or less oblique, meeting or narrowly separated on the median line, not in contact with the frontoparietals; only a small portion of the ethmoid uncovered above in the adult; zygomatic process of squamosal long, at least as long as the posterior process. Omosternal style entire. Terminal phalanges slightly expanded distally.

Eggs small, 1 to  $1\frac{1}{2}$  millim. in diameter.

Tadpole with the tail about twice the length of the body and acutely pointed. Beak broadly edged with black; lips bordered with papillae on the sides and on the lower border; upper lip with a long series of horny teeth, followed on each side by a short series; lower lip with 3 series of teeth, the 2 outer uninterrupted, the innermost also uninterrupted, or narrowly interrupted.

*Habitat.* Southern and Eastern Europe, North Africa, Asia as far south as the Sinaitic Peninsula, as far east as Turkestan, Baluchistan and Afghanistan.

### Var. *chinensis*.

*Rana chinensis*, Osbeck, *Voy. China*, I, p. 299 (1771); Bonnat., *Encycl. Méth.*, *Erp.* p. 6 (1789); Stone, *Proc. Ac. Philad.* 1899, p. 183; Bolkey, *Allatt. Kösl. Budapest*, VIII, 1909, p. 53, pl. viii, and *Proc. Washington. Ac.* XIII, 1911, p. 67, pl. vi.

*Rana esculenta*, Schleg., *Faun Japon.*, *Rept.* p. 109, pl. iii, fig. 1 (1836).

*Rana esculenta*, var. *japonica*, Maack, *Voy. Amour*, p. 153 (1859); Bouleng., *Cat. Batr. Écaud.* p. 40, fig. (1882).

*Rana marmorata*, Hallow., *Proc. Ac. Philad.* 1860, p. 500; Camerano, *Atti Acc. Torin.* XIV, 1879, p. 871.

*Rana nigromaculata*, Hallow., *l.c.*; Stejneger., *Herp. Jap.* p. 94, fig. (1907); Annand., *Mem. As. Soc. Beng.* VI, 1917, p. 140, pl. vi, fig. 4.

*Hoplobatrachus reinhardti*, Peters, *Mon. Berl. Ac.* 1867, p. 711.

*Tomopterna porosa*, Cope, *Proc. Ac. Philad.* 1868, p. 111.

*Rana reinhardti*, Moellend., *Fourn. N. China Br. As. Soc.* (2) XI, 1877, p. 105.

*Rana esculenta marmorata*, Lataste, *Bull. Soc. Zool. France*, 1880, p. 61.

*Rana porosa*, Bouleng., *Cat. Batr. Écaud.* p. 40.

*Rana esculenta*, var. *nigromaculata*, Bouleng., *Proc. Zool. Soc.* 1891, p. 376; Bedriaga, *Wiss. Res. Przewalski Exped.*, *Zool.* III, i, p. 11 (1899); Werner, *Abh. Bayer. Ak.* XXII, 1903, p. 358.

*Rana esculenta*, var. *chinensis*, Bouleng., *Taill. Batr. Eur.* p. 272 (1898); Méhely, *Zool. Ergebn. Zichy Forschungs.* p. 62 (1899); Wolterst., *Abh. Mus. Magdeb.* I, 1906, p. 135.

Head not or but slightly broader than long; snout usually pointed, but sometimes rounded; interorbital space  $\frac{2}{3}$  to  $\frac{3}{4}$  the width of the upper eyelid; tympanum  $\frac{3}{4}$  to  $\frac{6}{7}$  the diameter of the eye.

First finger constantly longer than the second.

Tibio-tarsal articulation reaching the tympanum, the eye, or the nostril; heels meeting, or failing to meet; tibia  $2\frac{1}{2}$  to  $3\frac{1}{2}$  times as long as broad, usually much shorter than the foot; toes  $\frac{3}{4}$  to nearly entirely webbed, 1 or 2 phalanges of fourth free; inner metatarsal tubercle large, compressed, semicircular or semielliptic, its base more or less oblique to the axis of the foot, 1 to  $1\frac{3}{4}$  times in the length of the inner toe, and 5 to 8 times in that of the tibia; this tubercle often connected with the inner toe by a membrane which penetrates into the distal third of its base.

Back with more or less distinct elongate glandular or interrupted glandular folds; dorso-lateral glandular fold prominent,  $\frac{1}{2}$  to  $\frac{2}{3}$  the width of the upper eyelid, extending to the hip, or if broken up posteriorly not deviating from its course.

Coloration very variable. Green, olive, or brown above, with or without black spots which may form longitudinal bands or cross-bars on the back; a pale green or yellow vertebral streak or band usually present, the dorso-lateral folds also of a pale colour and standing out very conspicuously; some specimens black above, with three yellow streaks; hind limbs usually with well-marked dark cross-bands; exceptionally a fine light line along the inner side of the upper surface of the tibia; groin and hinder side of thighs yellow, marbled with black. Lower parts white, always unspotted. Vocal sacs grey to blackish.

*Habitat.* Amoor Province of Siberia, Saghalien Island, Japan, Corea, Mongolia, China.

The localities Loo Choo Islands and Bangkok, Siam, appended to specimens presented by Mr. G. E. Mason to the British Museum, are probably erroneous.

*Measurements in millimetres.*

|                    | var. <i>ridibunda</i> . |         |         |         |         |         |         |         |         |          | var. <i>chinensis</i> . |          |          |          |          |
|--------------------|-------------------------|---------|---------|---------|---------|---------|---------|---------|---------|----------|-------------------------|----------|----------|----------|----------|
|                    | 1.<br>♂                 | 2.<br>♀ | 3.<br>♂ | 4.<br>♀ | 5.<br>♂ | 6.<br>♂ | 7.<br>♀ | 8.<br>♀ | 9.<br>♂ | 10.<br>♀ | 11.<br>♂                | 12.<br>♀ | 13.<br>♀ | 14.<br>♀ | 15.<br>♀ |
| From snout to vent | 67                      | 86      | 64      | 63      | 58      | 72      | 75      | 90      | 84      | 79       | 55                      | 66       | 50       | 70       | 82       |
| Head               | 24                      | 28      | 23      | 22      | 21      | 25      | 24      | 29      | 29      | 24       | 21                      | 23       | 17       | 24       | 28       |
| Width of head      | 24                      | 30      | 24      | 23      | 21      | 26      | 25      | 32      | 31      | 26       | 21                      | 23       | 17       | 24       | 29       |
| Snout              | 9                       | 12      | 8       | 9       | 7       | 10      | 10      | 11      | 11      | 10       | 7                       | 9        | 6        | 10       | 12       |
| Eye                | 7                       | 8       | 8       | 7       | 6       | 8       | 7       | 9       | 9       | 8        | 6                       | 7        | 6        | 9        | 8        |
| Interorbital width | 2                       | 2.5     | 2.5     | 2.5     | 2       | 2.5     | 2.5     | 3       | 2.5     | 2.5      | 2                       | 2.5      | 2        | 2.5      | 4        |
| Tympanum           | 5                       | 6       | 5       | 5       | 4       | 5       | 5       | 6       | 6       | 5        | 5                       | 6        | 4        | 6        | 7        |
| Fore limb          | 35                      | 47      | 33      | 35      | 35      | 40      | 39      | 50      | 45      | 43       | 32                      | 38       | 26       | 38       | 45       |
| First finger       | 7                       | 11      | 7       | 8       | 7.5     | 7       | 9       | 12      | 10      | 9        | 6.5                     | 8        | 5.5      | 8        | 9        |
| Second finger      | 6                       | 10      | 7       | 8       | 7       | 7       | 8       | 11      | 10      | 9        | 5                       | 7        | 5        | 7        | 8        |
| Third finger       | 11                      | 14      | 9       | 11      | 11      | 11      | 12      | 14      | 13      | 13       | 8.5                     | 10       | 7        | 10       | 11       |
| Fourth finger      | 6                       | 9       | 6       | 6.5     | 6       | 7       | 8       | 9       | 9       | 8        | 5                       | 7        | 4        | 6        | 6        |
| Hind limb          | 103                     | 128     | 93      | 92      | 90      | 109     | 110     | 122     | 125     | 119      | 88                      | 102      | 74       | 109      | 125      |
| Tibia              | 34                      | 43      | 29      | 29      | 27      | 34      | 35      | 43      | 41      | 37       | 28                      | 33       | 23       | 34       | 38       |
| Foot               | 35                      | 44      | 31      | 31      | 31      | 39      | 38      | 48      | 45      | 42       | 32                      | 39       | 27       | 40       | 45       |
| Third toe          | 19                      | 24      | 16      | 17      | 18      | 21      | 21      | 36      | 27      | 23       | 16                      | 19       | 14       | 19       | 21       |

|                           | var. <i>ridibunda</i> . |     |    |     |    |    |     |     |    |     | var. <i>chinensis</i> . |     |     |     |     |
|---------------------------|-------------------------|-----|----|-----|----|----|-----|-----|----|-----|-------------------------|-----|-----|-----|-----|
|                           | 1.                      | 2.  | 3. | 4.  | 5. | 6. | 7.  | 8.  | 9. | 10. | 11.                     | 12. | 13. | 14. | 15. |
|                           | ♂                       | ♀   | ♂  | ♀   | ♂  | ♂  | ♀   | ♀   | ♂  | ♀   | ♂                       | ♀   | ♀   | ♀   | ♀   |
| Fourth toe                | 30                      | 37  | 25 | 25  | 26 | 33 | 33  | 40  | 38 | 36  | 27                      | 33  | 23  | 33  | 36  |
| Fifth toe                 | 22                      | 27  | 17 | 19  | 20 | 24 | 24  | 30  | 30 | 27  | 20                      | 24  | 15  | 23  | 25  |
| First toe                 | 9                       | 12  | 7  | 7.5 | 8  | 9  | 9   | 11  | 11 | 11  | 5.5                     | 8   | 4.5 | 5   | 8   |
| Inner metatarsal tubercle | ..                      | 3.5 | 4  | 3   | 3  | 3  | 3.5 | 3.5 | 4  | 5   | 4                       | 4.5 | 5   | 3.5 | 5   |

1—2. Kermanshah, S.W. Persia, 6000 f. 3—4. Susa, S.W. Persia (type of var. *susana*). 5. Shiraz, S.W. Persia. 6—7. Kazerun, S.W. Persia. 8. Nr. Sarawan, Baluchistan. 9. Turbat, Afghanistan. 10. Chinese Turkestan. 11—12. Shanghai. 13. Chusan. 14. Ningpo. 15. Mountains N. of Kiukiang.

There has been much discussion as to the propriety of assigning specific rank to the two forms here described. I have recently (1918) expressed very fully my views on this subject, and the arguments I have adduced have a bearing on the status of *R. tigrina* and *R. crassa*, as noticed above.

#### 41. *Rana pleuraden*.

*Rana pleuraden*, Bouleng., *Ann. and Mag. N.H.* (7) XIII, 1904, p. 131.

Vomerine teeth in two oblique groups or short series between the choanae, nearer to each other than to the latter.

Head moderately depressed, as long as broad; snout obtusely pointed, prominent, as long as or a little longer than the eye; canthus rostralis obtuse; loreal region oblique, concave; nostril equidistant from the eye and from the end of the snout; distance between the nostrils greater than the interorbital width, which is less than that of the upper eyelid; tympanum very distinct,  $\frac{3}{8}$  to  $\frac{4}{8}$  the diameter of the eye and 2 to 4 times its distance from the latter.

Fingers rather slender, obtusely pointed, first longer than the second, third longer than the snout; subarticular tubercles moderate.

Hind limb moderately long, the tibio-tarsal articulation reaching between the eye and the tip of the snout, the heels overlapping when the limbs are folded at right angles to the body; tibia 3 to  $3\frac{1}{2}$  times as long as broad, twice or a little more than twice in length of head and body, shorter than the fore limb, which nearly equals the length of the foot. Toes rather long and slender, obtusely pointed,  $\frac{1}{2}$  webbed, 3 phalanges of fourth and 2 of third and fifth free; outer metatarsals separated nearly to the base; subarticular tubercles rather feeble; no tarsal fold; inner metatarsal tubercle oval, prominent,  $\frac{2}{3}$  to  $\frac{1}{2}$  the length of the inner toe; no outer tubercle.

Skin smooth or with small warts which may bear small conical asperities; a moderately broad, very prominent dorso-lateral glandular fold, from above the tympanum to the groin; the distance between the dorso-lateral folds, on the back,  $\frac{2}{3}$  to  $\frac{2}{11}$  the length of head and body. Lower parts smooth.

Olive-brown or greyish above, spotted with black; a light vertebral streak, narrow or broad, usually present; a dark brown or

blackish band on each side of the head, passing through the eye and involving the tympanum; a whitish streak along the upper lip; limbs with more or less regular black cross-bars; sometimes a light line along the inner side of the leg, continued to the outer toe; hinder side of thighs marbled black and yellow. Lower parts white, throat sometimes brownish.

Males with a vocal sac on each side, forming loose folds on the throat and a very large flat gland on each side of the body, above and behind the shoulder; inner side of first finger feebly thickened, with a nearly smooth horny layer.

Eggs very small, 1 millim. in diameter.

Nasal bones large and in contact with each other, separated from the frontoparietals, which do not cover the ethmoid in front, zygomatic branch of squamosal not longer than the posterior. Omosternum entire. Terminal phalanges very feebly expanded at the end.

*Measurements in millimetres.*

|                       | 1.  | 2.  | 3.  | 4.  | 5.  | 6.  | 7.  | 8. |
|-----------------------|-----|-----|-----|-----|-----|-----|-----|----|
|                       | ♂   | ♂   | ♂   | ♀   | ♀   | ♀   | ♀   | ♂  |
| From snout to vent    | 58  | 48  | 47  | 64  | 51  | 68  | 64  | 52 |
| Head ..               | 20  | 17  | 17  | 21  | 17  | 22  | 21  | 17 |
| Width of head ..      | 20  | 17  | 17  | 21  | 17  | 22  | 21  | 17 |
| Snout ..              | 7   | 6   | 6   | 8   | 6   | 9   | 7   | 6  |
| Eye ..                | 6   | 5   | 5   | 7   | 5   | 8   | 7   | 5  |
| Interorbital width .. | 2.5 | 2.5 | 2.5 | 3   | 3   | 3   | 3   | 3  |
| Tympanum ..           | 4   | 3   | 4   | 4   | 3.5 | 5   | 4   | 4  |
| Fore limb             | 34  | 29  | 28  | 35  | 30  | 38  | 34  | 32 |
| First finger          | 7   | 6   | 6   | 7   | 6   | 8   | 8   | 7  |
| Second finger         | 6   | 5   | 5   | 5   | 5   | 7   | 7   | 6  |
| Third finger          | 10  | 8   | 7   | 10  | 8   | 11  | 10  | 10 |
| Fourth finger         | 6   | 5   | 4   | 6   | 5   | 6   | 5   | 6  |
| Hind limb             | 97  | 82  | 80  | 106 | 87  | 113 | 100 | 89 |
| Tibia ..              | 29  | 24  | 24  | 32  | 26  | 34  | 30  | 26 |
| Foot                  | 34  | 28  | 28  | 34  | 31  | 37  | 35  | 31 |
| Third toe             | 18  | 14  | 13  | 18  | 16  | 20  | 18  | 16 |
| Fourth toe            | 25  | 22  | 21  | 28  | 26  | 30  | 28  | 25 |
| Fifth toe ..          | 18  | 16  | 14  | 20  | 17  | 21  | 19  | 17 |

1—5. Yunnan fu (types). 6—8. Tongchuan fu.

*Habitat.* Yunnan. Types in the British Museum.

A very remarkable frog, combining characters of *R. esculenta* and of the species clustering round *R. temporaria*.

#### 42. *Rana grahami*.

*Rana grahami*, Boulenger, *Ann. and Mag. N.H.* (8) XX, 1917, p. 415.

Vomerine teeth in transverse or slightly oblique series between the choanae or extending a little beyond the level of their posterior borders.

Head as long as broad or a little broader than long, much depressed; snout rounded or obtusely pointed, feebly or rather strongly projecting beyond the mouth, as long as the eye or a little shorter; canthus rostralis obtuse; loreal region feebly oblique, concave; nostril equidistant from the eye and from the tip of the snout or a little nearer the former; the distance between the

nostrils greater than the interorbital width, which is less than that of the upper eyelid; tympanum very distinct,  $\frac{2}{3}$  to  $\frac{3}{4}$  the diameter of the eye and 2 to 4 times its distance from the latter.

Fingers rather long, the tips feebly swollen, first as long as or a little longer than the second, third much longer than the snout; subarticular tubercles moderately large, moderately prominent.

Hind limb long, the tibio-tarsal articulation reaching the tip of the snout or a little beyond; heels overlapping when the limbs are folded at right angles to the body; tibia 3 to 4 times as long as broad,  $1\frac{3}{4}$  to  $1\frac{1}{2}$  times in length from snout to vent, shorter than the fore limb, as long as or a little longer than the foot. Toes with the tips slightly swollen, entirely webbed; outer metatarsals separated nearly to the base; subarticular tubercles rather small, moderately prominent, no tarsal fold; inner metatarsal tubercle rather small, feebly prominent,  $\frac{1}{3}$  to  $\frac{2}{3}$  the length of the inner toe; no outer tubercle.

Skin smooth above or finely corrugated, often with large flat warts on the back, sides granulate, with large warts, some of which may bear minute white spinose tubercles; a broad glandular dorso-lateral fold sometimes present but much broken up; one or two large glands behind the angle of the mouth. Lower parts smooth or posterior part of belly granulate.

Olive above, with more or less distinct darker spots and often speckled or mottled with black; sides yellow with large black spots or marblings; limbs with numerous dark cross-bands which may be broken up into spots or marblings; hinder side of thighs yellow, spotted or marbled with black. Lower parts white, throat and breast sometimes spotted with blackish.

Males with internal vocal sacs, fore limb much thickened; the inner finger with a large pad covered, during the breeding season, with a velvety yellowish or greyish horny layer.

Nasals small and widely separated from each other and from the frontoparietals; upper part of ethmoid largely uncovered anteriorly. Omosternum entire.

Eggs as in *R. esculenta*.

*Measurements, in millimetres, of type specimens.*

|                    | ♂      | ♂   | ♂   | ♂   | ♂   | ♂   | ♀   | ♀   | ♀   | ♀   | ♀   | ♀   | ♀   |
|--------------------|--------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| From snout to vent | .. 80  | 74  | 74  | 74  | 70  | 66  | 102 | 102 | 100 | 98  | 90  | 85  | 78  |
| Head               | 26     | 25  | 26  | 24  | 24  | 24  | 30  | 30  | 31  | 32  | 31  | 29  | 26  |
| Width of head      | .. 26  | 25  | 26  | 24  | 24  | 25  | 33  | 33  | 34  | 34  | 33  | 31  | 26  |
| Snout              | .. 9   | 9   | 9   | 8   | 9   | 8   | 11  | 11  | 12  | 12  | 10  | 10  | 9   |
| Eye                | .. 10  | 9   | 9   | 9   | 9   | 8   | 11  | 11  | 12  | 12  | 11  | 10  | 9   |
| Interorbital width | 5      | 4   | 4   | 4   | 4   | 4   | 6   | 6   | 6   | 5   | 5   | 4   | 5   |
| Tympanum           | .. 5   | 5   | 5   | 5   | 5   | 4   | 6   | 6   | 5   | 5   | 4.5 | 5   | 5   |
| Fore limb          | 54     | 45  | 47  | 50  | 48  | 47  | 68  | 64  | 64  | 62  | 59  | 56  | 54  |
| First finger       | 9      | 8   | 9   | 7   | 8   | 9   | 15  | 15  | 14  | 14  | 14  | 12  | 13  |
| Second finger      | .. 9   | 8   | 9   | 7   | 8   | 9   | 14  | 14  | 14  | 13  | 13  | 11  | 12  |
| Third finger       | .. 14  | 13  | 13  | 12  | 13  | 13  | 17  | 18  | 17  | 18  | 17  | 16  | 16  |
| Fourth finger      | .. 9   | 8   | 9   | 7   | 7   | 8   | 11  | 13  | 12  | 13  | 12  | 11  | 11  |
| Hind limb          | .. 137 | 123 | 132 | 124 | 126 | 122 | 180 | 167 | 176 | 167 | 166 | 150 | 147 |
| Tibia              | .. 44  | 40  | 42  | 42  | 42  | 41  | 60  | 55  | 58  | 55  | 35  | 50  | 48  |

|              | ♂  | ♂  | ♂  | ♂  | ♂  | ♂  | ♀  | ♀  | ♀  | ♀  | ♀  | ♀  | ♀  |
|--------------|----|----|----|----|----|----|----|----|----|----|----|----|----|
| Foot         | 43 | 38 | 42 | 39 | 39 | 38 | 56 | 54 | 56 | 55 | 54 | 48 | 48 |
| Third toe .. | 24 | 20 | 24 | 21 | 21 | 20 | 29 | 28 | 30 | 30 | 28 | 27 | 26 |
| Fourth toe   | 36 | 32 | 35 | 36 | 32 | 30 | 46 | 45 | 46 | 47 | 43 | 41 | 40 |
| Fifth toe .. | 27 | 23 | 27 | 25 | 25 | 21 | 34 | 35 | 34 | 34 | 32 | 31 | 30 |

*Habitat.* Yunnan fu, Yunnan. Types in the British Museum.

This species is very similar to *R. andersonii*, Blgr., but readily distinguished by the absence of discs to the fingers and toes. It is truly a link between the subgenera *Rana* and *Hylorana*, and I cannot doubt that a direct genetic relationship exists between these two allied species; this remark applies also to *R. pleuroaden* and *R. adenopleura*, and points to the polyphyletic origin of the subgenus *Hylorana*, which appears to be made up of specialized forms leading to scansorial types all derived from the *Ranae typicae*.

#### 43. *Rana japonica*.

*Rana temporaria* (non Linn.), Schleg., *Faun. Japon.*, Rept. p. 109, pl. ii, fig. 2 (1838).

*Rana temporaria*, part., Middend., *Sibir. Reis.* II, p. 247, pl. xxvi, figs. 2—4 (1853); Dum. et Bibr., *Erp. Gén.* VIII, p. 358 (1841).

*Rana temporaria*, var. *japonica*, Günth., *Cat. Batr. Sal.* p. 17 (1858).

*Rana silvatica*, part., Hallow., *Proc. Ac. Philad.* 1860, p. 500; Günth., *Rept. Brit. Ind.* p. 409 (1864); Camerano, *Atti. Acc. Torin.* XIV, 1879, p. 876.

*Rana middendorffii*, Steenstr., *Vid. Meddel.* 1869, p. 18, fig.

*Rana japonica*, Bouleng., *Bull. Soc. Zool. France*, 1879, p. 190, and *Cat. Batr. Ecaud.* p. 47 (1882); Boettg., *Ber. Offenb. Ver. Nat.* 1888, p. 96; Bouleng., *Proc. Zool. Soc.* 1891, p. 610; Boettg., *Ber. Offenb. Ver. Nat.* 1895, p. 102; Werner, *Abh. Bay. Ak.* XXII, 1904, p. 358; Stejneger., *Herp. Jap.* p. 107, fig. (1907).

*Rana japonica*, var. *ornativentris*, Werner, *t. c.* p. 383.

*Rana tsushimensis*, Stejneger. *op. cit.* p. 116, fig.

Vomerine teeth in oblique groups or short series between the choanae or behind the level of their posterior borders.

Head rather depressed, as long as broad or a little longer or a little broader; snout rounded or more or less acuminate, more or less projecting beyond the mouth, as long as or little longer than the eye; canthus rostralis distinct; loreal region oblique, feebly concave; nostril equidistant from the eye and from the tip of the snout, or a little nearer the latter; distance between the nostrils equal to or a little greater than the interorbital width, which equals  $\frac{2}{3}$  to  $\frac{4}{5}$ , rarely once, that of the upper eyelid and is usually less than the diameter of the tympanum; tympanum very distinct,  $\frac{3}{5}$  to  $\frac{5}{8}$  the diameter of the eye and 2 to 3 times its distance from the latter.

Fingers moderate or rather long, obtuse, first as long as or longer than the second, third longer than the snout, subarticular tubercles rather large, very prominent.

Hind limb long, the tibio-tarsal articulation reaching the nostril, the tip of the snout, or a little beyond, the heels strongly overlapping when the limbs are folded at right angles to the body; tibia 4 to  $5\frac{1}{2}$  times as long as broad,  $1\frac{2}{3}$  to  $2\frac{1}{9}$  times in length

from snout to vent, as long as or shorter than the fore limb or the foot. Toes obtuse or with the tips slightly swollen,  $\frac{1}{2}$  to  $\frac{3}{4}$  webbed, 2 or 3 phalanges of fourth free; outer metatarsals separated nearly to the base; subarticular tubercles moderately large, very prominent; no tarsal fold; inner metatarsal tubercle oval, very prominent,  $\frac{1}{3}$  to  $\frac{1}{2}$  the length of the inner toe; outer tubercle absent or rather indistinct.

Skin of upper parts smooth or with small flat warts; a narrow glandular dorso-lateral fold from above the tympanum to the hip, parallel with its fellow or converging towards it behind the tympanum, the distance between the two folds  $5\frac{1}{2}$  to 7 times in the length from snout to vent; a glandular fold from below the eye to above the arm; sometimes a  $\Lambda$ -shaped glandular ridge between the shoulders. Lower parts smooth, hinder half of thighs granulate.

Grey or yellowish brown to dark brown above, uniform or with darker spots; dorso-lateral folds often edged with dark brown on the outer side; sometimes a dark cross-bar between the eyes and a  $\Lambda$ -shaped dark marking between the shoulders; a dark brown or black streak from the end of the snout to the eye and a larger dark temporal spot, bordered below by a light streak which does not extend forward to beyond the eye; limbs with more or less numerous dark cross-bands, which may be very narrow, almost linear, or alternately broad and narrow. Lower parts white, uniform or more or less spotted or speckled with brown or grey, especially on the throat and breast.

Males without or with very small internal vocal sacs; fore limb very strong; a strong pad on the inner side of the first finger, covered, during the breeding season, with a spinulose greyish horny layer.

Nasal bones small, oblique, widely separated from each other and from the ethmoid, which is uncovered and truncate in front; zygomatic process of squamosal short. Omosternum entire. Terminal phalanges slightly expanded at the end.

Tadpole with the tail ending in an obtuse point, 2 to  $2\frac{1}{2}$  times the length of the body; beak broadly edged with black; 3 series of teeth on the upper lip and 4 on the lower, the outer upper and the 3 lower series uninterrupted.

*Measurements in millimetres.*

|                       | 1.  | 2.  | 3.  | 4.  | 5.  | 6. | 7. | 8.  | 9.  | 10. | 11. | 12. | 13. | 14. |
|-----------------------|-----|-----|-----|-----|-----|----|----|-----|-----|-----|-----|-----|-----|-----|
|                       | ♂   | ♂   | ♀   | ♀   | ♀   | ♀  | ♀  | ♀   | ♂   | ♀   | ♀   | ♂   | ♀   | ♂   |
| From snout to vent.   | 52  | 48  | 65  | 60  | 43  | 68 | 59 | 48  | 36  | 41  | 50  | 64  | 58  | 40  |
| Head ..               | 17  | 16  | 20  | 19  | 15  | 21 | 19 | 16  | 12  | 14  | 16  | 20  | 20  | 14  |
| Width of head ..      | 15  | 15  | 20  | 18  | 14  | 22 | 19 | 16  | 12  | 13  | 16  | 20  | 20  | 14  |
| Snout ..              | 6   | 6   | 6.5 | 6.5 | 6   | 7  | 6  | 6   | 4   | 5.5 | 5.5 | 7   | 7   | 5   |
| Eye ..                | 5   | 5.5 | 6.5 | 6   | 5   | 7  | 6  | 6   | 4   | 5   | 5.5 | 6   | 6   | 5   |
| Interorbital width .. | 2.5 | 2.5 | 3   | 2.5 | 2   | 3  | 3  | 2   | 2   | 3   | 2.5 | 3.5 | 3   | 2   |
| Tympanum              | 3.5 | 3.5 | 4   | 4   | 3   | 4  | 4  | 3.5 | 2.5 | 3   | 3.5 | 5   | 4   | 2   |
| Fore limb             | 30  | 31  | 8   | 35  | 27  | 40 | 37 | 29  | 22  | 25  | 29  | 39  | 37  | 26  |
| First finger ..       | 5.5 | 6   | 7   | 6   | 5   | 8  | 7  | 5.5 | 4   | 5   | 6   | 7   | 7   | 4.5 |
| Second finger         | 4.5 | 5   | 6   | 5.5 | 4.5 | 7  | 6  | 5   | 4   | 4.5 | 5.5 | 6   | 6   | 4   |
| Third finger ..       | 8   | 9   | 9.5 | 8   | 7.5 | 11 | 10 | 8   | 6   | 7   | 8.5 | 9   | 9   | 6   |

|               | 1. | 2.  | 3.  | 4.  | 5.  | 6.  | 7.  | 8. | 9. | 10. | 11. | 12. | 13. | 14. |
|---------------|----|-----|-----|-----|-----|-----|-----|----|----|-----|-----|-----|-----|-----|
|               | ♂  | ♂   | ♀   | ♀   | ♀   | ♀   | ♀   | ♀  | ♂  | ♀   | ♀   | ♂   | ♀   | ♂   |
| Fourth finger | 4  | 5.5 | 6   | 5   | 4.5 | 7   | 6   | 5  | 4  | 4   | 5   | 5   | 5   | 4   |
| Hind limb     | 92 | 90  | 115 | 107 | 81  | 115 | 104 | 91 | 62 | 77  | 85  | 121 | 115 | 72  |
| Tibia ..      | 30 | 29  | 37  | 34  | 25  | 36  | 33  | 29 | 20 | 25  | 27  | 38  | 36  | 22  |
| Foot ..       | 30 | 30  | 37  | 34  | 27  | 38  | 35  | 29 | 21 | 25  | 27  | 36  | 36  | 24  |
| Third toe     | 16 | 16  | 19  | 17  | 14  | 18  | 19  | 15 | 11 | 13  | 14  | 19  | 19  | 13  |
| Fourth toe    | 24 | 24  | 30  | 28  | 20  | 29  | 27  | 25 | 18 | 20  | 23  | 30  | 29  | 20  |
| Fifth toe     | 17 | 17  | 21  | 18  | 15  | 20  | 19  | 16 | 12 | 14  | 15  | 20  | 19  | 14  |

1—2. Yokohama. 3—4. Japan (types). 5. Yezo. 6—7. Tsu Shima (*R. tsushimensis*). 8. Ningpo. 9. Da Zu Valley, Chi Kiang. 10. Lushan Mts., Kiu Kiang. 11. Sze Chuen. 12—13. Yunnan fu. 14. Canton.

*Habitat.* Japan, Corea, China from Pekin to Canton and Yunnan. The record from the Loo Choo Island requires confirmation.

*R. japonica* varies much in the shape of the head. Specimens from Tsu Shima (*R. tsushimensis*, Stejn.) have a short rounded snout, but the difference between them and typical specimens is, in this respect, not greater than between the extremes met with in the European *R. agilis* and *R. arvalis*; the difference is besides bridged over by specimens from Hondo and from China.

As this species is known to occur in Corea, it is very probable that the specimens with long and pointed snouts from S.E. Siberia noticed by Middendorff and for which the name *R. middendorffi* has been proposed by Steenstrup, belong to this species.

#### 44. *Rana longicrus*.

*Rana longicrus*, Stejneger, *Fourn. Sc. Coll. Tokyo*, XII, 1898, p. 216, and *Herp. Japan*, p. 104, fig. (1907).

Vomerine teeth in oblique groups between and projecting beyond the choanae, or entirely behind them.

Head longer than broad; snout pointed, feebly projecting beyond the mouth, longer than the eye, canthus rostralis distinct; loreal region feebly oblique; nostril nearer the tip of the snout than the eye; distance between the nostrils equal to the inter-orbital width, which equals or exceeds that of the upper eyelid or the diameter of the tympanum; tympanum very distinct;  $\frac{3}{8}$  to  $\frac{2}{3}$  the diameter of the eye and 2 to 3 times its distance from the latter.

Fingers long and slender, obtuse, first and second equal or first slightly the longer, third longer than the snout; subarticular tubercles moderate.

Hind limb very long and slender, about twice as long as head and body; tibio-tarsal articulation reaching beyond the tip of the snout; heels strongly overlapping when the limbs are folded at right angles to the body; tibia  $5\frac{1}{2}$  to 6 times as long as broad,  $1\frac{1}{2}$  to  $1\frac{2}{3}$  times in length from snout to vent, as long as or longer than the fore limb, as long as or slightly shorter than the foot. Toes long and slender, obtuse or the tips slightly swollen,  $\frac{1}{2}$  webbed, 3 phalanges of fourth and  $1\frac{1}{2}$  or 2 of third and fifth free; outer metatarsals separated nearly to the base; subarticular tubercles rather small; no tarsal fold; inner metatarsal tubercle

oval, very prominent,  $\frac{1}{3}$  the length of the inner toe; outer tubercle barely indicated or absent.

Skin smooth, or with a few irregular tubercles on the sacrum; a narrow glandular dorso-lateral fold from above the tympanum to the hip, parallel with its fellow or converging towards it behind the tympanum, the distance between the two, on the back,  $5\frac{1}{2}$  to  $6\frac{1}{2}$  times in the length from snout to vent.

Pale brown above, uniform or with a dark bar between the eyes and small dark spots on the back and along the outer edge of the dorso-lateral fold; a dark brown streak from the tip of the snout to the eye and a large dark brown temporal spot with a light streak below it not extending beyond the eye; limbs with more or less distinct narrow dark cross-bars. Lower parts white.

Male unknown.

*Measurements in millimetres.*

|                    |    |    | 1.<br>♀ | 2.<br>♀ | 3.<br>♀ |
|--------------------|----|----|---------|---------|---------|
| From snout to vent | .. | .. | 50      | 37      | 50      |
| Head               | .. |    | 17      | 12      | 17      |
| Width of head      | .. |    | 15      | 10      | 16      |
| Snout              | .. | .. | 6       | 5       | 7       |
| Eye                | .. |    | 5       | 4       | 5.5     |
| Interorbital width | .. | .. | 3       | 3       | 3.5     |
| Tympanum           | .. | .. | 3       | 2.5     | 3.5     |
| Fore limb          | .. | .. | 28      | 21      | 32      |
| First finger       |    | .. | 5.5     | 4.5     | 7       |
| Second finger      |    | .. | 5       | 4.5     | 6.5     |
| Third finger       | .. | .. | 9       | 7.5     | 8.5     |
| Fourth finger      |    |    | 5.5     | 5       | 5.5     |
| Hind limb          | .. |    | 95      | 74      | 98      |
| Tibia              | .. | .. | 30      | 24      | 32      |
| Foot               |    |    | 32      | 24      | 32      |
| Third toe          | .. | .. | 16      | 13      | 19      |
| Fourth toe         |    |    | 25      | 19      | 28      |
| Fifth toe          |    | .. | 18      | 13      | 20      |

1—2. Formosa? 3. Ching Fung Lin, Fokien, 1500 ft.

*Habitat.* Formosa<sup>1</sup> and China (Fokien).

Very closely allied to *R. japonica*. Distinguished by the narrower head, the less oblique loreal region and, usually, by the broader interorbital space and the longer, more slender limbs. I am not sure that the smaller specimen from Shanghai mentioned by Werner, Abh. Bayer. Ak. xxii. 1903, p. 358, does not belong to *R. longicrus* rather than to *R. japonica*.

#### 45. *Rana lateralis*.

*Rana lateralis*, Bouleng., *Ann. Mus. Genova* (2) V, 1887, p. 483, pl. viii, fig. 2, and *Faun. Ind., Rept.* p. 457 (1890); Malcolm Smith, *Journ. N.H. Soc. Siam*, II, 1917, p. 266, pl.—, fig. 1.

<sup>1</sup> The type is from Taipa, Formosa. Two specimens, labelled China, Swinhoe, in the British Museum, are probably from Formosa, where R. Swinhoe made large collections.

Vomerine teeth in oblique series between the choanae, extending to or narrowly separated from the inner anterior corners of the latter.

Head rather strongly depressed, slightly longer than broad or slightly broader than long; snout obtusely pointed, projecting beyond the mouth, as long as the eye; canthus rostralis distinct; loreal region moderately oblique, concave; nostril equidistant from the eye and from the tip of the snout; distance between the nostrils greater than the interorbital width, which is equal to or a little less than that of the upper eyelid; tympanum very distinct,  $\frac{2}{3}$  to  $\frac{3}{4}$  the diameter of the eye and 2 to 3 times its distance from the latter.

Fingers obtuse or with the tips slightly swollen, first longer than the second, third slightly longer than the snout; subarticular tubercles rather large and very prominent.

Hind limb moderately long, the tibio-tarsal articulation reaching the anterior border of the eye, the heels strongly overlapping when the limbs are folded at right angles to the body; tibia 4 to  $4\frac{1}{2}$  times as long as broad, twice or a little more than twice in length from snout to vent, shorter than the fore limb, as long as or slightly shorter than the foot. Toes obtuse or with the tips slightly swollen,  $\frac{1}{2}$  or  $\frac{3}{5}$  webbed, 3 phalanges of fourth free; outer metatarsals separated in their distal  $\frac{1}{2}$  or  $\frac{2}{3}$ ; subarticular tubercles rather small, prominent; no tarsal fold; inner metatarsal tubercle strongly compressed and very prominent,  $\frac{2}{5}$  to  $\frac{3}{5}$  the length of the inner toe; outer tubercle absent or very small and very indistinct.

Upper parts smooth or finely granulate; a narrow glandular dorso-lateral fold from above the tympanum to the hip and another from below the eye to the shoulder; the distance between the dorso-lateral folds, on the back, about  $\frac{1}{3}$  the length from snout to vent; lower parts smooth.

Upper parts grey or bright crimson; sides of body sometimes black, the two colours sharply separated by the dorso-lateral fold; loreal region and temple black, separated from the grey or black upper lip by a white streak which sends up a process behind the tympanum; hind limbs with more or less distinct dark cross-bars; a more or less distinct dark band along the anterior side of the thigh; sometimes a dark band on each side of the belly. Lower parts white; males with the throat blackish with a whitish median line and the breast closely spotted with blackish.

Males with internal vocal sacs and a moderately large pad on the inner side of the first finger.

Nasal bones narrow, oblique, and widely separated from each other and from the frontoparietals.

The tadpole has been described by Malcolm Smith. Tail not quite twice as long as the body, obtusely pointed. Beak edged with black; two rows of long papillae on the lower lip; upper lip with a long continuous row of teeth and a second broadly interrupted by the beak; lower lip with 3 rows of teeth, the innermost usually narrowly interrupted.

## Measurements in millimetres.

|                    |    |    | 1.<br>♂ | 2.<br>♀ | 3.<br>♀ | 4.<br>♀ |
|--------------------|----|----|---------|---------|---------|---------|
| From snout to vent | .. | .. | 47      | 55      | 49      | 48      |
| Head               |    | .. | 16      | 20      | 17      | 17      |
| Width of head      |    | .. | 17      | 19      | 16      | 16      |
| Snout              | .. | .. | 6       | 6.5     | 6       | 6       |
| Eye ..             | .. | .. | 6       | 6.5     | 6       | 6       |
| Interorbital width |    | .. | 3       | 3       | 3       | 3       |
| Tympanum           |    | .. | 4       | 4       | 4       | 3.5     |
| Fore limb          | .. | .. | 29      | 31      | 27      | 26      |
| First finger       | .. | .. | 6       | 6.5     | 5.5     | 6       |
| Second finger      |    | .. | 4       | 5       | 4       | 4       |
| Third finger       | .. | .. | 7       | 7       | 6.5     | 6.5     |
| Fourth finger      | .. | .. | 4       | 4       | 4       | 3.5     |
| Hind limb          | .. | .. | 75      | 85      | 77      | 72      |
| Tibia ..           | .. | .. | 23      | 27      | 25      | 22      |
| Foot ..            | .. | .. | 24      | 27      | 25      | 22      |
| Third toe          | .. | .. | 12      | 14      | 13      | 11      |
| Fourth toe         | .. | .. | 16      | 21      | 19      | 16      |
| Fifth ..           | .. | .. | 11      | 13      | 12      | 11      |

1. Kokarit (Kawkareik) (type). 2—4. Lat Bur Kao, Siam.

*Habitat.* The types are from Tenasserim (Kokarit (Kawkareik), east of Moulmein); the species has since been rediscovered in Eastern and Central Siam.

*Rana sanguineomaculata*, Lesson, in Bélang. Voy. Ind. Or. p. 328, pl. v, fig. 2 (1832), from Bengal, only known from the very imperfect description and figure, is perhaps allied to *R. lateralis*. It is a frog with rather long snout, large tympanum, rather short and slender limbs, pointed fingers and toes, the latter  $\frac{1}{2}$  webbed, and a glandular dorso-lateral fold. Pinkish grey above, with dark striation and vermiculation; sides of head blackish, with a white streak on the upper lip; limbs without cross-bands; large blood-red spots on the sides and lower surface of the body and on the limbs. From snout to vent 57 millim.

46. *Rana okinavana*.

*Rana okinavana*, Boettg., Zool. Anz. 1895, p. 266; and Ber. Offenb. Ver. Nat. 1895, p. 103; Stejneger, Herp. Japan, p. 102 (1907).

Vomerine teeth in rounded groups on a line with the posterior borders of the choanae and equally separated from them and from each other.

Snout anteriorly pointed and somewhat produced, as long as the eye; canthus rostralis distinct; loreal region slightly concave; nostril equidistant from the eye and from the tip of the snout; interorbital space as broad as the upper eyelid; tympanum very distinct,  $\frac{3}{4}$  the size of the eye.

Fingers moderately long, tips truncate but without discs, first longer than second; subarticular tubercles well developed.

Tibio-tarsal reticulation reaching between the eye and the nostril; heels not overlapping; tibia  $\frac{1}{2}$  length of head and body. Toes  $\frac{3}{5}$  webbed, truncate like the fingers; inner metatarsal tubercle

oval, prominent, less than  $\frac{1}{2}$  the length of the inner toe; no outer tubercle.

Skin smooth above and beneath, with large flat warts on the sides; a narrow, very prominent, glandular dorso-lateral fold; another glandular fold from below the eye, ending above the shoulder in two round or oval glands.

Grey above, frequently with a fine, somewhat lighter vertebral line; a black blotch from the nostril through the eye to the temporal region; a blackish line bordering the upper lip and separated from the loreo-temporal blotch by a pure white streak which ends on the glands above the insertion of the arm; tympanum brown; dorso-lateral fold externally edged with black, the sides often entirely blackish; hind limbs with dark cross-bands. Lower parts yellowish white, spotted and dotted very densely with blackish, the throat usually entirely blackish.

Male unknown.

From snout to vent 46 millim.

*Habitat.* Okinawa, Loo Choo Islands.

This species, known to me from the descriptions only, is stated to be allied to *R. labialis*.

#### 47. *Rana malabarica*.

*Rana malabarica* (Bibr.), Tschudi, *Class Batr.* pp. 40 and 80 (1838); Dum. et Bibr., *Erp. Gén.* VIII, p. 635, pl. lxxvi, fig. 1 (1841); Bouleng., *Cat. Batr. Ecaud.* p. 60 (1882), and *Faun. Ind., Rept.* p. 456 (1890); Boettg., *Ber. Offenb. Ver. Nat.* 1892, 95.  
*Hylorana malabarica*, Günth., *Rept. Brit. Ind.* p. 426 (1864); Stoliczka, *Proc. As. Soc. Beng.* 1872, p. 105.

Vomerine teeth in oblique groups or short series between the choanae, nearer to each other than to the latter.

Head rather strongly depressed, as long as broad; snout rounded or obtusely pointed, moderately projecting, as long as or a little longer than the eye; canthus rostralis obtuse, loreal region feebly oblique, concave; nostril a little nearer the end of the snout than the eye; the distance between the nostrils greater than the interorbital width, which is equal to or a little less than that of the upper eyelid; tympanum very distinct,  $\frac{2}{3}$  to once the diameter of the eye, close to it or separated from it by a space not exceeding  $\frac{1}{3}$  its diameter.

Fingers a little swollen at the end, first longer than the second, third longer than the snout; subarticular tubercles large and very prominent.

Hind limb rather short or moderately long, the tibio-tarsal articulation reaching the tympanum or the eye, the heels strongly overlapping when the limbs are folded at right angles to the body; tibia  $3\frac{1}{2}$  to 4 times as long as broad, 2 to  $2\frac{1}{3}$  times in length from snout to vent, shorter than the fore limb, as long as or slightly longer than the foot. Toes rather short, slightly swollen at the end,  $\frac{1}{3}$  to  $\frac{1}{2}$  webbed, 2 or 3 phalanges of fourth free, the outer metatarsals separated in their distal half, subarticular tubercles

rather large, very prominent; no tarsal fold; inner metatarsal tubercle oval, very prominent,  $\frac{1}{3}$  to  $\frac{1}{2}$  the length of the inner toe; a rather large, round, very prominent outer tubercle.

Skin smooth or granulate above, with small warts on the sides; a broad but feebly prominent and ill-defined glandular dorso-lateral fold, from above the tympanum to the groin; the distance between the dorso-lateral folds on the back  $\frac{1}{3}$  to  $\frac{1}{2}$  the length of head and body; another glandular fold, followed by a large gland, below the tympanum. Lower parts smooth, or granulate on the posterior part of the belly and under the thighs.

Crimson above, with or without a few small black spots, dark brown or black with more or less numerous white spots or with a white or yellow lateral streak on the sides, the limit between the crimson and the black very sharply defined, if not accompanied by a white line, and corresponding to the inner edge of the dorso-lateral fold and to the canthus rostralis; tympanum often reddish brown; a white streak on the upper lip, terminating with the glandular fold behind the mouth, sometimes continuous with the light streak on the side of the body; limbs pale brown, with more or less distinct dark brown or black cross-bands or spotted and marbled with dark brown or black; hinder side of thighs black, with white or yellow spots. Lower parts white or yellow, uniform or spotted or marbled with dark brown, or throat and breast dark brown.

Males with rather feebly developed external vocal sacs, forming folds on the side of the throat, below the temporal region; an ill-defined flat gland on the anterior side of the arm; a feeble pad on the inner side of the first finger, covered with a velvet-like greyish horny layer.

Tadpoles from Talewadi, collected by Mr. Kemp and identified as of this species by Dr. Annandale, are remarkable for their large size (total length 70 millim.) and black colour above and beneath. Tail pointed,  $1\frac{1}{2}$  to  $1\frac{2}{3}$  times as long as the body, the crest not extending on to the back. Buccal disc more than half the width of the body, with numerous papillae on the sides, the upper edges toothed, the lower with a single series of small round papillae; horny teeth in 8 upper series, the 2 outer continuous, the others gradually decreasing in length, and 6 or 7 lower series, the innermost narrowly interrupted, the others continuous; beak white, broadly edged with black.

Nasal bones small, oblique, separated from each other and from the ethmoid, which is exposed and truncate in front; fronto-parietals broad and flat; zygomatic branch of the squamosal not longer than the posterior. Omosternal style forked at the base. Terminal phalanges feebly expanded at the end.

*Measurements in millimetres.*

|                    | 1. | 2. | 3. | 4. | 5. | 6. | 7. | 8. | 9. | 10. | 11. | 12. | 13. | 14. | 15. |
|--------------------|----|----|----|----|----|----|----|----|----|-----|-----|-----|-----|-----|-----|
|                    | ♀  | ♂  | ♀  | ♀  | ♀  | ♀  | ♀  | ♀  | ♀  | ♀   | ♀   | ♀   | ♀   | ♀   | ♂   |
| From snout to vent | 40 | 59 | 61 | 59 | 58 | 55 | 51 | 48 | 46 | 70  | 66  | 70  | 45  | 40  | 65  |
| Head               | 13 | 19 | 20 | 19 | 19 | 19 | 18 | 16 | 16 | 22  | 22  | 22  | 15  | 13  | 21  |

|                    | 1.  | 2. | 3.  | 4.  | 5. | 6.  | 7. | 8. | 9. | 10. | 11. | 12. | 13. | 14. | 15. |
|--------------------|-----|----|-----|-----|----|-----|----|----|----|-----|-----|-----|-----|-----|-----|
|                    | ♀   | ♂  | ♀   | ♀   | ♀  | ♀   | ♀  | ♀  | ♀  | ♀   | ♀   | ♀   | ♀   | ♀   | ♂   |
| Width of head      | 13  | 19 | 20  | 19  | 19 | 19  | 18 | 16 | 16 | 21  | 22  | 22  | 15  | 13  | 21  |
| Snout              | 5   | 7  | 7   | 7   | 7  | 7   | 7  | 6  | 6  | 9   | 9   | 8   | 6   | 5   | 8   |
| Eye ..             | 5   | 7  | 6   | 6   | 7  | 7   | 6  | 6  | 6  | 7   | 7   | 8   | 6   | 6   | 7   |
| Interorbital width | 3   | 4  | 3.5 | 3.5 | 4  | 3.5 | 3  | 3  | 3  | 6   | 5   | 4   | 3.5 | 3   | 5   |
| Tympanum           | 4   | 6  | 6   | 5   | 5  | 5   | 5  | 5  | 5  | 6   | 6   | 6   | 4.5 | 4   | 7   |
| Fore limb          | 27  | 36 | 40  | 36  | 35 | 36  | 33 | 30 | 29 | 41  | 41  | 41  | 30  | 26  | 42  |
| First finger       | 5.8 | 8  | 8   | 8   | 8  | 8   | 7  | 6  | 6  | 10  | 9   | 8   | 6   | 5.5 | 10  |
| Second finger ..   | 4.5 | 7  | 7   | 7   | 7  | 7   | 6  | 5  | 5  | 9   | 8   | 7   | 5   | 4.5 | 9   |
| Third finger       | 7.5 | 10 | 10  | 10  | 10 | 10  | 9  | 8  | 8  | 12  | 12  | 10  | 8   | 7.5 | 12  |
| Fourth finger ..   | 4.5 | 7  | 7   | 7   | 7  | 7   | 6  | 5  | 5  | 8   | 8   | 7   | 5   | 4.5 | 8   |
| Hind limb          | 64  | 86 | 89  | 83  | 81 | 84  | 76 | 68 | 70 | 102 | 98  | 93  | 70  | 63  | 95  |
| Tibia ..           | 20  | 27 | 29  | 27  | 27 | 27  | 25 | 21 | 21 | 33  | 30  | 30  | 21  | 20  | 32  |
| Foot ..            | 20  | 26 | 29  | 27  | 27 | 26  | 24 | 22 | 21 | 31  | 30  | 29  | 21  | 20  | 31  |
| Third toe          | 9   | 13 | 14  | 13  | 13 | 13  | 12 | 11 | 11 | 15  | 15  | 13  | 11  | 9   | 16  |
| Fourth toe         | 15  | 19 | 21  | 20  | 20 | 19  | 18 | 17 | 17 | 25  | 25  | 20  | 17  | 15  | 23  |
| Fifth toe          | 9   | 13 | 14  | 12  | 13 | 12  | 12 | 11 | 11 | 17  | 16  | 13  | 10  | 9   | 16  |

1. Matheran, Bombay. 2. Canara. 3—9. Cannanore, Malabar. 10—11. Malabar (Paris Museum, types). 12—14 Malabar. 15. Goa (Indian Museum).

*Habitat.* Western India, from Bombay to Malabar.

[This frog is by no means confined to hilly country, though most abundant at the base of hill-ranges. It does not ascend to high altitudes. I have not seen it on the Nilgiri plateau, but it breeds in streams running into the gorge of the Bhavani River at the base of the Nilgiris. The tadpoles live in the stiller pools of small rocky streams in fairly level ground but as a rule shaded by dense jungle. N. A.]

This species, together with the African *R. galamensis*, D. and B., which is very closely allied to it, occupies an isolated position in the subgenus *Rana*. The forked condition of the omosternum precludes our considering them as links between *Rana* and *Hylorana*.

### Subgenus **Tomopterna**.

Dum. et Bibr., *Exp. Gén*, VIII, p. 443 (1841).

Vomerine teeth in small groups or short series between or just behind the choanae. Fingers and toes not dilated at the tip; outer metatarsals bound together or separated in the distal third or fourth only. Zygomatic branch of the squamosal very short. Precoracoids strong, straight; omosternal style forked at the base in the Indian species. Terminal phalanges obtuse.

Burrowing, more or less toad-like forms, with large head and compressed inner metatarsal tubercle, clearly derived from the group embracing *Rana tigrina* and *R. limnocharis*.

### SYNOPSIS OF THE SPECIES.

1. First finger longer than second; tympanum  $\frac{2}{3}$  to  $\frac{2}{5}$  diameter of eye. Snout as long as or a little shorter than eye; first finger a little longer than second, much shorter than third; tibio-tarsal articulation reaching tympanum or posterior border of eye; tibia 3 to  $3\frac{1}{2}$  times as long as broad,  $2\frac{1}{5}$  to  $2\frac{1}{2}$  times in length from snout to vent; toes  $\frac{1}{4}$  to  $\frac{1}{3}$  webbed; outer metatarsals separated in the distal third or fourth; inner metatarsal

- tubercle  $\frac{3}{8}$  to  $\frac{3}{4}$  length of inner toe; a small outer metatarsal tubercle ... *R. rufescens*, Jerd.
- Snout shorter than eye; first finger much longer than second, as long as or a little shorter than third; tibio-tarsal articulation reaching axil or shoulder; tibia 2 to 3 times as long as broad,  $2\frac{3}{8}$  to 3 times in length from snout to vent; toes  $\frac{1}{4}$  to  $\frac{1}{2}$  webbed; outer metatarsals united; inner metatarsal tubercle longer than inner toe; no outer tubercle ... *R. breviceps*, Schn.
- Snout as long as eye; first finger much longer than second, as long as third; tibio-tarsal articulation reaching shoulder; tibia 3 times as long as broad,  $2\frac{3}{4}$  to  $2\frac{4}{5}$  times in length from snout to vent; toes with a mere rudiment of web; outer metatarsals united; inner metatarsal tubercle longer than inner toe; no outer tubercle ... *R. dobsoni*, Blgr.
- II. First and second fingers equal; tympanum as large as eye; toes  $\frac{1}{2}$  webbed; an outer metatarsal tubercle ... *R. strachani*, Murr.

#### 48. *Rana rufescens*.

*Pyxicephalus rufescens*, Jerdon, *Journ. As. Soc. Beng.* XXII, 1854, p. 534; Günth., *Rept. Brit. Ind.* p. 412 (1864).  
*Rana rufescens*, Bouleng., *Cat. Batr. Ecaud.*, p. 29 (1882), and *Faun. Ind.*, *Rept.* p. 451 (1890).

Vomerine teeth in oblique series between and extending posteriorly a little beyond the choanae.

Head a little broader than long, feebly depressed; snout rounded, as long as or a little shorter than the eye, scarcely projecting beyond the mouth; canthus rostralis very obtuse; loreal region oblique, feebly concave; nostril equidistant from the eye and from the tip of the snout; the distance between the nostrils greater than the interorbital width, which is much less than that of the upper eyelid; tympanum very distinct, about  $\frac{1}{2}$  the diameter of the eye and about twice its distance from the latter.

Fingers obtusely pointed, first much longer than the second, third not or but slightly longer than the first, as long as the snout; subarticular tubercles well developed and very prominent.

Hind limb rather short, the tibio-tarsal articulation reaching the tympanum or the posterior border of the eye, the heels feebly overlapping when the limbs are folded at right angles to the body; tibia 3 to  $3\frac{1}{2}$  times as long as broad,  $2\frac{2}{3}$  to  $2\frac{1}{2}$  times in length from snout to vent, a little shorter than the foot, shorter than the fore limb. Toes obtusely pointed,  $\frac{1}{3}$  or  $\frac{1}{4}$  webbed; outer metatarsals narrowly separated in the distal third or fourth only; subarticular tubercles rather small, but very prominent; no tarsal fold; inner metatarsal tubercle large, very prominent, compressed,  $\frac{2}{3}$  to  $\frac{3}{4}$  the length of the inner toe; a small outer metatarsal tubercle.

Upper surface of head and body with very prominent warts of unequal size. Sometimes with two short glandular ridges forming a **A** between the shoulders; a strong glandular fold from the eye to the shoulder; a more or less distinct fold across the head, behind the eyes. Lower parts smooth.

Greyish brown above, with more or less distinct darker spots or marblings; often a dark cross-bar between the eyes and a **A**-or **W**-shaped marking between the shoulders; dark vertical bars on the lips, two of which extend to the eye; limbs with dark cross-bands. Lower parts white, throat spotted with brown.

Males with a vocal sac on each side, forming folds on the throat, which bears a **M**-shaped black marking; fore limb very robust; a strong pad on the inner side of the first finger.

Nasal bones large, in contact with each other and with the fronto-parietals, which are narrow and flat; ethmoid not exposed; zygomatic process of squamosal short. Omosternal style forked at the base. Terminal phalanges obtusely pointed.

*Measurements in millimetres.*

|                    |    | ♂   | ♂   | ♂   | ♂   | ♀  | ♀   |
|--------------------|----|-----|-----|-----|-----|----|-----|
| From snout to vent | .. | 35  | 34  | 33  | 32  | 34 | 33  |
| Head ..            |    | 11  | 11  | 11  | 11  | 11 | 11  |
| Width of head      |    | 12  | 12  | 12  | 12  | 12 | 12  |
| Snout              |    | 3.5 | 4   | 4   | 4   | 4  | 4   |
| Eye ..             | .. | 4.5 | 4   | 4   | 4   | 4  | 4   |
| Interorbital width | .. | 1.5 | 2   | 1.5 | 1.5 | 2  | 2   |
| Tympanum           | .. | 2   | 2   | 2.5 | 2   | 2  | 2   |
| Fore limb          |    | 18  | 18  | 19  | 19  | 18 | 19  |
| First finger       | .. | 4   | 3.5 | 3.5 | 3.5 | 4  | 3.5 |
| Second finger      |    | 2   | 2   | 2   | 2   | 2  | 2   |
| Third finger       |    | 4   | 4   | 4   | 4   | 4  | 4   |
| Fourth finger      | .. | 2   | 2   | 2   | 2   | 2  | 2   |
| Hind limb          | .. | 48  | 50  | 47  | 48  | 50 | 51  |
| Tibia ..           | .. | 14  | 15  | 14  | 14  | 15 | 15  |
| Foot ..            | .. | 15  | 16  | 15  | 15  | 16 | 16  |
| Third toe          | .. | 7   | 8   | 7   | 7   | 8  | 8   |
| Fourth toe         | .. | 11  | 12  | 11  | 11  | 12 | 12  |
| Fifth toe          | .. | 5   | 6   | 6   | 6   | 6  | 6   |

*Habitat.* Malabar.

Connects *Rana* with *Tomopterna*.

#### 49. *Rana breviceps*.

*Rana breviceps*, Schneid., *Hist. Amph.* 1, p. 140 (1799); Peters, *Mon. Berl. Ac.* 1863, p. 76; Bouleng., *Cat. Batr. Ecaud.* p. 32 (1882), and *Faun. Ind., Rept.* p. 451 (1890); Ferguson, *Journ. Bomb. N.H. Soc.* XV, 1904, p. 502, pl. B, fig. 1.

*Rana variegata*, Gravenh. *Delic. Mus. Vratisl.* p. 33, pl. viii, fig. 1 (1829).

*Pyxicephalus fodiens*, Jerd., *Journ. As. Soc. Beng.* XXII, 1853, p. 534.

*Pyxicephalus pluvialis*, Jerd., *l.c.*

*Sphaerotheca strigata*, Günth., *Cat. Batr. Sal.* p. 32, pl. ii, fig. A (1858).

*Tomopterna delalandii*, part., Günth., *op. cit.* p. 129.

*Tomopterna strigata*, Günth., *Proc. Zool. Soc.* 1860, p. 165.

*Pyxicephalus breviceps*, Günth., *Rept. Brit. Ind.* p. 411 (1864); Theob., *Cat. Rept. As. Soc. Mus.* p. 80 (1868); Anders., *Proc. Zool. Soc.* 1871, p. 200; Murray, *Zool. Sind.* p. 399 (1884).

Vomerine teeth in strong, short oblique series between the choanae or extending a little beyond the level of their posterior borders.

Habit stout, toad-like.

Head convex, broader than long; snout rounded, not projecting, shorter than the eye; canthus rostralis very obtuse; loreal region oblique, feebly concave; nostril equidistant from the eye and from the tip of the snout, or nearer the former; distance between the nostrils equal to or a little greater than the inter-orbital width, which is  $\frac{1}{2}$  to  $\frac{3}{4}$  that of the upper eyelid; tympanum distinct,  $\frac{2}{3}$  to  $\frac{3}{5}$  the diameter of the eye, 2 to 3 times its distance from the latter.

Fingers rather short, obtuse, first much longer than the second, as long as or a little shorter than the third, which is longer than the snout; subarticular tubercles large and very prominent or subconical.

Hind limb very short, the tibio-tarsal articulation reaching the axil or the shoulder, the heels separated or just meeting when the limbs are folded at right angles to the body; tibia 2 to 3 times as long as broad,  $2\frac{2}{3}$  to 3 times in length from snout to vent, much shorter than the fore limb, shorter than the foot. Toes rather short, obtuse,  $\frac{1}{4}$  to  $\frac{1}{2}$  webbed; outer metatarsals united; subarticular tubercles small, prominent; no tarsal fold; inner metatarsal tubercle large, strongly compressed, inserted obliquely at the base of the first toe, which it considerably exceeds in length; no outer tubercle.

Skin smooth or granulate above, sometimes with elongate warts or interrupted longitudinal glandular folds along the back; a more or less distinct curved fold from the eye to the shoulder. Belly and lower surface of thighs granulate.

Brown or yellowish above, with dark brown spots or marblings, the spots sometimes disposed with great symmetry; a yellow vertebral streak or broad band often present; often a yellowish band from the upper eyelid to the groin; usually a dark canthal streak and dark vertical bars on the upper lip; limbs usually with irregular dark cross-bands, groin and hinder side of thighs dark brown with yellow spots, or marbled dark brown and yellow. Lower parts white, throat sometimes with brown spots.

Males with a vocal sac forming folds on the sides of the throat, which are black or blackish.

Nasal bones rather small, separated from each other and from the frontoparietals; ethmoid largely exposed above, produced forward beyond the nasals. Omosternal style forked at the base. Terminal phalanges obtuse.

The tadpole, described and figured by Ferguson, and of which I have examined two specimens, is not unlike that of *R. limnocharis*. Beak edged with black, lower mandible finely serrated; horny labial teeth in a long marginal upper series followed by an interrupted inner series, and in 3 uninterrupted lower series, the outermost very short; fleshy papillae on the sides of the lip.

Eggs 1 millim. in diameter.

*Measurements in millimetres.*

|                     | 1   | 2   | 3   | 4  | 5  | 6   | 7  | 8   | 9   | 10  | 11  | 12  | 13  | 14  | 15  | 16  | 17  |
|---------------------|-----|-----|-----|----|----|-----|----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
|                     | ♀   | ♂   | ♀   | ♀  | ♀  | ♀   | ♀  | ♀   | ♀   | ♀   | ♀   | ♂   | ♀   | ♀   | ♀   | ♀   | ♀   |
| From snout to vent  | 50  | 45  | 56  | 50 | 47 | 42  | 55 | 51  | 44  | 37  | 55  | 35  | 45  | 40  | 38  | 37  | 53  |
| Head ..             | 18  | 17  | 18  | 17 | 17 | 15  | 15 | 18  | 15  | 13  | 18  | 13  | 16  | 14  | 14  | 14  | 17  |
| Width of head       | 21  | 20  | 21  | 20 | 19 | 17  | 21 | 21  | 17  | 16  | 22  | 15  | 18  | 15  | 16  | 16  | 21  |
| Snout               | 5   | 5   | 5   | 5  | 4  | 4   | 5  | 5   | 4   | 3.5 | 5   | 3   | 4   | 3   | 3   | 3   | 5   |
| Eye ..              | 7   | 6   | 7   | 6  | 6  | 5.5 | 7  | 7   | 6   | 5   | 7   | 5   | 6   | 5   | 5   | 5   | 7   |
| Interorbital width  | 2.5 | 2   | 2.5 | 2  | 2  | 2   | 2  | 2.5 | 2.5 | 2   | 2.5 | 2   | 2.5 | 2.5 | 2.5 | 2   | 2.5 |
| Tympanum            | 4   | 3   | 4   | 3  | 3  | 2.5 | 4  | 3   | 3   | 2.5 | 4   | 2.5 | 3   | 2   | 2   | 2   | 3   |
| Fore limb           | 29  | 27  | 32  | 26 | 25 | 24  | 29 | 28  | 24  | 21  | 29  | 19  | 26  | 20  | 22  | 20  | 30  |
| First finger        | 7   | 6   | 8   | 6  | 6  | 6   | 7  | 7   | 5.5 | 4   | 7   | 4   | 6   | 5   | 5   | 5   | 7   |
| Second finger       | 4   | 3.5 | 5   | 4  | 4  | 4.5 | 4  | 4   | 4   | 3   | 4   | 3   | 4   | 3.5 | 4   | 3.5 | 4   |
| Third finger        | 7   | 6   | 8   | 7  | 7  | 6.5 | 7  | 7   | 6   | 5   | 7   | 5   | 6   | 5   | 6   | 5   | 7   |
| Fourth finger       | 3   | 3   | 4   | 3  | 3  | 3   | 3  | 3   | 2.5 | 2.5 | 3.5 | 2   | 3   | 2   | 2   | 2.5 | 3   |
| Hind limb           | 61  | 55  | 62  | 60 | 57 | 53  | 61 | 63  | 52  | 45  | 63  | 40  | 54  | 46  | 47  | 46  | 62  |
| Tibia               | 19  | 17  | 19  | 17 | 17 | 16  | 18 | 18  | 15  | 13  | 19  | 12  | 15  | 14  | 14  | 14  | 18  |
| Foot                | 22  | 20  | 24  | 23 | 22 | 20  | 22 | 22  | 19  | 17  | 23  | 15  | 18  | 17  | 17  | 17  | 21  |
| Third toe           | 9   | 8   | 9   | 8  | 8  | 8   | 9  | 9   | 7   | 6   | 8   | 5   | 7   | 6   | 6   | 6   | 8   |
| Fourth toe          | 12  | 12  | 14  | 13 | 13 | 12  | 13 | 13  | 12  | 9   | 13  | 8   | 11  | 9   | 9   | 9   | 12  |
| Fifth toe ..        | 5   | 4.5 | 5   | 4  | 4  | 4   | 5  | 5   | 3   | 3   | 5   | 2.5 | 4   | 3   | 4   | 3   | 5   |
| First toe ..        | 3   | 2.5 | 3   | 3  | 3  | 3   | 3  | 3   | 3   | 2.5 | 3   | 2   | 2.5 | 2.5 | 2.5 | 2   | 3   |
| Inner met. tubercle | 5   | 4   | 5   | 5  | 5  | 4.5 | 5  | 5   | 4   | 4   | 5   | 3   | 4   | 3.5 | 4   | 3.5 | 4   |

1. Simla. 2—6. Madras (types of *Sphaerotheca strigata*). 7—8. Malabar.  
9—10. Trevandrum, Travancore. 11. Trincomalee, Ceylon. 12—16. Ceylon.  
17. North Chin Hills, Upper Burma.

*Habitat.* India, Ceylon, and Upper Burma. Restricted to the plains in Southern India.

**50. *Rana dobsonii*.**

*Rana dobsonii*, Bouleng., *Cat. Batr. Ecaud.* p. 32, pl. iii, fig. 1 (1882), and  
*Faun. Ind., Rept.* p. 452 (1890).

Vomerine teeth in strong, short oblique series between the choanae, nearer to each other than to the latter.

Habit stout, toad-like.

Head convex, broader than long; snout rounded, not projecting, as long as the eye; canthus rostralis obtuse; loreal region oblique, feebly concave; nostril equidistant from the eye and from the tip of the snout; distance between the nostrils a little greater than the interorbital width, which is  $\frac{2}{3}$  that of the upper eyelid; tympanum distinct, vertically oval, about  $\frac{2}{3}$  the diameter of the eye.

Fingers rather short, obtuse, first much longer than the second, as long as the third, which is a little longer than the snout; subarticular tubercles very large, very prominent.

Hind limb very short, the tibio-tarsal articulation reaching the shoulder, the heels meeting when the limbs are folded at right angles to the body; tibia 3 times as long as broad,  $2\frac{3}{4}$  to  $2\frac{1}{2}$  times in length from snout to vent, much shorter than the fore limb, a little shorter than the foot. Toes rather short, obtuse, with a slight rudiment of web; outer metatarsals united; subarticular tubercles small, prominent; no tarsal fold; inner metatarsal tubercle large, strongly compressed, inserted obliquely at the

base of the first toe, which it considerably exceeds in length ; no outer tubercle.

Skin finely granulate above ; a strong curved glandular fold from the eye to the shoulder. Belly and lower surface of thighs granulate.

Grey above, uniform or indistinctly marbled with dark brown ; a fine yellow vertebral line sometimes present ; a deep black streak from the tip of the snout, through the nostril and the eye, to the shoulder, expanding in a round spot on the tympanum ; limbs without or with very indistinct darker cross-bands ; groin marbled with black ; upper surface of thighs black, spotted or marbled with white. Lower parts white, throat spotted with brown.

Male unknown.

Nasal bones separated from each other and from the frontoparietals.

*Measurements in millimetres.*

|                           |    |    |    |    | 1.<br>♀ | 2.<br>♀ |
|---------------------------|----|----|----|----|---------|---------|
| From snout to vent        | .. | .. | .. | .. | 55      | 57      |
| Head                      | .. | .. | .. | .. | 19      | 20      |
| Width of head             | .. | .. | .. | .. | 22      | 23      |
| Snout                     | .. | .. | .. | .. | 7       | 7       |
| Eye                       | .. | .. | .. | .. | 7       | 7       |
| Interorbital width        |    |    |    |    | 3       | 3       |
| Tympanum                  | .. | .. | .. | .. | 4.5     | 5       |
| Fore limb                 | .. | .. | .. | .. | 34      | 35      |
| First finger              | .. | .. | .. | .. | 8       | 8       |
| Second finger             | .. | .. | .. | .. | 5       | 5       |
| Third finger              | .. | .. | .. | .. | 8       | 8       |
| Fourth finger             | .. | .. | .. | .. | 4       | 4       |
| Hind limb                 | .. | .. | .. | .. | 69      | 67      |
| Tibia                     | .. | .. | .. | .. | 20      | 20      |
| Foot                      | .. | .. | .. | .. | 22      | 22      |
| Third toe                 | .. | .. | .. | .. | 8       | 7       |
| Fourth toe                | .. | .. | .. | .. | 13      | 13      |
| Fifth toe                 | .. | .. | .. | .. | 5       | 5       |
| First toe                 | .. | .. | .. | .. | 3       | 3       |
| Inner metatarsal tubercle | .. | .. | .. | .. | 4       | 5       |

1. Mangalore (type). 2. S. Canara.

*Habitat.* Malabar.

### 51. *Rana strachani*.

*Tomopterna strachani*, Murray, *Zool. Sind*, p. 399 (1884).

*Rana strachani*, Bouleng., *Faun. Ind., Rept.* p. 452 (1890).

This species being unknown to me, I merely reproduce the original description.

“Muzzle very little longer than broad. Snout obtuse. Tympanum distinct, circular, as large as the eye. Crown flattish. Lower jaw with weak bony prominences. Skin of back with short longitudinal folds ; a fold on each side of the abdomen, and another across the under surface of the body, immediately behind the fore limbs. A plait behind the tympanum, coming down to the shoulder. Fingers quite free, swollen at the tips ; laid beside each other, the first, second, and fourth fingers are of

equal length. Hind limb longer than the head and body ; laid beside the body, the metatarsal tubercle reaches the end of the snout. Metatarsus with a sharp-edged spur on the inner side and a tubercle on the outer. Toes half-webbed, the tips slightly swollen, and each of the joints on the under surface with a tubercle. Third toe slightly longer than the fifth, fourth the longest. Colour greyish, with a rufescent tinge. A dark brown subtriangular spot on the occiput, extending from across and behind the eyelids, immediately following which is a filiform white vertebral streak, extending to the vent ; back with six irregular-shaped dark brown spots. Plait behind the tympanum reddish brown. Fore and hind limbs externally with transverse bars of the same colour. Upper and lower jaws with vertical bars of reddish brown. Chin, throat, and rest of under surface white."

*Habitat.* Malir, near Kurrachi (Karachi), Sind.

### Subgenus *Nanorana*.

Günth., *Ann. Mus. Zool. St. Pétersb.* I, 1896, p. 207.

Vomerine teeth, if present, much reduced. No tympanum, no stapes. Fingers and toes not dilated at the tips ; outer metatarsals separated by web in their distal third or fourth only. Zygomatic branch of the squamosal short. Omosternal style not forked at the base. Terminal phalanges obtuse.

I regard the single species of this subgenus as a dwarfed, degraded form derived from the *R. liebigii* group, with which it is connected to a certain extent by *R. blanfordii*.

### 52. *Rana pleskei*.

*Nanorana pleskei*, Günth., *Ann. Mus. Zool. St. Pétersb.* I, 1896, p. 207 ; Bedriaga, *Wiss. Res. Przewalski Reis.*, *Zool.* III, i, p. 32, pl. i, fig. 5. (1898).

*Rana pleskei*, Bouleng., *Am. and Mag. N.H.* (7) XV, 1905, p. 378 ; Annand., *Rec. Ind. Mus.* II, 1908, p. 345, and XIII, 1917, p. 417, fig.

Vomerine teeth absent or reduced to small oblique groups behind the level of the choanae.

Head a little broader than long, rather strongly depressed ; snout rounded, scarcely projecting beyond the mouth, as long as or a little shorter than the eye ; canthus rostralis very obtuse ; loreal region very oblique, concave ; nostril a little nearer the eye than the end of the snout ; the distance between the nostrils greater than the interorbital width, which is much less than that of the upper eyelid ; no tympanum.

Fingers obtuse, first as long as or slightly shorter than the second, third as long as or longer than the snout ; a single, feebly prominent subarticular tubercle at the base of each finger.

Hind limb rather short, the tibio-tarsal articulation reaching the shoulder or the temple, the heels just meeting when the limbs are folded at right angles to the body ; tibia 3 times as long as

broad,  $2\frac{2}{3}$  to  $2\frac{3}{4}$  times in length from snout to vent, considerably shorter than the foot or the fore limb. Toes obtusely pointed, entirely or nearly entirely webbed, the distal phalanx of the fourth often free; outer metatarsals separated by web only in their distal third or fourth; subarticular tubercles small and very feebly prominent; no tarsal fold; inner metatarsal tubercle small, oval, about  $\frac{1}{3}$  the length of the inner toe; no outer metatarsal tubercle.

Upper parts with small elongate smooth warts, which often form regular longitudinal series or interrupted folds on the back; a glandular fold from the eye to the shoulder; lower parts smooth.

Olive above, uniform or with numerous small blackish spots which may have a light centre; a yellow vertebral streak sometimes present; a blackish streak from the tip of the snout to the shoulder, passing through the eye; limbs with dark spots but no cross-bars. Lower parts white, uniform or spotted with blackish.

Males without secondary sexual characters.

Nasal bones rather small, in contact with each other; frontoparietals not meeting on the median line; a small part of the ethmoid uncovered. Pectoral arch as in *R. temporaria*.

Eggs large, 2 millim. in diameter in uterus of female measuring 54 mm. from snout to vent.

*Measurements in millimetres.*

|                       | 1  | 2   | 3   | 4   | 5   | 6   | 7   | 8   | 9   | 10  |
|-----------------------|----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
|                       | ♂  | ♂   | ♀   | ♀   | ♂   | ♂   | ♀   | ♀   | ♀   | ♀   |
| From snout to vent    | 34 | 31  | 53  | 40  | 41  | 35  | 54  | 47  | 58  | 53  |
| Head .. ..            | 11 | 10  | 15  | 13  | 13  | 12  | 16  | 15  | 16  | 15  |
| Width of head ..      | 12 | 11  | 18  | 14  | 14  | 13  | 18  | 17  | 19  | 18  |
| Snout .. ..           | 4  | 4   | 5   | 4.5 | 4.5 | 4.5 | 6   | 5   | 5   | 5.5 |
| Eye .. ..             | .. | 4   | 4   | 6   | 4.5 | 4.5 | 4.5 | 6   | 5   | 6   |
| Interorbital width .. | .. | 2   | 2   | 2.5 | 2   | 2   | 2   | 2.5 | 2   | 2   |
| Fore limb ..          | 17 | 16  | 27  | 21  | 24  | 20  | 29  | 27  | 32  | 30  |
| First finger          | .. | 3.5 | 3   | 5   | 3.5 | 5   | 3.5 | 5   | 4.5 | 5.5 |
| Second finger         | .. | 4   | 3.5 | 5   | 4   | 5.5 | 3.5 | 5   | 4.5 | 5.5 |
| Third finger          | .. | 5   | 4   | 6   | 5   | 6   | 5   | 6   | 7   | 6   |
| Fourth finger         | .. | 3.5 | 3   | 4   | 4   | 3.5 | 3   | 4.5 | 4   | 5   |
| Hind limb             | 41 | 39  | 68  | 52  | 55  | 48  | 69  | 65  | 80  | 75  |
| Tibia                 | .. | 13  | 12  | 19  | 16  | 17  | 13  | 20  | 18  | 22  |
| Foot                  | .. | 15  | 14  | 23  | 18  | 19  | 16  | 24  | 21  | 29  |
| Third toe             | .. | 8   | 6   | 11  | 9   | 10  | 8   | 12  | 11  | 14  |
| Fourth toe            | .. | 10  | 9   | 15  | 11  | 12  | 10  | 16  | 15  | 19  |
| Fifth toe             | .. | 7   | 7   | 10  | 8   | 8   | 7   | 10  | 10  | 14  |

1—4. L. Yamdok, 15,000 f. 5—8. Kamba Jong. 9—10. Gyangtse.

*Habitat.* Tibet, up to 15,000 feet; Kashmir between 9000 and 1200 ft.

A very aberrant species.

According to Annandale, the tadpole reaches a large size,—72 millim., in which the tail enters for 45. The tail is round at the end. Lips moderately developed with a fringe of papillae which is only narrowly interrupted in the middle of the upper lip; beak serrated at the edge, the upper mandible bearing a couple of long narrow cusps at either end; 4 upper and 5 lower series of labial teeth, only the outermost uninterrupted; these series of teeth

are supported by thick fleshy ridges. But for the shape of the beak, the mouth-structure of this tadpole is very suggestive of that of the European *Pelobates*.

Since the above was written, Dr. Annandale has submitted to me two specimens of a toad<sup>1</sup> from Srinagar, Kashmir, sent to him by Mr. F. J. M. Mitchell as representing the adult of the tadpole assigned by him to *Rana pleskii*. I have no doubt this suggestion is correct, and as the toads belong to *Aelurophryne mammata*, Gthr., the resemblance of the tadpole to that of *Pelobates* is accounted for.

### Subgenus *Discodeles*.

Bouleng., *Ann. and Mag. N.H.* (9) I, 1918, p. 238.

Tips of toes, and usually of fingers, dilated into discs, the upper surface of which is separated from the lower by a crescentic or horseshoe-shaped groove; web not penetrating or not penetrating far between the outer metatarsals. Vomerine teeth in transverse or oblique series behind the choanae or on a level with the posterior borders of the latter. Tongue with a large, retractile papilla in the middle. Glandular dorso-lateral fold, if present, not confluent with the temporal. Nasal bones large, in contact with each other and with the frontoparietals. Omosternal style forked at the base.

Connected with *Rana*, s. str., through *R. grunniens*. The genera *Cornufer* and *Platymantis* are evidently derived from this group.<sup>2</sup>

### SYNOPSIS OF THE SPECIES.

I. Discs of toes longer than broad; first finger at least as long as second; toes  $\frac{2}{3}$  to entirely webbed; lingual papilla obtuse; terminal phalanges feebly expanded at the end.

Vomerine teeth not extending outwards beyond vertical of inner edges of choanae; tympanum about  $\frac{1}{3}$  diameter of eye; fingers without discs; tibio-tarsal articulation reaching temple; tibia  $2\frac{1}{4}$  to  $2\frac{2}{3}$  times as long as broad; upper parts very warty, with an interrupted glandular dorso-lateral fold; belly granulate ...

*R. bufoniformis*, Blgr.

Vomerine teeth not extending outwards beyond vertical of inner edges of choanae; tympanum  $\frac{2}{5}$  to  $\frac{1}{2}$  diameter of eye; fingers without discs; tibio-tarsal articulation reaching eye; tibia 3 to  $3\frac{1}{2}$  times as long as broad; upper parts smooth or warty; belly feebly granulate; male with internal vocal sacs ...

*R. opisthodon*, Blgr.

Vomerine teeth extending outwards beyond vertical of inner edges of choanae; tympanum  $\frac{1}{5}$  to  $\frac{1}{2}$  diameter of eye; tips of fingers dilated into distinct discs; tibio-tarsal articulation reaching eye or tip of snout; tibia 3 to  $3\frac{1}{2}$  times as long as broad; skin smooth or feebly warty above, with or without an indication of an interrupted dorso-lateral fold, smooth beneath; male with external vocal sacs ...

*R. guppyi*, Blgr.

II. Discs of fingers and toes broader than long; lingual papilla long and pointed male without vocal sacs; terminal phalanges T-shaped or Y-shaped.

<sup>1</sup> Cf. Boulenger, *Rec. Ind. Mus.* XVI, p. 470 (1919).

<sup>2</sup> Cf. Boulenger, *Ann. and Mag. N.H.* (9) I, 1918, p. 372.

- A. Toes  $\frac{1}{2}$  to  $\frac{2}{3}$  webbed, tibia 4 to  $4\frac{1}{2}$  times as long as broad.  
 Toes  $\frac{2}{3}$  webbed, the web reaching discs of third and fifth ;  
 first finger at least as long as second ; tympanum  $\frac{1}{2}$   
 to  $\frac{2}{3}$  diameter of eye ... *R. beddomii*, Gthr.  
 Toes  $\frac{2}{3}$  webbed, the web reaching discs of third and fifth ;  
 first finger shorter than second ; tympanum  $\frac{2}{3}$  dia-  
 meter of eye ... *R. leithii*, Blgr.  
 Toes  $\frac{1}{2}$  webbed, 2 phalanges of third and fifth free ; first  
 finger longer than second ; tympanum nearly as large  
 as eye and close to it ... *R. semipalmata*, Blgr.  
 B. Toes not more than  $\frac{1}{4}$  webbed, the web not or scarcely penetrating between  
 outer metatarsals ; first finger shorter than second ; tympanum  $\frac{1}{2}$  to  $\frac{2}{3}$  dia-  
 meter of eye.  
 Tympanum very distinct ; loreal region very oblique ;  
 tibia 4 to 5 times as long as broad ; skin of head  
 smooth, of back with short longitudinal folds ... *R. leptodactyla*, Blgr.  
 Tympanum very distinct ; loreal region feebly oblique ;  
 tibia  $3\frac{1}{2}$  to 4 times as long as broad ; skin of head  
 smooth, of back with short longitudinal folds ... *R. diplosticta*, Gthr.  
 Tympanum moderately distinct ; tibia 4 times as long  
 as broad ; head and back with large warts ... *R. phrynoderma*, Blgr.

The first group (species 53 to 55) may be designated as *Ranae guppianae*, the second (species 56 to 61) as *Ranae beddomiana*.

### 53. *Rana bufoniformis*.

*Rana bufoniformis*, Bouleng., *Proc. Zool. Soc.* 1884, p. 210, *Tr. Zool. Soc.* XII, 1886, p. 47, pl. viii, and *Ann. and Mag. N.H.* (9) I, 1918, p. 239.

Vomerine teeth in short and strong oblique series behind the choanae, not extending outwards beyond the vertical of the inner edges of the latter, the space between the two series equal to the length of one of them. Tongue with an obtuse papilla in the middle.

Habit very stout. Head large, much depressed, much broader than long ; snout rounded, feebly projecting beyond the mouth, as long as or slightly longer than the eye ; canthus rostralis obtuse ; loreal region very oblique, feebly concave ; nostril nearer the tip of the snout than the eye ; distance between the nostrils less than the interorbital width, which equals that of the upper eyelid ; tympanum distinct, about  $\frac{1}{3}$  the diameter of the eye and  $\frac{2}{3}$  to  $\frac{3}{4}$  its distance from the latter.

Fingers rather short and thick, with slightly swollen tips, first longer than the second, third nearly as long as the snout ; sub-articular tubercles large, prominent.

Hind limb short ; the tibio-tarsal articulation reaches the temple, the heels meet or fail to meet when the limbs are folded at right angles to the body ; tibia  $2\frac{1}{4}$  to  $2\frac{3}{4}$  times as long as broad, about  $2\frac{1}{2}$  times in length from snout to vent, shorter than the fore limb, slightly shorter than the foot. Toes short, the tips dilated into small discs with a groove separating the upper from the lower surface,  $\frac{2}{3}$  webbed, 2 phalanges of fourth free ; the web not penetrating very far between the outer metatarsals ; sub-articular tubercles large and oval, very prominent ; no tarsal fold ;

inner metatarsal tubercle oval, flat,  $\frac{1}{2}$  the length of the inner toe; a rather larger but rather indistinct roundish outer metatarsal tubercle.

Head, body, and hind limbs rough with small warts, the largest of which, on the body, are round and studded with minute horny spinules; larger warts form an interrupted dorso-lateral fold; a strong glandular fold above the tympanum. Lower parts smooth, except the belly and the thighs, which are feebly granulate.

Uniform purplish brown above, yellowish beneath.

Male unknown.

Nasal bones large and in contact with each other and with the frontoparietals, which entirely cover the ethmoid above. Terminal phalanges with feeble transverse distal expansion.

*Measurements in millimetres.*

|                    |    |    |    |    | 1.<br>♀ | 2.<br>♀ |
|--------------------|----|----|----|----|---------|---------|
| From snout to vent | .. |    |    |    | 145     | 150     |
| Head               | .. | .. |    |    | 55      | 53      |
| Width of head      |    |    |    |    | 70      | 70      |
| Snout              | .. | .. |    | .. | 17      | 21      |
| Eye                | .. | .. | .. |    | 17      | 19      |
| Interorbital width | .. | .. |    | .. | 15      | 15      |
| Tympanum           | .. | .. | .. |    | 5       | 6       |
| Fore limb          | .. | .. | .. |    | 85      | 87      |
| First finger       | .. |    | .. | .. | 16      | 18      |
| Second finger      |    | .. |    | .. | 15      | 16      |
| Third finger       |    |    |    |    | 19      | 20      |
| Fourth finger      | .. | .. |    | .. | 14      | 15      |
| Hind limb          |    | .. | .  |    | 185     | 195     |
| Tibia              | .. |    |    | .. | 58      | 61      |
| Foot               | .. |    |    | .. | 60      | 65      |
| Third toe          | .. |    |    |    | 30      | 32      |
| Fourth toe         |    | .. |    | .. | 41      | 43      |
| Fifth toe          | .. | .. | .. | .. | 24      | 25      |

1. Treasury Id. (type). 2. Faro Id.

*Habitat.* Solomon Islands; the type is from Treasury Id., a second specimen from Faro Id.

One of the most toad-like species of the genus, its form contrasting strikingly with that of the allied *R. guppyi*; the difference is, however, bridged over by *R. opisthodon*.

#### 54. *Rana opisthodon*.

*Rana opisthodon*, Bouleng., *Proc. Zool. Soc.* 1884, p. 211, *Tr. Zool. Soc.* XII, 1886, p. 50, pl. x, and *Ann. and Mg. N.H.* (9) I, 1918, p. 239.

Vomerine teeth in short and strong oblique series behind the choanae, well within their inner borders, the space between the two series equal to or, usually, less than the length of one of them. Tongue with an obtuse papilla in the middle.

Head large, much depressed, a little broader than long; snout rounded, scarcely projecting beyond the mouth, as long as or slightly longer than the eye; canthus rostralis obtuse; loreal region very oblique, feebly concave; nostril much nearer the tip of the snout than the eye; distance between the nostrils equal

to or less than the interorbital width, which is equal to or less than that of the upper eyelid; tympanum distinct,  $\frac{2}{3}$  to  $\frac{1}{2}$  the diameter of the eye and  $\frac{3}{4}$  to once its distance from the latter.

Fingers moderate, blunt or with slightly swollen tips, first as long as or a little longer than the second, third as long as or slightly longer or shorter than the snout; subarticular tubercles large, prominent.

Hind limb rather short or moderate; the tibio-tarsal articulation reaches the posterior border or the centre of the eye, the heels meet or fail to meet when the limbs are folded at right angles to the body; tibia 3 to  $3\frac{1}{2}$  times as long as broad,  $2\frac{1}{2}$  to  $2\frac{3}{4}$  times in length from snout to vent, shorter than the fore limb, as long as or a little shorter than the foot. Toes rather short, the tips dilated into small discs with a groove separating the upper from the lower surface,  $\frac{2}{3}$  to  $\frac{3}{4}$  webbed, 2 phalanges of fourth free, the web not penetrating very far between the outer metatarsals; subarticular tubercles large and oval, very prominent; no tarsal fold; inner metatarsal tubercle elliptic, flat,  $\frac{1}{2}$  to  $\frac{3}{5}$  the length of the inner toe; outer tubercle, if distinct, small.

Skin smooth or with more or less numerous, small flat porous warts, which may be elongate on the anterior part of the back; a strong glandular fold above the tympanum. Lower parts smooth, except the belly and the thighs, which are feebly granulate.

Olive or dark brown above, with the warts blackish or with a few dark spots and cross-bars on the limbs, vertical bars on the upper lip, and a cross-bar between the eyes; hinder side of thighs with small whitish dots. Lower parts brownish white, the throat entirely light brown.

Males with internal vocal sacs.

Nasal bones large, in contact with each other and with the frontoparietals; ethmoid covered over. Terminal phalanges with feeble transverse distal expansion.

*Measurements in millimetres.*

|                      |    | 1.  | 2.  | 3.  | 4.  | 5. |
|----------------------|----|-----|-----|-----|-----|----|
|                      |    | ♀   | ♂   | ♂   | ♀   | ♀  |
| From snout to vent.. | .. | 125 | 80  | 72  | 64  | 61 |
| Head                 | .. | 47  | 29  | 27  | 25  | 23 |
| Width of head        | .. | 56  | 33  | 31  | 27  | 26 |
| Snout                | .. | 17  | 10  | 10  | 9   | 9  |
| Eye                  | .. | 15  | 10  | 10  | 9   | 9  |
| Interorbital width   |    | 10  | 5.5 | 5   | 4   | 4  |
| Tympanum             | .. | 6   | 5   | 4   | 3.5 | 4  |
| Fore limb            | .. | 68  | 44  | 41  | 37  | 33 |
| First finger         |    | 15  | 8   | 8   | 7   | 6  |
| Second finger        | .. | 14  | 7.5 | 7.5 | 6.5 | 6  |
| Third finger         | .. | 18  | 11  | 10  | 9   | 8  |
| Fourth finger        | .. | 14  | 7   | 7   | 6   | 6  |
| Hind limb            |    | 170 | 108 | 94  | 86  | 86 |
| Tibia                |    | 55  | 33  | 30  | 27  | 28 |
| Foot                 | .. | 57  | 36  | 31  | 29  | 28 |
| Third toe            | .. | 27  | 18  | 13  | 14  | 13 |
| Fourth toe           | .. | 36  | 24  | 21  | 19  | 19 |
| Fifth Toe            | .. | 20  | 14  | 12  | 11  | 10 |

1. Faro Id. (type). 2—4. Treasury Id. (type). 5. Solomon Ids.

This species dispenses with the ordinary metamorphoses, the young emerging from the eggs, which are laid in moist crevices of rocks close to the water, in the perfect condition, without a vestige of tail. The eggs measure 6 to 10 millim. in diameter; the advanced young, within the transparent gelatinous capsule, show no gills, but each side of the abdomen is provided with several regular transverse folds which must be regarded as breathing organs; the tip of the snout bears a small conical horny tubercle for the purpose of cutting through the egg-capsule.

*Habitat.* Solomon Islands (Faro and Treasury Islands).

*Rana ventricosa*, T. Vogt, Sitzb. Ges. Nat. Fr. Berl. 1912, p. 8, which, according to the description, differs only in having the toes entirely webbed, is from Lambassa Island.

### 55. *Rana guppyi*.

*Rana guppyi*, Bouleng., *Proc. Zool. Soc.* 1884, p. 211, *Tr. Zool. Soc.* XII, 1886, p. 48, pl. ix, and *Ann. and Mag. N.H.* (9) 1, 1918, p. 239.

Vomerine teeth in short and strong, transverse or slightly oblique, straight or curved series behind the choanae and extending outwards beyond the vertical of the inner edges of the latter, the space between the two series greater than the length of one of them. Tongue with a more or less distinct small obtuse papilla in the middle.

Head large, much depressed, broader than long; snout obtusely pointed, projecting a little beyond the mouth, much longer than the eye; canthus rostralis rather strong; loreal region very oblique, not or but feebly concave; nostril much nearer the tip of the snout than the eye; distance between the nostrils equal to or a little less than the interorbital width, which equals that of the upper eyelid; tympanum distinct,  $\frac{1}{3}$  to  $\frac{1}{2}$  the diameter of the eye,  $\frac{3}{4}$  to over its distance from the latter.

Fingers moderately long, the tips dilated into small discs, with a groove in front, separating the upper from the lower surface; first finger longer than the second, third as long as or a little longer than the snout; subarticular tubercles large and prominent.

Hind limb rather long; the tibio-tarsal articulation reaches the eye or the end of the snout, the heels meet or feebly overlap when the limbs are folded at right angles to the body; tibia 3 to  $3\frac{1}{2}$  times as long as broad,  $1\frac{1}{3}$  to  $2\frac{1}{3}$  times in length from snout to vent, shorter than the fore limb, as long as or a little shorter than the foot. Toes moderately long, the tips dilated into small discs similar to but a little larger than those of the fingers,  $\frac{3}{4}$  to entirely webbed, the web not penetrating very far between the outer metatarsals; subarticular tubercles large and oval, prominent; no tarsal fold; inner metatarsal tubercle elliptic, flat,  $\frac{2}{5}$  to  $\frac{3}{5}$  the length of the inner toe; a rather large but rather indistinct outer tubercle.

Upper parts smooth or with small warts, especially on the upper eyelids and on the sides; an interrupted glandular fold

sometimes present on each side of the anterior part of the back; a strong glandular fold above the tympanum. Lower parts smooth.

Dark olive or brown above, uniform or with rather indistinct darker spots, sometimes with vertical bars on the upper lip and cross-bars on the limbs. Lower parts white or brownish, uniform or spotted with dark brown.

Males with a large external vocal sac on each side of the throat in front of the fore limb.

Nasals very large, in contact with each other and with the frontoparietals; upper surface of ethmoid covered; zygomatic branch of squamosal rather long. Terminal phalanges with feeble transverse distal expansion.

*Measurements in millimetres.*

|                    | 1.<br>♂ | 2.<br>♀ | 3.<br>♀ | 4.<br>♂ | 5.<br>♂ | 6.<br>♀ | 7.<br>♀ | 8.<br>♀ | 9.<br>♀ | 10.<br>♀ | 11.<br>♀ | 12.<br>♂ | 13.<br>♂ |
|--------------------|---------|---------|---------|---------|---------|---------|---------|---------|---------|----------|----------|----------|----------|
| From snout to vent | 165     | 167     | 123     | 98      | 85      | 220     | 215     | 213     | 217     | 132      | 98       | 99       | 80       |
| Head               | 57      | 58      | 48      | 35      | 32      | 70      | 71      | 71      | 73      | 46       | 35       | 37       | 30       |
| Width of head.     | 68      | 69      | 52      | 39      | 35      | 83      | 83      | 85      | 84      | 55       | 40       | 40       | 32       |
| Snout              | 23      | 25      | 20      | 14      | 13      | 30      | 27      | 27      | 28      | 20       | 15       | 15       | 13       |
| Eye                | 18      | 19      | 15      | 10      | 10      | 20      | 19      | 19      | 19      | 14       | 11       | 12       | 10       |
| Interorbital width | ..      | 15      | 15      | 11      | 8       | 7       | 17      | 17      | 18      | 18       | 12       | 7        | 6        |
| Tympanum           | ..      | 6       | 7       | 5       | 4       | 4       | 8       | 8       | 9       | 5        | 4        | 4        | 4        |
| Pore limb          | 95      | 99      | 71      | 58      | 52      | 118     | 113     | 117     | 113     | 80       | 57       | 56       | 49       |
| First finger       | ..      | 23      | 22      | 16      | 13      | 12      | 27      | 27      | 28      | 27       | 18       | 13       | 11       |
| Second finger      | ..      | 19      | 19      | 13      | 11      | 11      | 23      | 22      | 25      | 23       | 17       | 12       | 11       |
| Third finger       | ..      | 26      | 26      | 20      | 15      | 14      | 30      | 28      | 30      | 29       | 22       | 15       | 14       |
| Fourth finger      | ..      | 19      | 21      | 15      | 11      | 11      | 25      | 22      | 23      | 22       | 16       | 11       | 10       |
| Hind limb          | ..      | 287     | 272     | 205     | 152     | 144     | 325     | 315     | 320     | 312      | 210      | 150      | 164      |
| Tibia              | ..      | 91      | 86      | 68      | 50      | 45      | 103     | 100     | 100     | 100      | 66       | 49       | 52       |
| Foot               | ..      | 93      | 86      | 68      | 50      | 45      | 103     | 100     | 100     | 101      | 70       | 49       | 52       |
| Third toe          | ..      | 40      | 39      | 31      | 22      | 22      | 45      | 42      | 47      | 44       | 37       | 20       | 25       |
| Fourth toe         | ..      | 59      | 55      | 44      | 35      | 33      | 64      | 62      | 65      | 68       | 46       | 31       | 35       |
| Fifth toe          | ..      | 37      | 35      | 28      | 22      | 19      | 34      | 33      | 37      | 35       | 25       | 18       | 23       |

1. Shortland Id. (type). 2—3. Faro Id. 4—10. Guadalcanar Id. 11. Rubiana Id., 12—13. Isabel Id.

One of the largest species of the genus.

*Habitat.* Solomon Islands (Faro, Shortland, New Georgia, Guadalcanar, Rubiana, and Isabel Islands).

## 56. *Rana beddomii*.

*Polypedates beddomii*, Günth., *Proc. Zool. Soc.* 1875, p. 571, pl. lxiii, fig. B.

*Polypedates brachytarsus*, Günth., *t. c.* p. 572.

*Rana beddomii*, Bouleng., *Cat. Batr. Ecaud.* pp. 55 and 461 (1882), and *Faun. Ind., Rept.* p. 453 (1890); Annand., *Rec. Ind. Mus.* XV, 1918, p. 18, pl. i, fig. 4.

Vomerine teeth in short, transverse or feebly oblique series on a level with the posterior borders of the choanae or just behind the latter, the space between the two series usually equal to or greater than the length of one of them. Tongue with a long pointed papilla in the middle.

Head much depressed, as long as broad or a little broader than long; snout rounded or obtusely pointed, feebly projecting

beyond the mouth, as long as or slightly longer than the eye; canthus rostralis obtuse; loreal region oblique, concave; nostril equidistant from the eye and from the tip of the snout; distance between the nostrils equal to or greater than the interorbital width, which is equal to or less than that of the upper eyelid; tympanum very distinct,  $\frac{1}{2}$  to  $\frac{2}{3}$  the diameter of the eye, 2 to 4 times its distance from the latter.

Fingers moderately long, sometimes with more or less feeble dermal border, the tips dilated into rather large discs, which are a little broader than long and with a groove in front, separating the upper from the lower surface; first finger as long as or a little longer than the second, third as long as or a little longer than the snout; subarticular tubercles large and very prominent.

Hind limb long; the tibio-tarsal articulation reaches the tip of the snout or beyond, rarely only the anterior border of the eye, the heels strongly overlap when the limbs are folded at right angles to the body; tibia 4 to  $4\frac{1}{2}$  times as long as broad,  $1\frac{3}{5}$  to 2 times in length from snout to vent, as long as or a little shorter than the fore limb, a little longer than the foot. Toes rather long, depressed, and dilated at the end like the fingers,  $\frac{2}{3}$  webbed, 3 phalanges of fourth free, the web reaching the discs of the third and fifth and penetrating  $\frac{1}{4}$  to  $\frac{1}{2}$  between the outer metatarsals; subarticular tubercles moderate or rather small, prominent; no tarsal fold; inner metatarsal tubercle oval or elliptic, feebly prominent,  $\frac{2}{3}$  to  $\frac{1}{2}$  the length of the inner toe; no outer tubercle.

Skin smooth or finely granulate above, with small elongate warts or short granular longitudinal folds; a strong granular fold from the eye to the shoulder. Lower parts smooth or feebly granulate on the posterior part of the belly; a discoidal ventral fold sometimes present.

Brown above, with rather indistinct darker spots, rarely uniform pinkish; a light vertebral band sometimes present; a more or less distinct dark cross-bar between the eyes; a black streak on the canthus rostralis and a dark brown or black temporal spot, the tympanum sometimes reddish; limbs with more or less distinct dark cross-bars. Lower parts uniform white, the throat rarely brown or with brown spots.

Males without vocal sacs, with an enlarged pad on the inner side of the first finger.

Nasal bones large and in contact with each other and with the frontoparietals; upper surface of ethmoid covered. Terminal phalanges T-shaped or Y-shaped.

Tadpole remarkable for its long tail, 3 times the length of the body, with mere rudiments of crests. Beak black and very narrow, the upper mandible A-shaped, the lower U-shaped; upper lip divided in the middle, with 4 series of teeth, the outer marginal, with 2 or 3 large papillae on the side; lower lip edged with papillae, with 4 series of teeth, the two outer of which are long and uninterrupted.

[Capt. R. B. Seymour Sewell, I.M.S., has recently found the

characteristic tadpoles of this species at Khandala in the Bombay Ghats. They are remarkable not only for their long tail but also for the fact that their front legs remain concealed beneath the skin for a long period. In their two-legged stage they cling to damp rocks, both horizontal and vertical, and are extremely active out of water, leaping powerfully when disturbed. *N. A.*]

Ripe uterine eggs measure 2 millim. in diameter in female 40 millim. long from snout to vent.

*Measurements in millimetres.*

|                    | 1. | 2.  | 3. | 4.  | 5.  | 6.  | 7.  | 8.  | 9. | 10. | 11. | 12. | 13. |     |
|--------------------|----|-----|----|-----|-----|-----|-----|-----|----|-----|-----|-----|-----|-----|
|                    | ♂  | ♀   | ♀  | ♂   | ♀   | ♀   | ♀   | ♀   | ♀  | ♀   | ♀   | ♀   | ♀   |     |
| From snout to vent | 33 | 47  | 56 | 40  | 47  | 38  | 56  | 46  | 40 | 35  | 68  | 45  | 35  |     |
| Head ..            | 13 | 17  | 21 | 15  | 17  | 14  | 21  | 18  | 14 | 13  | 25  | 17  | 13  |     |
| Width of head      | 13 | 17  | 22 | 15  | 17  | 14  | 23  | 18  | 14 | 13  | 28  | 17  | 13  |     |
| Snout              |    | 4.5 | 6  | 8   | 5.5 | 6   | 5   | 7   | 6  | 5   | 4.5 | 9   | 5.5 | 5   |
| Eye ..             |    | 4.5 | 6  | 7   | 5.5 | 6   | 5   | 7   | 6  | 5   | 4.5 | 9   | 5.5 | 5   |
| Interorbital width |    | 2.5 | 3  | 3.5 | 2.5 | 3   | 3   | 4.5 | 3  | 2.5 | 2   | 5   | 3   | 2.5 |
| Tympanum ..        |    | 3   | 3  | 4   | 3   | 3   | 3   | 4   | 3  | 2.5 | 2   | 6   | 3   | 3   |
| Fore limb ..       |    | 21  | 30 | 34  | 26  | 27  | 23  | 35  | 29 | 23  | 22  | 43  | 27  | 23  |
| First finger ..    |    | 4   | 5  | 7   | 5   | 5   | 4   | 7   | 5  | 4   | 4   | 9   | 5   | 4   |
| Second finger      |    | 3.5 | 5  | 6   | 4.5 | 4.5 | 3.5 | 6.5 | 5  | 4   | 4   | 8   | 4.5 | 4   |
| Third finger ..    |    | 5   | 7  | 8   | 6   | 7   | 5   | 8   | 7  | 6   | 6   | 11  | 6   | 6   |
| Fourth finger      |    | 3   | 5  | 5.5 | 4   | 4.5 | 3   | 6   | 5  | 4   | 4   | 7   | 4.5 | 4   |
| Hind limb ..       |    | 55  | 88 | 99  | 72  | 85  | 60  | 105 | 86 | 70  | 70  | 121 | 82  | 67  |
| Tibia              |    | 18  | 28 | 31  | 24  | 27  | 19  | 36  | 27 | 22  | 22  | 41  | 26  | 22  |
| Foot ..            |    | 17  | 26 | 30  | 22  | 25  | 17  | 33  | 21 | 21  | 21  | 37  | 25  | 20  |
| Third toe ..       |    | 8   | 12 | 15  | 11  | 12  | 8   | 14  | 12 | 10  | 10  | 19  | 11  | 10  |
| Fourth toe ..      |    | 12  | 17 | 19  | 11  | 17  | 11  | 20  | 17 | 14  | 14  | 25  | 17  | 14  |
| Fifth toe ..       |    | 7   | 10 | 11  | 9   | 10  | 7   | 12  | 9  | 8   | 8   | 15  | 9   | 8   |

1—2. Sivagiri hills (types). 3. Sivagiri hills (type of *P. brachytarsus*). 4—5. Anamalai hills (types). 6. Anamalai hills (type of *P. brachytarsus*). 7—10. Malabar (types). 11—12. Malabar. 13. Travancore.

*Habitat.* Forests of Southern India.

Whilst the three preceding species lead to the genus *Platymanthis*, Gthr., this and the following may be regarded as forming a group from which the genus *Cornufer*, Tschudi, is directly derived.

### 57. *Rana leithii*.

*Rana leithii*, Bouleng., *Ann. and Mag. N.H.* (6) II, 1888, p. 506, and *Faun. Ind., Rept.* p. 453 (1890).

Vomerine teeth in very short oblique series on a level with the posterior borders of the choanae, the space between the two series a little broader than one of them. Tongue with a long pointed papilla in the middle.

Head moderately depressed, as long as broad; snout rounded, scarcely projecting beyond the mouth, as long as the eye; canthus rostralis obtuse; loreal region moderately oblique, concave; nostril nearer the end of the snout than the eye; distance between the nostrils greater than the interorbital width, which is a little less than that of the upper eyelid; tympanum very distinct,  $\frac{2}{3}$  the diameter of the eye, 3 times its distance from the latter.

Fingers moderately long, the tips dilated into rather large discs, which are a little broader than long and with a groove in

front, separating the upper from the lower surface; first finger a little shorter than the second, third a little longer than the snout; subarticular tubercles moderate.

Hind limb moderately long, the tibio-tarsal articulation reaching between the eye and the tip of the snout, the heels feebly overlapping when the limbs are folded at right angles to the body; tibia 4 times as long as broad, twice in length from snout to vent, shorter than the fore limb, slightly longer than the foot. Toes moderately long, depressed, and dilated at the end like the fingers,  $\frac{3}{4}$  webbed, 3 phalanges of fourth free, the web reaching the discs of the third and fifth and not penetrating far between the outer metatarsals; subarticular tubercles moderate; no tarsal fold; inner metatarsal tubercle oval, feebly prominent,  $\frac{2}{5}$  the length of the inner toe; no outer tubercle.

Skin of back with small scattered warts, some of which are elongate; a strong glandular fold from the eye to the shoulder. Lower parts smooth.

Brown above, with small dark spots; a triangular dark spot between the eyes; upper lip with dark vertical bars; limbs with dark cross-bands. Lower parts white, throat mottled with brown.

*Measurements in millimetres.*

|                    |    |    |    |     |
|--------------------|----|----|----|-----|
| From snout to vent | .. |    |    | 32  |
| Head               |    | .. | .. | 12  |
| Width of head.     |    |    | .. | 12  |
| Snout              |    |    | .. | 4   |
| Eye..              | .. |    |    | 4   |
| Interorbital width |    |    | .. | 2   |
| Tympanum           | .. | .. |    | 2.5 |
| Fore limb          | .. | .  | .. | 19  |
| First finger       | .. |    | .. | 3   |
| Second finger      | .. |    | .. | 3.5 |
| Third finger       | .. |    | .. | 5   |
| Fourth finger      |    | .. |    | 3.5 |
| Hind limb          | .. | .. |    | 52  |
| Tibia              | .. |    | .. | 16  |
| Foot               |    | .. |    | 15  |

This species is known from a single female specimen, from Matheran near Bombay.

**58. *Rana semipalmata*.**

*Rana semipalmata*, Bouleng., *Cat. Batr. Ecaud.* p. 56, pl. iv, fig. 3 (1882), and *Faun. Ind., Rept.* p. 454 (1890); Annand. *Rec. Ind. Mus.* XV, 1918, p. 20, pl. i, fig. 3.

Vomerine teeth in short oblique series just behind the level of the choanae, the space between the two series equal to the length of one of them. Tongue with a long pointed papilla in the middle.

Head rather depressed, as long as broad; snout rounded, feebly projecting beyond the mouth, as long as the eye; canthus rostralis obtuse; loreal region moderately oblique, concave; nostril a little nearer the end of the snout than the eye; distance

between the nostrils a little greater than the interorbital width, which is equal to or a little less than that of the upper eyelid; tympanum very distinct, nearly as large as the eye and close to it.

Fingers moderately long, the tips dilated into rather large discs, which are a little broader than long and with a groove in front, separating the upper from the lower surface; first finger a little longer than the second, third a little longer than the snout; sub-articular tubercles moderate.

Hind limb rather long, the tibio-tarsal articulation reaching the tip of the snout or between the eye and the tip of the snout, the heels overlapping when the limbs are folded at right angles to the body; tibia 4 times as long as broad, nearly twice in length from snout to vent, a little shorter than the fore limb, a little longer than the foot. Toes rather long, depressed, and dilated at the end like the fingers,  $\frac{1}{2}$  webbed,  $3\frac{1}{2}$  phalanges of fourth and 2 of third and fifth free, the web penetrating barely half way down between the outer metatarsals; subarticular tubercles moderate; no tarsal fold; inner metatarsal tubercle oval, feebly prominent,  $\frac{1}{3}$  the length of the inner toe; no outer tubercle.

Skin of back with short longitudinal glandular folds; sides granulate, with small warts; a strong glandular fold from the eye to the shoulder. Lower parts smooth.

Brown above, sides of body darker; loreal and temporal regions blackish; a dark cross-bar between the eyes; limbs with dark cross-bars. Lower parts white, throat and breast mottled with brown.

Males without secondary sexual characters.

The tadpole, described by Annandale, is very similar to that referred by him to *R. leptodactyla*, but the tail is a little longer, the upper lip is broader, more than 3 times the breadth of one of the lateral lobes, the beak is brown and stouter.

*Measurements in millimetres (of types).*

|                       |    |    |    | ♂   | ♀  |
|-----------------------|----|----|----|-----|----|
| From snout to vent    | .. | .. | .. | 27  | 36 |
| Head .. ..            | .. | .. | .. | 10  | 13 |
| Width of head         |    |    | .. | 10  | 13 |
| Snout .. ..           | .. | .. | .. | 3.5 | 4  |
| Eye .. ..             | .. | .. | .. | 3.5 | 4  |
| Interorbital width .. | .. | .. | .. | 2   | 3  |
| Tympanum              | .. | .. | .. | 3   | 3  |
| Fore limb             | .. | .. | .. | 15  | 22 |
| Hind limb             | .. | .. | .. | 41  | 57 |
| Tibia .. ..           | .. | .. | .. | 13  | 19 |
| Foot .. ..            | .. | .. | .. | 12  | 17 |

*Habitat.* Malabar.

### 59. *Rana leptodactyla*.

*Polypedates brevipalmatus*, Günth., *Proc. Zool. Soc.* 1875, p. 572.

*Rana leptodactyla*, Bouleng., *Cat. Batr. Ecaud.* p. 57 (1882), and *Faun.*

*Ind.*, *Rept.* p. 454 (1890); Boettg., *Ber. Offenb. Ver. Nat.* 1892, p. 95;

Annand., *Rec. Ind. Mus.* XV, 1918, p. 19, pl. i, fig. 2.

Vomerine teeth in short transverse or feebly oblique series or small feeble groups on a level with the posterior borders of the choanae or just behind them, the distance between the two series equal to or a little less than the length of one of them. Tongue with a long pointed papilla in the middle.

Head rather strongly depressed, as long as broad or a little broader than long; snout rounded, feebly projecting beyond the mouth, as long as or a little shorter than the eye; canthus rostralis very obtuse or indistinct; loreal region oblique, concave; nostril equidistant from the eye and from the tip of the snout; distance between the nostrils a little greater than the inter-orbital width, which is equal to or a little less than that of the upper eyelid; tympanum very distinct,  $\frac{1}{2}$  to  $\frac{3}{5}$  the diameter of the eye, 1 to 3 times its distance from the latter.

Fingers moderately long, the tips dilated into rather large discs, which are a little broader than long and with a groove in front, separating the upper from the lower surface; first finger shorter than the second, third a little longer than the snout; sub-articular tubercles moderately large, not very prominent.

Hind limb long; the tibio-tarsal articulation reaches the tip of the snout or beyond, rarely between the eye and the tip of the snout, the heels strongly overlap when the limbs are folded at right angles to the body; tibia 4 to 5 times as long as broad,  $1\frac{1}{2}$  to  $1\frac{3}{4}$  times in length from snout to vent, as long as or a little longer or a little shorter than the fore limb, slightly longer than the foot. Toes rather long, depressed, and dilated at the end like the fingers,  $1\frac{1}{4}$  webbed or the web reduced to a mere rudiment, and not penetrating or scarcely penetrating between the outer metatarsals, subarticular tubercles rather small, feebly prominent; no tarsal fold; inner metatarsal tubercle elliptic, feebly prominent,  $\frac{1}{2}$  to  $\frac{3}{5}$  the length of the inner toe; no outer tubercle.

Skin of back with short longitudinal glandular folds; sides granulate, with flat warts; a strong glandular fold from the eye to the shoulder. Lower parts smooth, or posterior part of belly feebly granulate.

Olive or brownish above, mottled with darker; a more or less distinct subtriangular dark spot between the eyes, often limited in front by a light cross-bar; a black streak along the canthus rostralis and a black temporal spot; a light vertebral band sometimes present; limbs with dark cross-bars. Lower parts white, uniform or spotted with brown, sometimes brown dotted with white.

Males without secondary sexual characters.

Skeleton as in *R. beddomii*.

The tadpole referred to this species by Annandale is pretty normal in shape, the tail about  $1\frac{3}{4}$  times as long as the body and ending in a blunt point; but the mouth-disc is very remarkable, without horny teeth; the upper lip forms a crescentic membrane which can be closed down over the mouth, the lower is divided into three lobes, and there is a large, rounded lateral lobe; all fringed with pointed papillae; papillae are scattered on

the inner side of the lobes ; beak minutely serrated, edged with black. The upper surface and the tail are yellow, with boldly contrasting black markings.

The ova in the uterus measure  $1\frac{1}{2}$  millim. in a female 30 millim. long from snout to vent.

*Measurements in millimetres.*

|                       | 1.<br>♂ | 2.<br>♀ | 3.<br>♀ | 4.<br>♀ | 5.<br>♀ | 6.<br>♀ | 7.<br>♀ |
|-----------------------|---------|---------|---------|---------|---------|---------|---------|
| From snout to vent    | 33      | 45      | 30      | 36      | 34      | 32      | 35      |
| Head .. ..            | 13      | 15      | 12      | 14      | 13      | 13      | 13      |
| Width of head         | 13      | 17      | 12      | 14      | 13      | 13      | 14      |
| Snout ..              | 4       | 6       | 4       | 5       | 4       | 4       | 4       |
| Eye .. ..             | 4       | 6       | 4       | 5       | 4       | 4       | 5       |
| Interorbital width .. | 2.5     | 2.5     | 2       | 2.5     | 2.5     | 2.5     | 3       |
| Tympanum              | 2.5     | 3       | 2       | 2.5     | 2.5     | 2.5     | 2.5     |
| Fore limb ..          | 21      | 28      | 17      | 23      | 21      | 21      | 23      |
| First finger          | 3       | 4       | 3       | 4       | 3       | 3       | 3       |
| Second finger         | 4       | 5       | 4       | 4.5     | 4       | 4       | 4       |
| Third finger          | 5       | 7       | 4       | 6       | 5       | 5       | 6       |
| Fourth finger         | 4       | 5       | 3       | 4       | 4       | 4       | 4       |
| Hind limb             | 62      | 88      | 52      | 68      | 62      | 62      | 72      |
| Tibia .. ..           | 20      | 27      | 17      | 22      | 20      | 20      | 24      |
| Foot                  | 19      | 26      | 16      | 21      | 19      | 19      | 22      |
| Third toe .. ..       | 9       | 11      | 7       | 10      | 9       | 9       | 10      |
| Fourth toe .. ..      | 12      | 16      | 11      | 14      | 12      | 12      | 14      |
| Fifth toe .. ..       | 6       | 9       | 5       | 7       | 6       | 6       | 7       |

1—3. Malabar (types). 4—5. Malabar. 6. Anamalai hills (type). 7. Devicolum, Travancore.

*Habitat.* Forests of Southern India.

### 60. *Rana diplosticta*.

*Ixalus diplostictus*, Günth., *Proc. Zool. Soc.* 1875, p. 574, pl. lxiii, fig. C.  
*Rana diplosticta*, Bouleng., *Cat. Batr. Ecaud.* p. 58 (1882), and *Faun. Ind., Rept.*, p. 455 (1890).

Vomerine teeth, if distinct, in very feeble oblique groups just behind the level of the posterior borders of the choanae. Tongue with a long pointed papilla in the middle.

Head moderately depressed, as long as broad ; snout rounded, feebly projecting beyond the mouth, as long as the eye ; canthus rostralis obtuse ; loreal region feebly oblique, feebly concave ; nostril a little nearer the tip of the snout than the eye ; distance between the nostrils equal to the interorbital width or the width of the upper eyelid ; tympanum very distinct, a little more than  $\frac{1}{2}$  the diameter of the eye,  $1\frac{1}{2}$  to 2 times its distance from the latter.

Fingers moderately long, the tips dilated into rather large discs, which are a little broader than long and with a groove in front, separating the upper from the lower surface ; first finger shorter than the second, third as long as or a little longer than the snout ; subarticular tubercles moderately large, not very prominent.

Hind limb long ; the tibio-tarsal articulation reaches the tip of the snout or beyond, rarely between the eye and the tip of the snout, the heels strongly overlap when the limbs are folded

at right angles to the body ; tibia  $3\frac{1}{2}$  to 4 times as long as broad,  $1\frac{1}{2}$  to nearly 2 times in length from snout to vent, as long as or a little longer or a little shorter than the fore limb, as long as or a little longer than the foot. Toes rather long, depressed, and dilated at the end like the fingers,  $\frac{1}{4}$  webbed, the web not penetrating between the outer metatarsals ; subarticular tubercles rather small, feebly prominent ; no tarsal fold ; inner metatarsal tubercle elliptic, feebly prominent,  $\frac{1}{2}$  the length of the inner toe ; no outer tubercle.

Skin smooth above, with fine interrupted longitudinal glandular folds on the back ; sides granulate ; a strong glandular fold from the eye to the shoulder. Lower parts smooth.

Grey or pinkish brown above ; snout lighter, bordered by a dark cross-bar between the eyes ; a broad black canthal streak and a black temporal spot ; usually a few large black spots on the sides, one, above the groin, being constant ; limbs with regular dark cross-bands. Lower parts brownish, belly sometimes with small white spots.

Males without secondary sexual characters.

Eggs very large, 2 millim. in diameter in uterus of female measuring 27 millim. from snout to vent.

*Measurements in millimetres.*

|                    |    | 1.<br>♂ | 2.<br>♀ | 3.<br>♀ | 4.<br>♀ |
|--------------------|----|---------|---------|---------|---------|
| From snout to vent | .. | 25      | 27      | 25      | 35      |
| Head               |    | 10      | 11      | 10      | 13      |
| Width of head      | .. | 10      | 11      | 10      | 13      |
| Snout              |    | 3.5     | 4       | 3.5     | 4       |
| Eye                | .. | 3.5     | 4       | 3.5     | 4       |
| Interorbital width |    | 2       | 2.5     | 2       | 3       |
| Tympanum           | .. | 2       | 2.5     | 2       | 2.5     |
| Fore limb          |    | 14      | 16      | 15      | 19      |
| First finger       |    | 2       | 2.5     | 2.5     | 3       |
| Second finger      | .. | 2.5     | 3       | 3       | 4       |
| Third finger       | .. | 3.5     | 4       | 4       | 5.5     |
| Fourth finger      | .. | 2       | 3       | 3       | 3       |
| Hind limb          | .. | 44      | 45      | 51      | 69      |
| Tibia              |    | 14      | 14      | 16      | 23      |
| Foot               | .. | 13      | 14      | 15      | 19      |
| Third toe          | .. | 6       | 6       | 6       | 9       |
| Fourth toe         | .. | 8       | 9       | 9       | 12      |
| Fifth toe          | .. | 3.5     | 4       | 4       | 7       |

1—3. Malabar (types). 4. Anamalai hills.

*Habitat.* Malabar.

### 61. *Rana phrynoderma*.

*Rana phrynoderma*, Bouleng., *Cat. Batr. Ecaud.* p. 462 (1882), and *Faun. Ind., Rept.* p. 455 (1890).

Vomerine teeth in short transverse or slightly oblique series on a level with the posterior borders of the choanae, the distance between the two series equal to the length of one of them. Tongue with a long pointed papilla in the middle.

Head rather strongly depressed, as long as broad or a little broader than long, snout rounded, feebly projecting beyond the mouth, as long as the eye; canthus rostralis very obtuse or indistinct; loreal region oblique, concave; nostril equidistant from the eye and from the tip of the snout; distance between the nostrils greater than the interorbital width, which is a little less than that of the upper eyelid; tympanum moderately distinct, about  $\frac{3}{5}$  the diameter of the eye and 1 to  $1\frac{1}{2}$  times its distance from the latter.

Fingers moderately long, the tips dilated into rather large discs, which are a little broader than long and with a groove in front, separating the upper from the lower surface; first finger shorter than the second, third slightly longer than the snout; sub-articular tubercles moderately large, not very prominent.

Hind limb long; the tibio-tarsal articulation reaches the tip of the snout or a little beyond, the heels strongly overlap when the limbs are folded at right angles to the body; tibia 4 times as long as broad,  $1\frac{3}{5}$  to  $1\frac{3}{4}$  times in length from snout to vent, nearly as long as the fore limb, a little longer than the foot. Toes rather long, depressed, and dilated at the end like the fingers, with a mere rudiment of web, which does not penetrate between the outer metatarsals, subarticular tubercles rather small, feebly prominent; no tarsal fold; inner metatarsal tubercle elliptic, feebly prominent,  $\frac{1}{2}$  to  $\frac{3}{5}$  the length of the inner toe; no outer tubercle.

Upper parts covered with strong warts of different sizes and short glandular folds; a strong glandular fold from the eye to the shoulder. Belly granulate.

Dark greyish brown above, with obsolete darker spots; limbs with regular dark cross-bars. Lower parts brown, dotted with whitish.

Males without secondary sexual characters.

*Measurements in millimetres.*

|                    |    |    | 1.<br>♂ | 2.<br>♂ | 3.<br>♂ |
|--------------------|----|----|---------|---------|---------|
| From snout to vent | .. | .. | 35      | 32      | 35      |
| Head               | .. | .. | 15      | 13      | 14      |
| Width of head      | .. | .. | 15      | 13      | 16      |
| Snout              | .. | .. | 4.5     | 4       | 4.5     |
| Eye                | .. | .. | 4.5     | 4       | 4.5     |
| Interorbital width | .. | .. | 2.5     | 2       | 2.5     |
| Tympanum           | .. | .. | 2.5     | 2.5     | 2.5     |
| Fore limb          | .. | .. | 21      | 19      | 21      |
| First finger       | .. | .. | 3       | 2.5     | 2.5     |
| Second finger      | .. | .. | 4       | 3.5     | 3.5     |
| Third finger       | .. | .. | 5       | 4.5     | 5       |
| Fourth finger      | .. | .. | 3.5     | 2.5     | 3       |
| Hind limb          | .. | .. | 61      | 52      | 63      |
| Tibia              | .. | .. | 20      | 18      | 22      |
| Foot               | .. | .. | 18      | 16      | 19      |
| Third toe          | .. | .. | 9       | 6       | 9       |
| Fourth toe..       | .. | .. | 11      | 10      | 11      |
| Fifth toe          | .. | .. | 6       | 5       | 7       |

1—2. Types.

*Habitat.* Anamalai hills, Malabar.

Subgenus **Hylorana**.Tschudi, *Class. Batr.* p. 37 (1838).

Tips of toes, or of fingers and toes, dilated into more or less distinct discs bearing a crescentic or horseshoe-shaped groove separating the upper from the lower surface<sup>1</sup>; outer metatarsals separated nearly to the base, or, rarely, bound together in their basal half; omosternal style not forked at the base, sometimes with a very small notch; terminal phalanges with feeble transverse expansion, or T-shaped with the transverse limb short or long.

I. Discs of fingers, if present, without the above-mentioned groove, or with the groove very indistinct.

A. Fingers obtuse, first not longer than second, with a rudiment of pollex projecting as a knob or spine; tibio-tarsal articulation reaching eye or between eye and nostril; heels not overlapping; tibia 3 times as long as broad; head broader than long, loreal region nearly vertical; tympanum  $\frac{2}{3}$  to  $\frac{3}{4}$  diameter of eye; toes  $\frac{3}{4}$  or nearly entirely webbed; dorso-lateral fold incomplete or absent; male without vocal sacs, with a large gland above axil ... *R. holsti*, Blgr.

B. Fingers with swollen tips, first longer than second; tibio-tarsal articulation reaching tympanum or eye; heels not or but feebly overlapping; tibia 4 to  $4\frac{1}{2}$  times as long as broad; head large; loreal region oblique; tympanum  $\frac{3}{4}$  to once diameter of eye; toes  $\frac{3}{4}$  or nearly entirely webbed; dorso-lateral fold narrow; male with internal vocal sacs ... *R. curtipes*, Jerd.

C. Fingers with swollen or dilated tips; heels overlapping; head moderately large, not broader than long.

1. Fingers with the tips merely swollen, first longer than second; dorso-lateral fold extending to hip, or broken up behind the sacrum.

a. Toes  $\frac{2}{3}$  to nearly entirely webbed; tibia 4 to 5 times as long as broad,  $1\frac{3}{4}$  to 2 times in length from snout to vent.

Vomerine teeth in long and strong series touching the anterior corners of the choanae; head a little longer than broad; snout longer than eye; loreal region moderately oblique; tympanum  $\frac{2}{3}$  to  $\frac{6}{7}$  diameter of eye; tibio-tarsal articulation reaching between eye and tip of snout; dorso-lateral fold narrow or rather broad; male with external vocal sacs and a humeral gland... *R. guentheri*, Blgr.

Vomerine teeth in oblique groups usually extending beyond level of posterior borders of choanae; head as long as broad; snout not longer than eye; loreal region moderately oblique; tympanum  $\frac{2}{3}$  to  $\frac{2}{3}$  diameter of eye; tibio-tarsal articulation reaching nostril or tip of snout; dorso-lateral fold broad or rather broad; male with internal vocal sacs and a humeral gland ... *R. mortenseni*, Blgr.

Vomerine teeth in oblique groups extending more or less beyond level of posterior borders of choanae; head as long as broad or slightly longer; snout not longer than eye; loreal region feebly oblique; tympanum  $\frac{1}{3}$  to  $\frac{2}{3}$  diameter of eye; tibio-tarsal articulation reaching eye or between eye and tip of snout; dorso-lateral fold very broad; male with internal vocal sacs and no humeral or cubital gland ... *R. latouchii*, Blgr.

<sup>1</sup> Absent in some specimens of *R. curtipes*.

- Vomerine teeth in oblique groups just behind level of choanae; head as long as broad; snout longer than eye; loreal region moderately oblique; tympanum nearly as large as eye; tibio-tarsal articulation reaching beyond tip of snout; male with internal vocal sacs and a cubital gland ... .. *R. cubitalis*, M. Smith.
- b. Toes  $\frac{1}{2}$  to  $\frac{2}{3}$  webbed; tibia  $1\frac{1}{3}$  to a little less than 2 times in length from snout to vent; tympanum  $\frac{2}{3}$  to  $\frac{5}{8}$  diameter of eye; vomerine teeth in oblique groups or series between the choanae; dorso-lateral fold moderate or rather broad.
- Loreal region moderately oblique; interorbital region a little narrower than the upper eyelid; tibia 3 to 4 times as long as broad; male with internal vocal sacs and a very large gland on each side above and behind the shoulder ... .. *R. adenopleura*, Blgr.
- Loreal region feebly oblique or nearly vertical; interorbital region as broad as or a little broader than the upper eyelid; tibia 4 to  $4\frac{1}{2}$  times as long as broad; male with external vocal sacs ... .. *R. gracilis*, Gravh.
- c. Toes nearly entirely webbed; tibia  $1\frac{1}{3}$  times in length from snout to vent; loreal region vertical; tympanum  $\frac{3}{8}$  diameter of eye; vomerine teeth in oblique groups between and extending a little beyond the choanae; dorso-lateral fold narrow ... .. *R. elberti*, Roux.
2. Fingers with the tips swollen into small discs; loreal region feebly oblique or nearly vertical; tympanum  $\frac{3}{8}$  to nearly once diameter of eye.
- Tibio-tarsal articulation reaching tip of snout or a little beyond; tibia  $4\frac{1}{2}$  to  $5\frac{1}{2}$  times as long as broad; toes  $\frac{2}{3}$  webbed; first finger not longer than second; vomerine teeth extending considerably beyond level of posterior borders of choanae; dorso-lateral fold very narrow... .. *R. sauteri*, Blgr.
- Tibio-tarsal articulation reaching eye or nostril; tibia  $3\frac{1}{2}$  to 4 times as long as broad; toes webbed to the discs of the third and fifth; first finger a little longer than second; vomerine teeth between or just behind posterior borders of choanae; dorso-lateral fold rather broad; male with internal vocal sacs and a humeral gland ... .. *R. nigrovittata*, Blyth.
- Tibio-tarsal articulation reaching eye or between eye and nostril; tibia 4 to  $4\frac{1}{2}$  times as long as broad; toes  $\frac{1}{2}$  to  $\frac{2}{3}$  webbed; first finger much longer than second; vomerine teeth between the choanae, or extending a little beyond; dorso-lateral fold broad; male with external vocal sacs and a humeral gland ... .. *R. leptoglossa*, Cope.
11. Discs of fingers bearing a groove separating the upper from the lower surface.
- A. Tips of fingers and toes dilated into small discs which are not twice as broad as the narrowest part of the corresponding penultimate phalanx.
1. A glandular dorso-lateral fold.
- a Vomerine teeth in strong oblique series nearly touching anterior corners of choanae; first finger longer than second; tibia 4 to  $4\frac{1}{2}$  times as long as broad; no outer metatarsal tubercle; tympanum  $\frac{2}{3}$  to  $\frac{3}{4}$  diameter of eye; male with external vocal sacs and a humeral gland.
- Head as long as broad; loreal region moderately oblique; interorbital region as broad as upper eyelid; tibio-tarsal articulation reaching nostril; tibia shorter than foot; toes nearly entirely webbed ... .. *R. humeralis*, Blgr.
- Head as long as broad; loreal region more oblique; interorbital region narrower than upper eyelid; tibio-tarsal articulation reaching eye; tibia longer than foot; toes  $\frac{2}{3}$  webbed ... .. *R. miopus*, Blgr.
- Head longer than broad; loreal region feebly oblique; interorbital region as broad as upper eyelid; tibio-tarsal articulation reaching between eye and tip of

- snout; tibia as long as foot; toes nearly entirely webbed ... *R. oatesii*, Blgr.
- b. Vomerine teeth in short groups or series remote from the anterior corners of the choanae.
- a. Tibia as long as or shorter than foot; first finger as long as or a little longer than second; head longer than broad; tympanum  $\frac{2}{3}$  to once diameter of eye.
- Tibio-tarsal articulation reaching eye or tip of snout; tibia 4 to  $4\frac{1}{2}$  times as long as broad; toes  $\frac{2}{3}$  to nearly entirely webbed; dorso-lateral fold broad; male with internal vocal sacs and no humeral gland ... *R. crythraea*, Schleg.
- Tibio-tarsal articulation reaching tip of snout or beyond; tibia  $4\frac{1}{2}$  to  $5\frac{1}{2}$  times as long as broad; toes  $\frac{1}{2}$  webbed; dorso-lateral fold narrow; male without vocal sacs or humeral gland... *R. macrodactyla*, Gthr.
- Tibio-tarsal articulation reaching between eye and tip of snout; tibia 6 times as long as broad; toes  $\frac{2}{3}$  webbed; dorso-lateral fold narrow ... *R. aurantiaca*, Blgr.
- Tibio-tarsal articulation reaching far beyond tip of snout; toes  $\frac{3}{4}$  webbed; dorso-lateral fold narrow ... *R. sanguinea*, Boettg.
- β. Tibia usually longer than foot, never shorter; first finger longer than second; tympanum  $\frac{3}{5}$  to once diameter of eye.
- \*Dorso-lateral fold narrow or moderately broad; male with internal vocal sacs and a humeral gland.
- Head as long as broad or a little longer than broad; vomerine teeth extending beyond level of posterior borders of choanae; tibio-tarsal articulation reaching nostril, tip of snout, or a little beyond; tibia 4 to  $4\frac{1}{2}$  times as long as broad; discs of third and fourth fingers not more than  $\frac{1}{3}$  diameter of tympanum; toes  $\frac{3}{4}$  webbed ... *R. temporalis*, Gthr.
- Head as long as broad or a little longer than broad; vomerine teeth not extending beyond level of posterior borders of choanae; tibio-tarsal articulation reaching tip of snout; tibia 5 to  $5\frac{1}{2}$  times as long as broad; discs of third and fourth fingers  $\frac{2}{5}$  to  $\frac{1}{2}$  diameter of tympanum; toes  $\frac{3}{4}$  webbed ... *R. florensis*, Blgr.
- Head longer than broad; tibio-tarsal articulation reaching nostril or tip of snout; tibia 5 to  $5\frac{1}{2}$  times as long as broad; discs of third and fourth fingers  $\frac{1}{3}$  to  $\frac{2}{5}$  diameter of eye; toes  $\frac{1}{2}$  to  $\frac{2}{3}$  webbed ... *R. nicobariensis*, Stol.
- \*\*Dorso-lateral fold narrow; head longer than broad; tibio-tarsal articulation reaching tip of snout or beyond; tibia 5 to 6 times as long as broad; toes  $\frac{3}{4}$  webbed; male with internal vocal sacs and no humeral gland.
- Loreal region nearly vertical, deeply concave; tibia  $1\frac{1}{2}$  to  $1\frac{3}{4}$  times in length from snout to vent ... *R. varians*, Blgr.
- Loreal region feebly oblique, moderately concave; tibia  $1\frac{2}{3}$  to  $1\frac{6}{7}$  times in length from snout to vent ... *R. alticola*, Blgr.
- \*\*\*Dorso-lateral fold broad; head longer than broad; tibio-tarsal articulation reaching nostril ... *R. celebensis*, Peters.
- γ. Tibia longer than foot, 4 to 5 times as long as broad; tympanum  $\frac{1}{2}$  diameter of eye; dorso-lateral fold narrow.
- First finger as long as second; discs of fingers smaller than those of the toes ... *R. garoensis*, Blgr.
- First finger longer than second; discs of fingers as large as those of the toes; male with external vocal sacs and no humeral gland ... *R. nasica*, Blgr.
2. Glandular dorso-lateral fold absent or represented by a chain of large warts.
- a. Toes entirely webbed; outer metatarsal tubercle absent or very indistinct.
- a. First finger much longer than second;

- tibio-tarsal articulation reaching between eye and tip of snout, tip of snout, or slightly beyond; tibia 3 to 4 times as long as broad; tympanum  $\frac{2}{3}$  to  $\frac{3}{4}$  diameter of eye; male with external vocal sacs and a humeral gland ... *R. arfaki*, A. B. Mey.
- B.* First finger as long as or a little longer than second; tibio-tarsal articulation reaching tip of snout or a little beyond.
- Tympanum  $\frac{2}{3}$  to  $\frac{1}{2}$  diameter of eye; interorbital region as broad as or a little broader than upper eyelid; tibia 4 to 5 times as long as broad; male with internal vocal sacs and no humeral gland ... *R. andersonii*, Blgr.
- Tympanum  $\frac{3}{4}$  size of eye; interorbital space a little narrower than upper eyelid ... *R. schmackeri*, Boettg.
- b.* Toes not more than  $\frac{3}{4}$  webbed; an outer metatarsal tubercle.
- a.* Tibio-tarsal articulation reaching considerably beyond tip of snout; first finger slightly longer than second; toes  $\frac{1}{2}$  webbed; tympanum  $\frac{1}{2}$  diameter of eye ... *R. ijimæ*, Stejn.
- B.* Tibio-tarsal articulation not reaching beyond tip of snout; first finger longer than second; tympanum  $\frac{2}{3}$  to  $\frac{3}{4}$  diameter of eye.
- \*Toes  $\frac{2}{3}$  to  $\frac{3}{4}$  webbed; outer metatarsals separated nearly to the base; tibia 4 to  $5\frac{1}{2}$  times as long as broad; male with internal vocal sacs.
- Interorbital space a little narrower than the upper eyelid; head a little longer than broad; male without humeral gland ... *R. signata*, Gthr.
- Interorbital space as broad as or a little narrower than the upper eyelid; head as long as broad; male with a humeral gland ... *R. picturata*, Blgr.
- Interorbital space nearly twice as broad as the upper eyelid ... *R. moellendorffi*, Boettg.
- \*\*Toes not more than  $\frac{2}{3}$  webbed; outer metatarsals separated nearly to the base; first finger much longer than second; head as long as broad or broader than long; male with external vocal sacs and a humeral gland.
- Toes  $\frac{1}{2}$  to  $\frac{2}{3}$  webbed; an outer metatarsal tubercle; tibia 4 to  $4\frac{1}{2}$  times as long as broad ... *R. glandulosa*, Blgr.
- Toes  $\frac{1}{3}$  webbed; no outer metatarsal tubercle ... *R. baramica*, Boettg.
- \*\*\*Toes less than  $\frac{1}{2}$  webbed; outer metatarsals bound together in basal third.
- Head as long as broad; tibia 3 to 4 times as long as broad; toes  $\frac{1}{3}$  webbed; male without vocal sacs, without humeral gland ... *R. luctuosa*, Peters.
- Head longer than broad; tibia 5 times as long as broad; toes  $\frac{1}{4}$  webbed ... *R. debussyi*, v. Kamp.
- B.* Tips of fingers dilated into moderate or rather large discs, as large as or smaller than those of the toes, the width of which equals at least twice that of the narrowest part of the penultimate phalanx.
1. Discs of fingers smaller than those of the toes; tibia usually more than  $1\frac{1}{2}$  times in length from snout to vent; a glandular dorso-lateral fold; head as long as broad or longer than broad; tympanum  $\frac{2}{3}$  to once diameter of eye.
- a.* Male with large external vocal sacs and a humeral gland; tibia 4 to  $4\frac{1}{2}$  times as long as broad.
- Tibio-tarsal articulation reaching beyond tip of snout; heels strongly overlapping; tibia  $1\frac{1}{2}$  to  $1\frac{3}{4}$  times in length from snout to vent ... *R. grisea*, v. Kamp.
- Tibio-tarsal articulation reaching eye or between eye and nostril; heels more or less overlapping; tibia 2 to a little over 2 times in length from snout to vent... *R. krefftii*, Blgr.
- b.* Male with vocal sacs internal, exceptionally external but feebly developed; no humeral gland.
- Tibio-tarsal articulation reaching nostril, tip of snout, or beyond; heels strongly overlapping; tibia 4 to  $5\frac{1}{2}$

- times as long as broad,  $1\frac{1}{2}$  to  $1\frac{6}{7}$  times in length from snout to vent ... *R. papua*, Less.
- Tibio-tarsal articulation reaching eye or between eye and nostril; heels feebly overlapping; tibia  $3\frac{1}{2}$  to 4 times as long as broad, 2 to  $2\frac{1}{8}$  times in length from snout to vent ... *R. daemeli*, Sldr.
2. Discs of fingers as large as those of the toes; no complete dorso-lateral fold; tibio-tarsal articulation reaching tip of snout or a little beyond; tibia  $3\frac{1}{2}$  to 5 times as long as broad,  $1\frac{2}{3}$  to 2 times in length from snout to vent; tympanum  $\frac{1}{2}$  diameter of eye; male with large external vocal sacs and a humeral gland ... *R. swinhoana*, Blgr.
3. Discs of fingers as large as or a little smaller than those of toes; tibio-tarsal articulation reaching far beyond tip of snout; tibia 6 to  $7\frac{1}{2}$  times as long as broad,  $1\frac{1}{4}$  to  $1\frac{1}{2}$  times in length from snout to vent; tympanum  $\frac{1}{2}$  to  $\frac{2}{3}$  diameter of eye; male with external vocal sacs and no humeral gland.
- No dorso-lateral fold; nostril slightly nearer eye than tip of snout; tympanum deeply sunk ... *R. cavitympanum*, Blgr.
- Dorso-lateral fold, if present, not extending to sacrum; nostril nearer tip of snout than eye ... *R. whiteheadi*, Blgr.
- Dorso-lateral fold extending to hip; nostril equally distant from eye and from tip of snout, or a little nearer latter ... *R. jerboa*, Gthr.
- C. Tips of fingers dilated into large or rather large discs, larger than those of the toes, the width of which equals at least twice that of the narrowest part of the penultimate phalanx.
1. Glandular dorso-lateral fold more or less distinct, at least anteriorly.
- a. First finger as long as or slightly shorter than second; tibia 4 to 6 times as long as broad.
- a. Male with internal vocal sacs; dorso-lateral fold feebly prominent and usually incomplete.
- Tibio-tarsal articulation reaching beyond tip of snout; toes entirely webbed; head as long as broad or slightly longer; tympanum  $\frac{2}{5}$  to  $\frac{3}{5}$  diameter of eye; male without humeral gland ... *R. hosii*, Blgr.
- Tibio-tarsal articulation reaching tip of snout or not quite so far or a little beyond; toes webbed to the discs of the third and fifth; head longer than broad; tympanum  $\frac{2}{3}$  to  $\frac{5}{6}$  diameter of eye; male without humeral gland ... *R. chalconota*, Schleg.
- Tibio-tarsal articulation reaching nostril or tip of snout; toes  $\frac{2}{3}$  webbed; head as long as broad; snout shorter than eye; tympanum  $\frac{1}{2}$  diameter of eye; male with a humeral gland ... *R. macrops*, Blgr.
- b. Male with external vocal sacs and no humeral gland; tibio-tarsal articulation reaching beyond tip of snout; toes entirely or nearly entirely webbed; head as long as broad or a little longer.
- Dorso-lateral fold distinct only anteriorly; tympanum  $\frac{2}{3}$  to  $\frac{3}{4}$  diameter of eye ... *R. graminea*, Blgr.
- Dorso-lateral fold narrow, complete; tympanum  $\frac{1}{3}$  to  $\frac{1}{2}$  diameter of eye ... *R. monticola*, And.
- b. First finger shorter than second; dorso-lateral fold narrow, complete, tibio-tarsal articulation reaching beyond tip of snout.
- First finger a little shorter than second; tibia 6 times as long as broad,  $1\frac{1}{2}$  to  $1\frac{3}{5}$  times in length from snout to vent; toes nearly entirely webbed; head as long as broad; tympanum  $\frac{1}{3}$  to  $\frac{2}{5}$  diameter of eye ... *R. gerbillus*, Annand.
- First finger a little shorter than second; tibia 6 to  $6\frac{1}{2}$  times as long as broad,  $1\frac{1}{3}$  to  $1\frac{3}{5}$  times in length from snout to vent; toes webbed to the discs of the third and fifth; head as long as broad or slightly longer; tympanum  $\frac{2}{5}$  to  $\frac{2}{3}$  diameter of eye ... *R. luzonensis*, Blgr.

- First finger much shorter than second; tibia  $1\frac{3}{4}$  times as long from snout to vent; toes nearly entirely webbed; head longer than broad; tympanum  $\frac{5}{8}$  diameter of eye ... *R. mearnsii*, Stejn.
2. Glandular dorso-lateral fold absent; toes entirely or nearly entirely webbed.
- a. Tympanum very distinct,  $\frac{1}{3}$  to  $\frac{4}{5}$  diameter of eye; discs of fingers not broader than long.
- a. Tibio-tarsal articulation reaching between eye and nostril; belly granulate.
- Tibia 5 times as long as broad,  $1\frac{4}{5}$  times in length from snout to vent; first finger as long as second; tympanum  $\frac{4}{5}$  diameter of eye; back smooth ... *R. everetti*, Blgr.
- Tibia  $2\frac{1}{5}$  times in length from snout to vent; first finger longer than second; tympanum  $\frac{1}{2}$  diameter of eye; head and back very rough with large tubercles ... *R. ishikawa*, Stejn.
- β. Tibio-tarsal articulation reaching beyond tip of snout; tibia  $1\frac{1}{2}$  to  $1\frac{3}{4}$  times in length from snout to vent.
- First finger as long as second; tibia  $5\frac{1}{2}$  to 6 times as long as broad; tympanum  $\frac{3}{8}$  diameter of eye; belly smooth ... *R. crassiovis*, Blgr.
- First finger shorter than second; tibia 6 times as long as broad; tympanum  $\frac{2}{3}$  diameter of eye; belly granulate ... *R. kampeni*, Blgr.
- First finger as long as or longer than second, tympanum  $\frac{1}{2}$  to  $\frac{2}{3}$  diameter of eye; belly granulate; male with external vocal sacs ... *R. livida*, Blyth.
- β. Tympanum more or less distinct, or obscured by granules, not  $\frac{1}{2}$  diameter of eye; discs of fingers very large, often broader than long, with a transverse groove on the upper surface, corresponding to the long horizontal limb of the terminal phalanx; first finger as long as or shorter than second.
- a. Third finger not more than twice as long as snout, first with well-developed terminal disc; foot shorter than tibia.
- Snout shorter than eye; tibio-tarsal articulation reaching tip of snout or not quite so far; tibia  $3\frac{1}{3}$  to 4 times as long as broad,  $1\frac{4}{5}$  to 2 times in length from snout to vent; male without vocal sacs ... *R. ricketti*, Blgr.
- Snout as long as eye; tibio-tarsal articulation reaching beyond tip of snout; tibia 4 to  $5\frac{1}{2}$  times as long as broad,  $1\frac{3}{5}$  to  $1\frac{2}{3}$  times in length from snout to vent; male with external vocal sacs ... *R. latopalmata*, Blgr.
- β. Third finger more than twice as long as snout.
- Vomerine teeth present; first finger with the tip merely swollen; tibio-tarsal articulation reaching beyond tip of snout; tibia 4 to  $4\frac{1}{2}$  times as long as broad,  $1\frac{1}{2}$  to  $1\frac{2}{3}$  times in length from snout to vent; foot shorter than tibia; male with internal vocal sacs ... *R. himalayana*, Blgr.
- Vomerine teeth present; first finger with the tip merely swollen; tibio-tarsal articulation reaching nostril or tip of snout; tibia  $4\frac{1}{2}$  to  $5\frac{1}{2}$  times as long as broad,  $1\frac{2}{3}$  to  $1\frac{5}{6}$  times in length from snout to vent; foot as long as or slightly shorter than tibia; male with internal vocal sacs ... *R. formosa*, Gthr.
- Vomerine teeth absent; first finger with well-developed terminal disc; tibio-tarsal articulation reaching tip of snout or slightly beyond; tibia 4 times as long as broad,  $1\frac{2}{3}$  to  $1\frac{5}{6}$  times in length from snout to vent; foot shorter than tibia ... *R. hainanensis*, Blgr.

The classification of the numerous species included in this subgenus presents great difficulties. A linear arrangement is best based on the degree of specialization of the fingers and toes, as expressing the general drift of evolution, and this has been

carried out as far as it is possible in a group which is manifestly of polyphyletic origin.

The species may be grouped under ten sections :—

A. RANAE HOLSTIANAE. Fingers simply obtuse, not at all dilated at the end : a projecting rudiment of pollex ; discs of toes small.

*R. holsti*.

B. RANAE CURTIPEDES. An aberrant type, answering, according to individuals, the definition of both *Rana* and *Hylorana*.

*R. curtipes*.

C. RANAE GRACILES. Fingers with swollen or dilated tips without the groove which is present on the feebly dilated tips of the toes.

*R. guentheri*, *R. mortenseni*, *R. latouchii*, *R. cubitalis*, *R. adeno-pleura*, *R. gracilis*, *R. elberti*, *R. sauteri*, *R. nigrovittata*, *R. leptoglossa*.

D. RANAE ERYTHRAEAE. Fingers with discs similar to and not larger than those of the toes, which are not twice as broad as the penultimate joint ; transverse distal expansion of terminal phalanx feeble ; dorso-lateral fold present.

*R. humeralis*, *R. miopus*, *R. oalesii*, *R. erythraea*, *R. macrodactyla*, *R. aurantiaca*, *R. sanguinea*, *R. temporalis*, *R. florensis*, *R. nicobariensis*, *R. varians*, *R. alticola*, *R. celebensis*, *R. garoensis*, *R. nasica*.

E. RANAE LUCTUOSAE. As in the preceding, but dorso-lateral fold absent or reduced to a chain of large warts.

*R. arfaki*, *R. andersonii*, *R. schmackeri*, *R. ijimae*, *R. signata*, *R. picturata*, *R. moellendorffi*, *R. glandulosa*, *R. baramica*, *R. luctuosa*, *R. debussyi*.

F. RANAE PAPUAE. As in D, but discs of toes at least twice as broad as the penultimate joint.

*R. grisea*, *R. krefftii*, *R. papua*, *R. daemeli*.

G. RANAE SWINHOANAE. As in the preceding, but dorso-lateral fold incomplete.

*R. swinhoana*.

H. RANAE JERBOAE. As in F, but hind limb extremely elongate and dorso-lateral fold present or absent.

*R. cavitympanum*, *R. whiteheadi*, *R. jerboa*.

I. RANAE CHALCONOTAE. Fingers with discs similar to those of the toes, but larger, with the transverse limb of the T-shaped terminal phalanx well developed, but not longer than the longitudinal limb ; dorso-lateral fold present or absent.

*R. hosii*, *R. chalconota*, *R. macrops*, *R. graminea*, *R. monticola*, *R. luzonensis*, *R. gerbillus*, *R. mearnsii*, *R. everetti*, *R. ishikavae*, *R. crassiovis*, *R. kampeni*, *R. livida*.

K. RANAE FORMOSAE. Discs of fingers larger still, with longer transverse limb to the T-shaped terminal phalanx; dorso-lateral fold absent.

*R. ricketti*, *R. latopalmata*, *R. himalayana*, *R. formosa*, *R. hainanensis*.

## 62. *Rana holsti*.

*Rana holsti*, Bouleng., *Ann. and Mag. N.H.* (6) X, 1892, p. 302; Stejneger., *Herp. Jap.* p. 105, fig. (1907).

*Rana subaspera*, Barbour, *Proc. Biol. Soc. Wash.* XXI, 1908, p. 189, and *Proc. N. Engl. Zool. Club*, IV, 1909, p. 58.

*Babina holsti*, Van Denburgh, *Proc. Calif. Ac.* (4) III, 1912, p. 197.

*Babina subaspera*, Van Denburgh, *t.c.* p. 199.

Vomerine teeth in oblique groups behind the level of the choanae, equally distant from each other and from the latter.

Head moderately depressed, broader than long; snout rounded, feebly projecting beyond the mouth, as long as the eye; canthus rostralis obtuse; loreal region nearly vertical, slightly concave; nostril a little nearer the end of the snout than the eye; distance between the nostrils equal to the interorbital width, which equals or slightly exceeds that of the upper eyelid; tympanum distinct (sometimes nearly hidden in *R. subaspera* according to Van Denburgh),  $\frac{2}{3}$  to  $\frac{3}{4}$  the diameter of the eye,  $1\frac{1}{2}$  to 3 times its distance from the latter.

Fingers moderately long, obtuse, first much longer than the second, third longer than the snout, second and third with a dermal margin on the inner side; subarticular tubercles strong, prominent; inner metacarpal forming a very prominent knob.

Hind limb moderately long, the tibio-tarsal articulation reaching the eye or between the eye and the nostril, the heels meeting or not when the limbs are folded at right angles to the body; tibia 3 times as long as broad, half length of head and body, or less, shorter than the fore limb, slightly longer than the foot. Toes with the tips dilated into small discs which are longer than broad and with a groove separating the upper from the lower surface,  $\frac{1}{4}$  or nearly entirely webbed, one or two phalanges of fourth free (merely margined); web separating the outer metatarsals for about  $\frac{3}{4}$  of their length; subarticular tubercles strong; no tarsal fold; inner metatarsal tubercle elliptic, not very prominent,  $\frac{3}{8}$  to  $\frac{2}{3}$  the length of the inner toe; no outer tubercle.

Back with a few scattered small warts, or (*R. subaspera*) with numerous low, prominent warts; body and limbs with whitish, pearl-like excrescences; glandular dorso-lateral fold present or absent; if present, originating above the tympanum and broken up behind; the distance between the folds, on the scapular region,  $4\frac{1}{2}$  times in length from snout to vent; a glandular fold from below the eye to above the arm.

Olive above, sides with blackish spots; a dark streak from the nostril to the eye and a blackish temporal spot; tympanum reddish brown; a light streak from below the eye to the angle of the mouth; limbs with dark cross-bars; hinder side of thighs marbled with black. Lower parts dirty white, with brown dots or marblings, or throat entirely dark brown.

Males without vocal sacs; a large kidney-shaped gland above the axil; light-coloured spine-like asperities on the two inner fingers, on the inner side of the arms, and sprinkled over the entire chest and throat; the inner metacarpal bone forms a spine which may pierce the skin.

Nasal bones moderately large and separated from each other.

*Measurements of the type specimen, in millimetres.*

|                    |    |    |     |
|--------------------|----|----|-----|
| From snout to vent | .. | ♀  | 120 |
| Head               | .. | .. | 37  |
| Width of head      | .. |    | 44  |
| Snout              |    | .. | 13  |
| Eye                | .. | .. | 13  |
| Interorbital width |    | .. | 11  |
| Tympanum           | .. | .. | 8   |
| Fore limb          |    |    | 70  |
| First finger       |    | .. | 16  |
| Second finger      |    |    | 12  |
| Third finger       |    | .. | 18  |
| Fourth finger      | .. |    | 12  |
| Hind limb          | .. | .. | 170 |
| Tibia              | .. | .. | 58  |
| Foot               | .. | .. | 55  |
| Third toe          |    | .. | 27  |
| Fourth toe         | .. | .. | 42  |
| Fifth toe          | .. | .. | 30  |

*Habitat.* Loo Choo Islands (Okinawa and Onami Oshima).

According to Van Denburgh, *R. subaspera* differs from *R. holsti* only in its more warty skin, and this does not seem to me to justify the specific distinction.

The above description is drawn up from the type specimen, the only one I have seen, and from the accounts given by Barbour and Van Denburgh, the latter having had the privilege of examining an abundant material.

I believe this remarkable form to be directly derived from relatives of *R. temporaria*. I have recently given my reasons for not accepting Van Denburgh's genus *Babina* (cf. *C.R. Ac. Sc. Paris*, clxv, 1917, p. 98).

### 63. *Rana curtipes*.

*Rana curtipes*, Jerdon, *Journ. As. Soc. Beng.* XXII, 1853, p. 532; Boulenger, *Cat. Batr. Ecaud.* p. 61 (1882), and *Faun. Ind., Rept.* p. 458 (1890); Rao, *Rec. Ind. Mus.* X, 1914, p. 265.

*Pachybatrachus robustus*, Mivart, *Proc. Zool. Soc.* 1868, p. 557, fig.

*Clinotarsus robustus*, Mivart, *Proc. Zool. Soc.* 1869, p. 227.

*Hylorana curtipes*, Jerdon, *Proc. As. Soc. Beng.* 1870, p. 83.

Vomerine teeth in oblique series or feeble groups on a level with the posterior borders of the choanae, sometimes very indistinct or absent.

Head large and strongly depressed, as long as broad or a little broader than long, broader than the body; snout rounded or obtusely pointed, moderately or feebly projecting, as long as or slightly longer than the eye; canthus rostralis distinct; loreal region oblique, concave; nostril nearer the tip of the snout than the eye; distance between the nostrils equal to or less than the interorbital width, which is equal to or greater than that of the upper eyelid; tympanum very distinct,  $\frac{3}{4}$  to once the diameter of the eye, close to it or separated from it by a space not exceeding  $\frac{1}{2}$  its diameter.

Fingers rather slender, swollen at the end, first longer than the second, third usually longer than the snout; subarticular tubercles large and very prominent.

Hind limb rather short and thin; tibio tarsal articulation reaching the tympanum or the eye, heels meeting or feebly overlapping when the limbs are folded at right angles to the body; tibia 4 to  $4\frac{1}{2}$  times as long as broad,  $2\frac{1}{4}$  to  $2\frac{1}{2}$  times in length from snout to vent, much shorter than the fore limb, a little longer than the foot. Toes rather short, the tips dilated into very small discs which are longer than broad, with or without a feeble groove between the upper and the lower surface,  $\frac{3}{4}$  to nearly entirely webbed, the web extending to the discs of the third and fifth, and penetrating about  $\frac{2}{3}$  down between the outer metatarsals; subarticular tubercles moderately large, very prominent; no tarsal fold; inner metatarsal tubercle oval, very prominent,  $\frac{2}{3}$  to  $\frac{1}{2}$  the length of the inner toe; no outer tubercle.

Skin smooth; a narrow but rather prominent glandular dorso-lateral fold, from above the tympanum to the groin; another, oblique, behind the tympanum to above the fore limb; the distance between the dorso-lateral folds, or the sacral region,  $\frac{1}{6}$  to  $\frac{1}{8}$  the length of head and body.

Grey, pale brown, or crimson above, with or without scattered small black spots, the sides darker brown to black; a blackish oblique spot or band below the eye; the temporal region sometimes lighter than the sides behind it; upper lip with a blackish margin; limbs dark purplish brown, without cross-bands; light brown to dark brown beneath, black in the young.

Males with internal vocal sacs; the fore limb more robust; a small patch of grey velvety rugosities on the inner metacarpal tubercle and on the inner side of the first finger.

Nasal bones moderately large, separated from each other and from the ethmoid, which is exposed and truncate in front; frontoparietals broad and flat; zygomatic branch of the squamosal not longer than the posterior. Terminal phalanges feebly expanded at the end.

Tadpole remarkable for the presence of a more or less distinct oval parotoid gland on each side, which persists in the young and sometimes even in half-grown specimens; the tail obtusely pointed and about  $1\frac{1}{2}$  times as long as the body. Beak edged with black; labial teeth in 8 upper and 8 lower series, the outer upper

marginal, followed by 2 uninterrupted series and 5 series on each side, the lower all long and uninterrupted or only the innermost narrowly interrupted; lower lip and sides of upper bordered by papillae. Dark brown, with small black spots on the tail.

Eggs very small, measuring 1 to  $1\frac{1}{2}$  millim. in uterus of females 75 to 85 millim. long from snout to vent.

*Measurements, in millimetres.*

|                    | 1.<br>♂ | 2.<br>♂ | 3.<br>♀ | 4.<br>♀ | 5.<br>♀ | 6.<br>♀ | 7.<br>♀ | 8.<br>♀ |
|--------------------|---------|---------|---------|---------|---------|---------|---------|---------|
| From snout to vent | 55      | 42      | 76      | 75      | 64      | 85      | 75      | 63      |
| Head               | 21      | 15      | 27      | 26      | 24      | 27      | 25      | 22      |
| Width of head      | 21      | 15      | 30      | 27      | 24      | 31      | 28      | 25      |
| Snout              | 8       | 5       | 9       | 9       | 8       | 9       | 9       | 7       |
| Eye                | 7       | 5       | 9       | 9       | 8       | 9       | 9       | 7       |
| Interorbital width | 4.5     | 4.5     | 8       | 8       | 6       | 9       | 9       | 6       |
| Tympanum           | 6       | 5       | 7       | 7       | 6       | 7       | 7       | 6       |
| Fore limb          | 35      | 28      | 48      | 47      | 43      | 53      | 47      | 42      |
| First finger       | 6       | 5       | 11      | 10      | 8       | 11      | 10      | 8       |
| Second finger      | 5       | 4.5     | 9       | 8       | 7       | 9       | 8       | 7       |
| Third finger       | 8       | 6.5     | 14      | 11      | 10      | 13      | 13      | 10      |
| Fourth finger      | 6       | 4.5     | 9       | 8       | 7       | 9       | 8       | 7       |
| Hind limb          | ..      | 74      | 55      | 109     | 105     | 89      | 115     | 105     |
| Tibia              | ..      | 23      | 17      | 34      | 33      | 28      | 37      | 33      |
| Foot               | ..      | 21      | 16      | 33      | 30      | 26      | 33      | 30      |
| Third toe          | ..      | 9       | 7       | 16      | 14      | 12      | 16      | 15      |
| Fourth toe         | ..      | 15      | 11      | 23      | 22      | 19      | 26      | 23      |
| Fifth toe          | ..      | 10      | 7       | 16      | 15      | 12      | 17      | 15      |

1-5. Malabar. 6. Sircee, S. Canara. 7. Piermerd, Travancore. 8. ? (type of *Pachybatrachus robustus*).

*Habitat.* Malabar hills, from Canara to Travancore.

This *Rana* is unlike any other in form, suggesting *Leptobrachium hasseltii*. It might as well be placed in the subgenus *Rana*, with which some specimens agree entirely in the shape of the toes, whilst others show a groove on the terminal discs, thus constituting a connecting link between the subgenera *Rana* and *Hylarana*. The presence of a parotoid gland in the larva and young is peculiar to some of the species included in the latter subgenus, e.g. *R. alticola*, and this consideration has determined its allocation. The coloration is also unique in the genus *Rana* in the upper parts being lighter than the lower, and in the temporal region being sometimes lighter than the sides, thus standing in comparison to *R. temporalis* like positive and negative in photography.

[The young frog of this species frequently attains a relatively large size before losing the vestiges of its tail. N. A.]

#### 64. *Rana guentheri*.

*Hylarana albolabris*, part., Günth. *Cat. Batr. Sal.* p. 143 (1858).

? *Hylarana malabarica* (non D. et B.), Steind. *Novara, Amph.*, p. 48 (1867).

*Rana guentheri*, Bouleng. *Cat. Batr. Ecaud.* p. 48, pl. iv, fig. 2 (1882): Boettg. *Ber. Offenb. Ver. Nat.* 1888, p. 95; Bouleng. *Proc. Zool. Soc.* 1897, p. 481; Wolterst. *Abh. Mus. Magdeb.* I, 1906, p. 144.

*Rana elegans*, Bouleng. *Cat.* p. 59, pl. v, fig. 1.

*Rana guentheri*, part., Bouleng. *Ann. Mus. Genova* (2) XIII, 1893, p. 331.

Vomerine teeth in long and strong, more or less oblique series between the choanæ, touching the anterior corners of the latter.

Head much depressed, a little longer than broad; snout acutely or obtusely pointed, strongly projecting beyond the mouth, longer than the eye; canthus rostralis distinct; loreal region moderately oblique, concave; nostril much nearer the tip of the snout than the eye; distance between the nostrils equal to or a little greater than the interorbital width, which equals or a little exceeds that of the upper eyelid; tympanum very distinct,  $\frac{2}{3}$  to  $\frac{4}{7}$  the diameter of the eye, 2 to 3 times its distance from the latter.

Fingers rather long, the tips swollen, first longer than the second, third longer than the snout; subarticular tubercles rather large, prominent.

Hind limb long, the tibio-tarsal articulation reaching between the eye and the tip of the snout, the heels strongly overlapping when the limbs are folded at right angles to the body; tibia 4 to 5 times as long as broad,  $1\frac{5}{8}$  to 2 times in length from snout to vent, shorter than the fore limb, as long as or a little longer or a little shorter than the foot. Toes rather long, the tips dilated into very small discs with a groove separating the upper from the lower surface,  $\frac{3}{4}$  webbed, 2 phalanges of fourth free, the web reaching the discs of the third and fifth and penetrating almost to the base of the outer metatarsals; subarticular tubercles rather small, prominent; no tarsal fold; inner metatarsal tubercle oval, feebly prominent,  $\frac{1}{3}$  to  $\frac{2}{5}$  the length of the inner toe; a very small and sometimes rather indistinct outer tubercle.

Skin smooth; a narrow or rather broad glandular dorso-lateral fold from above the tympanum to the groin, the distance between these folds  $\frac{1}{8}$  to  $\frac{1}{5}$  the length of head and body; another fold from below the eye to the shoulder. Lower parts smooth.

Greyish brown or reddish brown above, back uniform or with dark brown spots; a dark brown or black streak or band on each side of the head and back, passing through the eye and bordering the dorso-lateral fold; tympanum dark brown or reddish brown, edged with white in front and behind; limbs with dark cross-bands; hinder side of thighs marbled black and yellow. Lower parts white, throat or breast usually brown or mottled with brown.

Males with an external vocal sac on each side of the throat and a large flat gland at the base of the arm.

Nasal bones small, oblique, widely separated from each other and from the ethmoid, which is largely exposed and truncate in front; zygomatic branch of squamosal rather long. Terminal phalanges feebly expanded at the end.

*Measurements, in millimetres.*

|                       | 1.<br>♀ | 2.<br>♀ | 3.<br>♂ | 4.<br>♂ | 5.<br>♀ | 6.<br>♂ | 7.<br>♂ | 8.<br>♀ | 9.<br>♀ |
|-----------------------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| From snout to vent .. | 83      | 62      | 80      | 60      | 65      | 68      | 75      | 72      | 70      |
| Head ..               | 27      | 22      | 27      | 22      | 21      | 23      | 26      | 23      | 23      |
| Width of head ..      | 26      | 19      | 26      | 20      | 19      | 20      | 24      | 20      | 22      |
| Snout                 | 12      | 9       | 11      | 8       | 8       | 9       | 10      | 9       | 10      |

|                       | 1,<br>♀ | 2,<br>♀ | 3.<br>♂ | 4.<br>♂ | 5.<br>♀ | 6.<br>♂ | 7.<br>♂ | 8.<br>♀ | 9.<br>♀ |
|-----------------------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| Eye ..                | 9       | 7       | 9       | 7       | 7       | 7       | 8       | 8       | 8       |
| Interorbital width .. | 5       | 4       | 5       | 4       | 5       | 5       | 5       | 5       | 4       |
| Tympanum ..           | 7       | 5.5     | 6       | 5       | 5       | 6       | 5       | 5       | 6       |
| Fore limb             | 51      | 36      | 49      | 36      | 42      | 41      | 48      | 42      | 42      |
| First finger          | 12      | 9       | 12      | 9       | 10      | 10      | 12      | 11      | 10      |
| Second finger         | 10      | 8       | 10      | 7       | 8       | 8       | 10      | 9       | 9       |
| Third finger          | 14      | 11      | 14      | 10      | 12      | 12      | 13      | 12      | 12      |
| Fourth finger         | 10      | 7       | 10      | 7       | 9       | 8       | 9       | 9       | 9       |
| Hind limb             | 125     | 107     | 126     | 101     | 109     | 112     | 124     | 115     | 115     |
| Tibia                 | 42      | 33      | 43      | 31      | 35      | 37      | 39      | 36      | 36      |
| Foot ..               | 38      | 34      | 44      | 32      | 35      | 37      | 41      | 38      | 38      |
| Third toe             | 24      | 18      | 25      | 18      | 19      | 20      | 23      | 20      | 21      |
| Fourth toe.           | 32      | 29      | 38      | 29      | 30      | 33      | 35      | 32      | 32      |
| Fifth toe             | 27      | 21      | 27      | 20      | 22      | 23      | 25      | 22      | 22      |

1-2. Amoy (types). 3-5. Man Son Mts., Tonkin. 6. Chang Nam, Anam. 7-9. ? (types of *R. elegans*).

*Habitat.* China (Hong Kong, Canton, Amoy, Hainan, Sze Chuen), Tonkin, and Anam.

### 65. *Rana mortenseni*.

*Rana guentheri*, part., Bouleng. *Ann. Mus. Genova* (2) XIII, 1893, p. 331.

*Rana mortenseni*, Bouleng. *Ann. and Mag. N.H.* (7) XII, 1903, p. 219.

*Rana nigrovittata* (non Bouleng.), Malcolm Smith, *Journ. N. H. Soc. Siam*, 11. 1916, p. 42, pl. —

Vomerine teeth in small groups between the choanæ or short oblique series usually extending beyond the level of their posterior borders, nearer to each other than to the latter.

Head much depressed, as long as broad; snout rounded, feebly projecting beyond the mouth, as long as the eye; canthus rostralis distinct; loreal region moderately oblique, concave; nostril a little nearer the tip of the snout than the eye; distance between the nostrils greater than the interorbital width, which equals that of the upper eyelid; tympanum very distinct,  $\frac{3}{8}$  to  $\frac{2}{3}$  the diameter of the eye, 4 times its distance from the latter.

Fingers moderately long, the tips swollen, first longer than the second, third longer than the snout; subarticular tubercles rather large, prominent.

Hind limb long, the tibio-tarsal articulation reaching the nostril or the tip of the snout, the heels strongly overlapping when the limbs are folded at right angles to the body; tibia 4 to  $4\frac{1}{2}$  times as long as broad,  $1\frac{3}{4}$  to 2 times in length from snout to vent, shorter than the fore limb, as long as or slightly longer than the foot. Toes rather long, the tips dilated into small discs with a groove separating the upper from the lower surface,  $\frac{3}{4}$  to nearly entirely webbed, 1 or 2 phalanges of fourth free, the web reaching the discs of the third and fifth and penetrating almost to the base of the outer metatarsals; subarticular tubercles rather small, prominent; no tarsal fold; inner metatarsal tubercle oval, feebly prominent,  $\frac{2}{3}$  to  $\frac{1}{2}$  the length of the inner toe; a small round outer tubercle.

Skin more or less distinctly granulate above, with or without small flat warts; a rather broad and very prominent glandular dorso-lateral fold from above the tympanum, sometimes interrupted on the iliac region; the distance between the folds, on the back,  $\frac{1}{2}$  the distance from snout to vent; a second glandular fold from below the eye to the shoulder. Lower parts smooth.

Brown above, darker on the sides; a dark streak from the tip of the snout, through the eye, along the outer border of the dorso-lateral fold; limbs with dark cross-bands. Throat and breast brown, belly white.

Males with internal vocal sacs. Fore limbs strong and with an oval gland at the base of the arm; a strong pad on the inner side of the first finger.

Skull as in *R. guentheri*.

The tadpole has been described by Malcolm Smith as that of *R. nigrovittata*. Tail about twice as long as the body, bluntly pointed. Beak broadly edged with black and finely serrated; upper lip with a long continuous row of horny teeth, followed by a second row broadly interrupted by the beak; lower lip with 3 long rows of teeth, the innermost narrowly interrupted in the middle, and with a double row of papillæ.

*Measurements, in millimetres.*

|                       | 1.  | 2.  | 3.  | 4.  | 5. | 6. |
|-----------------------|-----|-----|-----|-----|----|----|
|                       | ♂   | ♂   | ♀   | ♀   | ♂  | ♀  |
| From snout to vent    | 61  | 71  | 68  | 67  | 50 | 50 |
| Head                  | 22  | 25  | 23  | 23  | 18 | 17 |
| Width of head ..      | 22  | 25  | 23  | 23  | 18 | 17 |
| Snout ..              | 7   | 9   | 8   | 8   | 6  | 6  |
| Eye ..                | 7   | 9   | 8   | 8   | 6  | 6  |
| Interorbital width .. | 4   | 6   | 4   | 4   | 3  | 3  |
| Tympanum ..           | 4   | 6   | 5   | 5   | 4  | 4  |
| Fore limb ..          | 36  | 45  | 42  | 42  | 33 | 31 |
| First finger ..       | 8   | 11  | 9   | 10  | 7  | 7  |
| Second finger         | 6.5 | 9   | 8   | 8   | 6  | 6  |
| Third finger          | 10  | 12  | 11  | 12  | 8  | 8  |
| Fourth finger         | 6   | 8   | 6   | 7   | 6  | 5  |
| Hind limb             | 100 | 124 | 110 | 114 | 80 | 81 |
| Tibia                 | 33  | 40  | 37  | 38  | 25 | 26 |
| Foot                  | 32  | 38  | 33  | 35  | 24 | 24 |
| Third toe ..          | 17  | 21  | 17  | 18  | 12 | 12 |
| Fourth toe ..         | 27  | 32  | 27  | 29  | 21 | 21 |
| Fifth toe ..          | 18  | 22  | 18  | 21  | 15 | 14 |

1. Koh Chang Id., S.E. Siam (type). 2—4. Koh Chang Id. 5—6. N. Siam.

*Habitat.* Siam and Karin hills between Siam and Burma.

Distinguished from *R. guentheri* by the more posterior position of the vomerine teeth, the shorter snout, the larger discs of the toes, and the absence of external vocal sacs.

## 66. *Rana latouchii*.

*Rana latouchii*, Bouleng. *Proc. Zool. Soc.* 1899, p. 167, pl. xix, fig. 1, and *Ann. and Mag. N.H.* (8) IV, 1909, p. 495; Werner, *Mitth. Nat. Mus. Hamb.* XXX, 1913, p. 47.

Vomerine teeth in oblique groups or short series between the choanæ, extending more or less beyond the level of their posterior borders.

Head much depressed, as long as broad or slightly longer than broad; snout rounded or obtusely pointed, projecting more or less beyond the mouth, as long as or slightly shorter than the eye; canthus rostralis distinct; loreal region feebly oblique, concave; nostril nearer the end of the snout than the eye; distance between the nostrils greater than the interorbital width, which equals or is a little less than that of the upper eyelid; tympanum very distinct,  $\frac{1}{3}$  to  $\frac{2}{3}$  the diameter of the eye and 3 to 5 times its distance from the latter.

Fingers rather slender, with feebly swollen tips, first longer than the second, third much longer than the snout; subarticular tubercles large, very prominent.

Hind limb moderately long, the tibio-tarsal articulation reaching the eye or between the eye and the tip of the snout, the heels overlapping when the limbs are folded at right angles to the body; tibia 4 to  $4\frac{1}{2}$  times as long as broad, about twice in length from snout to vent, shorter than the fore limb, as long as or slightly shorter than the foot. Toes rather slender, the tips dilated into very small discs with a groove between the upper and the lower surface,  $\frac{2}{3}$  to  $\frac{3}{4}$  webbed, 2 or 3 phalanges of fourth free; outer metatarsals separated nearly to the base; subarticular tubercles moderate, very prominent; no tarsal fold; inner metatarsal tubercle oval or elliptic, prominent,  $\frac{2}{5}$  to  $\frac{1}{2}$  the length of the inner toe; a very prominent, round outer tubercle.

Upper parts smooth or finely granulate, some males rough with small spinose tubercles; a very prominent and very broad glandular dorso-lateral fold, from above the tympanum, broken up behind the sacral region, its greatest width at least equal to that of the upper eyelid; the distance between the folds, on the back,  $\frac{1}{6}$  to  $\frac{1}{5}$  the length from snout to vent; two strong glands behind the angle of the mouth; lower parts smooth.

Greyish olive or pale brown above, uniform or with irregular darker spots; sides with black spots; a dark streak on the canthus rostralis and, usually, a dark temporal blotch, which may be continued along the side of the body; a white streak on the upper lip; limbs with dark cross-bands; hinder side of thighs with black spots. Lower parts white, uniform or with some greyish spots on the throat and breast.

Males with internal vocal sacs, with very thick fore limbs and a strong pad on the inner side of the first finger, covered with a yellowish velvet-like horny layer.

Nasal bones rather small, widely separated from each other and from the frontoparietals; ethmoid exposed in front. Terminal phalanges feebly expanded at the end.

*Measurements, in millimetres.*

|                    | 1.  | 2.  | 3.  | 4.  | 5.  | 6.  | 7.  | 8.  |
|--------------------|-----|-----|-----|-----|-----|-----|-----|-----|
|                    | ♂   | ♂   | ♀   | ♂   | ♂   | ♂   | ♂   | ♀   |
| From snout to vent | 37  | 37  | 45  | 47  | 43  | 42  | 40  | 55  |
| Head ..            | 13  | 13  | 14  | 17  | 15  | 15  | 15  | 19  |
| Width of head      | 13  | 13  | 14  | 17  | 15  | 15  | 14  | 19  |
| Snout              | 4   | 4   | 5   | 6   | 5.5 | 5.5 | 5.5 | 6.5 |
| Eye                | 5   | 4.5 | 5   | 6   | 5.5 | 5.5 | 5.5 | 6.5 |
| Interorbital width | 3   | 3   | 3.5 | 3.5 | 3   | 3.5 | 3   | 4.5 |
| Tympanum           | 2.5 | 2.5 | 3   | 3.5 | 3.5 | 3.5 | 3   | 4.5 |
| Fore limb          | 26  | 24  | 30  | 29  | 27  | 27  | 27  | 34  |
| First finger ..    | 5   | 4.5 | 7   | 7   | 5.5 | 6   | 5.5 | 8   |
| Second finger      | 4   | 4   | 5.5 | 5   | 4.5 | 5   | 4.5 | 6   |
| Third finger       | 7   | 6   | 8   | 8   | 7   | 7   | 7   | 10  |
| Fourth finger      | 4   | 3   | 5   | 5   | 4   | 4.5 | 4   | 5   |
| Hind limb          | 64  | 59  | 75  | 73  | 69  | 70  | 66  | 86  |
| Tibia              | 19  | 19  | 23  | 23  | 21  | 22  | 20  | 27  |
| Foot               | 21  | 19  | 24  | 24  | 22  | 22  | 21  | 27  |
| Third toe ..       | 11  | 10  | 13  | 13  | 12  | 12  | 12  | 14  |
| Fourth toe         | 18  | 17  | 20  | 20  | 19  | 19  | 17  | 22  |
| Fifth toe          | 11  | 10  | 13  | 14  | 13  | 12  | 12  | 15  |

1-3. Kuatun, Fokien (types). 4-8. Fuhosho, Formosa.

*Habitat.* China (N.W Fokien) and Formosa.**.67. *Rana cubitalis*.***Rana cubitalis*, Malcolm Smith, *Journ. N.H. Soc. Siam*, II, 1917, p. 277.

Vomerine teeth in two short, slightly oblique series just behind the level of the choanæ, equally distant from them and from each other.

Head much depressed, as long as broad; snout obtusely pointed, strongly projecting beyond the mouth, a little longer than the eye; canthus rostralis strong; loreal region oblique, deeply concave; nostril equally distant from the eye and from the tip of the snout; distance between the nostrils greater than the interorbital width, which is a little less than that of the upper eyelid; tympanum very distinct, nearly as large as the eye and close to it.

Fingers rather slender, merely swollen at the end, first much longer than the second, third longer than the snout; subarticular tubercles moderately large, very prominent.

Hind limb long, the tibio-tarsal articulation reaching a little beyond the tip of the snout, the heels strongly overlapping when the limbs are folded at right angles to the body; tibia  $4\frac{1}{2}$  times as long as broad,  $1\frac{3}{4}$  times in length from snout to vent, as long as the fore limb, longer than the foot. Toes moderately long, the tips dilated into small discs which are a little longer than broad, with a feeble groove between the upper and lower surface, extensively webbed, the membrane reaching the discs of the third and fifth but reduced to a narrow fringe on the penultimate phalanx of the fourth and separating the outer metatarsals down to their basal fourth; subarticular tubercles moderately large, very prominent; no tarsal fold; inner metatarsal tubercle elliptic,  $\frac{2}{5}$  the length of the first toe; a prominent outer tubercle.

Skin of upper parts rough with very small granules intermixed with small glands irregular in size ; some of the glands confluent into longitudinal folds on the hind limbs ; a moderately broad but very prominent glandular dorso-lateral fold from above the tympanum to the hip, somewhat broken up behind the sacral region ; these folds, as well as the glands on the upper parts and on the sides of the belly, closely studded with very minute spinules. Lower parts smooth, with feebly prominent granules on the posterior part of the belly and of the thighs.

Light olive (in life, according to Malcolm Smith) above and on the sides, with an irregular chain of small black spots along each flank ; a dark streak along the canthus rostralis and dark spots on the lips ; tympanum dark brown ; limbs with dark cross-bars ; back of thighs marbled with dark brown. Lower parts whitish.

Male with internal vocal sacs and a round flat gland on each side of the breast, in front of the base of the arm ; fore limb very strong, with a strong pad on the inner side of the first finger ; this pad covered with fine velvet-like nuptial excrescences which extend as a broad band on the inner side of the fore-arm, expanding into a large round gland near its articulation with the arm.

*Measurements of the type specimen, in millimetres.*

|                    |    |     |
|--------------------|----|-----|
| From snout to vent | .. | 70  |
| Head ..            | .  | 22  |
| Width of head      |    | 22  |
| Snout              |    | 9   |
| Eye ..             | .. | 7   |
| Interorbital width |    | 4   |
| Tympanum           | .. | 6   |
| Fore limb          | .. | 47  |
| First finger       | .. | 9   |
| Second finger      |    | 7   |
| Third finger       |    | 13  |
| Fourth finger      | .. | 6   |
| Hind limb          |    | 125 |
| Tibia              | .. | 41  |
| Foot               | .. | 37  |
| Third toe          | .. | 20  |
| Fourth toe         | .. | 32  |
| Fifth toe          | .  | 22  |

*Habitat.* Doi Nga Chang, N. Siam, at about 1600 ft. elevation. Described from the type specimen (male) presented by Dr. Malcolm Smith to the British Museum.

## 68. *Rana adenopleura*.

*Rana adenopleura*, Bouleng. *Ann. and Mag. N.H* (8) IV 1909, p. 492.

Vomerine teeth in small oblique groups between the choanæ, nearer to each other than to the latter.

Head as long as broad, moderately depressed ; snout obtusely pointed, feebly projecting beyond the mouth, as long as the eye ; canthus rostralis obtuse ; loreal region moderately oblique, concave ; nostril equidistant from the eye and from the tip of the snout ;

distance between the nostrils greater than the interorbital width, which is a little less than that of the upper eyelid; tympanum very distinct,  $\frac{2}{3}$  to  $\frac{5}{8}$  the diameter of the eye and 2 to 4 times its distance from the latter.

Fingers rather slender, with slightly swollen tips, first a little longer than the second, third longer than the snout; subarticular tubercles strong, prominent.

Hind limb long, the tibio-tarsal articulation reaching the tip of the snout or between the eye and the tip of the snout, the heels strongly overlapping when the limbs are folded at right angles to the body; tibia 3 to 4 times as long as broad, a little less than twice in length from snout to vent, a little shorter than the fore limb, as long as the foot. Toes slender, the tips dilated into small discs with a groove separating the upper from the lower surface,  $\frac{1}{2}$  to  $\frac{2}{3}$  webbed, 2 or 3 phalanges of fourth free, the web separating the outer metatarsals almost to the base; subarticular tubercles moderate; no tarsal fold; inner metatarsal tubercle oval,  $\frac{1}{3}$  or  $\frac{2}{3}$  the length of the inner toe; a more or less distinct, small, round outer tubercle.

Skin smooth; a moderately broad, very prominent glandular dorso-lateral fold from above the tympanum to the groin; the distance between the folds, or the back,  $4\frac{1}{2}$  to  $5\frac{1}{2}$  times in length from snout to vent.

Greyish brown above, with or without darker spots or marblings, with or without a light vertebral line; a more or less distinct dark band on each side of the head, passing through the eye; a whitish streak along the upper lip; dorso-lateral fold dark edged; limbs with dark cross-bars; hinder side of thighs yellowish, spotted or marbled with brown or black. Lower parts white, throat sometimes brownish.

Males with internal vocal sacs and a very large flat gland on each side above and behind the shoulder; first finger with a feeble pad on the inner side, covered with a velvet-like greyish layer.

Nasal bones large and in contact with each other, separated from the frontoparietals, which do not cover the ethmoid in front; zygomatic branch of squamosal not longer than the posterior. Terminal phalanges with feeble transverse expansion.

*Measurements of type specimens, in millimetres.*

|                       | 1.  | 2.  | 3.  | 4. |
|-----------------------|-----|-----|-----|----|
|                       | ♂   | ♂   | ♂   | ♀  |
| From snout to vent .. | 52  | 52  | 52  | 55 |
| Head ..               | 18  | 18  | 18  | 18 |
| Width of head ..      | 18  | 18  | 18  | 18 |
| Snout                 | 6   | 6   | 6   | 6  |
| Eye ..                | 6   | 6   | 6   | 6  |
| Interorbital width .. | 3   | 3   | 3   | 3  |
| Tympanum ..           | 5   | 4   | 4   | 4  |
| Fore limb             | 33  | 31  | 31  | 32 |
| First finger          | 6.5 | 6   | 6   | 7  |
| Second finger ..      | 6   | 5.5 | 5.5 | 6  |
| Third finger ..       | 10  | 9   | 9   | 10 |
| Fourth finger ..      | 5   | 5   | 5   | 6  |

|              | 1. | 2. | 3. | 4.  |
|--------------|----|----|----|-----|
|              | ♂  | ♂  | ♂  | ♀   |
| Hind limb    | 87 | 87 | 91 | 89. |
| Tibia ..     | 28 | 27 | 29 | 23  |
| Foot ..      | 28 | 27 | 29 | 28  |
| Third toe    | 16 | 15 | 17 | 16  |
| Fourth toe   | 25 | 24 | 25 | 24  |
| Fifth toe .. | 17 | 15 | 18 | 16  |

*Habitat.* Fudacho village, Formosa, altitude about 4,000 feet.

But for the digital dilatations this species resembles very closely *R. pleuraden*, from which it is probably derived.

### 69. *Rana gracilis*.

*Rana gracilis*, Gravenh. *Delic. Mus. Zool. Vratisl.* p. 45, pl. viii, fig. 3 (1829); Bouleng. *Faun. Ind., Rept.* p. 456 (1890); W. Sclater, *Proc. Zool. Soc.* 1892, p. 345.

*Limnodytes macularius*, Blyth, *Journ. As. Soc. Beng.* XXIII, 1854, p. 299.

*Rana malabarica*, part., Günth. *Cat. Batr. Sal.* p. 11 (1858).

*Hylorana macularia*, Günth. *Rept. Brit. Ind.* p. 425, pl. xxvi, fig. c (1864).

*Rana macularia*, Bouleng. *Cat. Batr. Ecaud.* p. 60 (1882).

Vomerine teeth in short oblique series between the choanæ, nearer to each other than to the latter.

Head moderately depressed, as long as broad or longer than broad; snout obtusely pointed, projecting beyond the mouth, as long as or a little longer than the eye; canthus rostralis obtuse; loreal region feebly oblique or nearly vertical, concave; nostril a little nearer the tip of the snout than the eye; distance between the nostrils equal to or a little greater than the interorbital width, which equals or a little exceeds that of the upper eyelid; tympanum very distinct,  $\frac{2}{3}$  to  $\frac{5}{8}$  the diameter of the eye, close to it or separated from it by a space not exceeding  $\frac{1}{3}$  its diameter.

Fingers long and slender, merely swollen at the end, first longer than the second, third much longer than the snout; subarticular tubercles large, very prominent.

Hind limb long and slender, the tibio-tarsal articulation reaching the nostril, the tip of the snout, or a little beyond, the heels strongly overlapping when the limbs are folded at right angles to the body; tibia 4 to  $4\frac{1}{2}$  times as long as broad,  $1\frac{2}{3}$  to  $1\frac{8}{9}$  times in length from snout to vent, shorter than the fore limb, as long as or slightly shorter than the foot. Toes long and slender, the tips dilated into very small discs, which are a little longer than broad and with a groove separating the upper from the lower surface,  $\frac{1}{2}$  webbed, 3 phalanges of fourth and 2 of third and fifth free; outer metatarsals separated by web nearly to the base; subarticular tubercles rather small but very prominent; no tarsal fold; inner metatarsal tubercle oval,  $\frac{1}{4}$  to  $\frac{1}{3}$  the length of the inner toe; a round outer metatarsal tubercle.

Skin smooth or feebly granulate above; a moderate or rather broad glandular dorso-lateral fold, from above the tympanum to the groin; the distance between the dorso-lateral folds, on the back,  $\frac{1}{6}$  to  $\frac{1}{5}$  the length of head and body; another glandular fold from

below the eye to the groin, sometimes broken up on the body. Lower parts smooth.

Pale brown above, sides of head and body dark brown ; some dark brown or black spots on the middle of the back, sometimes confluent into a vertebral band bifurcating on the sacral region ; dorso-lateral glandular folds pale brown or whitish, edged with a black streak which extends to the tip of the snout ; tympanum often reddish brown ; upper lip and lateral glandular fold white ; no dark cross-bars on the limbs, but sometimes a blackish streak along the outer side of the tibia ; hinder side of thighs marbled black and white. Lower parts white, sometimes spotted with brown on the throat.

Males with not much developed external vocal sacs below the angles of the mouth.

Nasal bones small and narrow, separated from each other and from the frontoparietals ; ethmoid largely exposed above, pointed and produced between the nasals ; zygomatic branch of squamosal not longer than the posterior. Terminal phalanges feebly expanded at the end.

Eggs small,  $1\frac{1}{2}$  millim. in diameter.

*Measurements, in millimetres.*

|                    |    | 1.  | 2.  | 3.  | 4. | 5. |
|--------------------|----|-----|-----|-----|----|----|
|                    |    | ♂   | ♀   | ♀   | ♀  | ♀  |
| From snout to vent | .. | 50  | 64  | 60  | 47 | 41 |
| Head               | .. | 18  | 22  | 19  | 16 | 15 |
| Width of head      | .. | 16  | 19  | 19  | 15 | 14 |
| Snout              | .. | 7   | 9   | 7   | 6  | 6  |
| Eye                | .. | 6   | 7   | 6   | 6  | 6  |
| Interorbital width | .. | 4   | 5   | 4   | 4  | 3  |
| Tympanum           |    | 5   | 5   | 5   | 4  | 4  |
| Fore limb          | .. | 33  | 40  | 40  | 32 | 27 |
| First finger       |    | 8   | 10  | 10  | 7  | 6  |
| Second finger      | .. | 6.5 | 8   | 8   | 6  | 5  |
| Third finger       | .. | 10  | 12  | 12  | 9  | 8  |
| Fourth finger      |    | 6   | 7   | 8   | 6  | 5  |
| Hind limb          | .. | 90  | 105 | 109 | 91 | 73 |
| Tibia              | .. | 28  | 34  | 34  | 28 | 24 |
| Foot               | .. | 29  | 34  | 35  | 29 | 25 |
| Third toe          | .. | 15  | 18  | 19  | 15 | 13 |
| Fourth toe         | .. | 24  | 29  | 29  | 24 | 21 |
| Fifth toe          | .. | 16  | 22  | 21  | 16 | 14 |

1-4. Ceylon. 5. Diyatalawa, Ceylon.

*Habitat.* Ceylon.

**70. *Rana elberti*.**

*Rana elberti*, Roux, *Zool. Jahrb., Syst.* XXX, 1911, p. 504.

Vomerine teeth in oblique groups between the choanæ and extending somewhat beyond the level of their posterior borders, nearer to each other than to the latter.

Head as long as broad, less depressed than in *R. varians* ; snout truncate, feebly projecting beyond the lower jaw, as long as the eye ; canthus rostralis rounded ; loreal region vertical, feebly concave ; nostril nearer the tip of the snout than the eye ; interorbital

space as broad as the upper eyelid; tympanum  $\frac{3}{8}$  the diameter of the eye, close to it.

Fingers moderately long, the tips feebly dilated, without distinct discs, first longer than the second.

Hind limb long and slender, tibio-tarsal articulation reaching beyond the tip of the snout; tibia  $\frac{2}{3}$  the length of head and body. Toes nearly entirely webbed, the tips dilated into small but distinct discs; subarticular tubercles prominent; no tarsal fold; inner metatarsal tubercle oval, prominent; a smaller, oval outer tubercle.

Skin of upper parts smooth or rather rough; a very narrow dorso-lateral fold. Lower parts smooth.

Uniform olive above; a rather broad brown streak below the canthus rostralis; a large brown temporal spot; limbs with brown cross-bands; hinder side of thighs with large black spots in a white network. Lower parts uniform yellowish white.

From snout to vent 48 millim.

*Habitat.* Iliwaki Island, Sunda Islands.

This species has been compared with *R. florensis* and *R. varians* but it appears to me, judging from the description, to be more nearly allied to *R. guentheri* and *R. gracilis*.

## 71. *Rana sauteri*.

*Rana sauteri*, Bouleng. *Ann. and Mag. N.H.* (8) IV, 1909, p. 493.

Vomerine teeth in strong oblique series originating between the choanæ and extending considerably beyond the level of their posterior borders.

Head as long as broad, much depressed; snout rounded, feebly projecting beyond the mouth, as long as the eye; canthus rostralis obtuse; loreal region not very oblique, slightly concave; nostril a little nearer the tip of the snout than the eye; distance between the nostrils greater than the interorbital width, which is a little less than that of the upper eyelid; tympanum very distinct,  $\frac{2}{3}$  to  $\frac{5}{6}$  the diameter of the eye, and 2 to 4 times its distance from the latter.

Fingers rather slender, with distinctly swollen tips, first as long as the second, third longer than the snout; subarticular tubercles strong, very prominent.

Hind limb long, the tibio-tarsal articulation reaching the tip of the snout or a little beyond, the heels strongly overlapping when the limbs are folded at right angles to the body; tibia  $4\frac{1}{2}$  to  $5\frac{1}{2}$  times as long as broad,  $1\frac{2}{3}$  to  $1\frac{5}{6}$  times in length from snout to vent, a little shorter than the fore limb, slightly longer than the foot. Toes slender, the tips dilated into small discs with a groove separating the upper from the lower surface,  $\frac{3}{4}$  webbed, the web extending to the discs of the fourth and fifth, leaving 2 phalanges of fourth free, and separating the outer metatarsals almost to the base; subarticular tubercles large and prominent; no tarsal fold; inner metatarsal tubercle oval, very prominent,  $\frac{1}{3}$  to  $\frac{2}{5}$  the length of the inner toe; a small round outer tubercle.

Skin smooth or finely shagreened above; a very narrow glandular dorso-lateral fold, from above the tympanum to the groin; the distance between the folds, on the back,  $\frac{1}{7}$  to  $\frac{1}{6}$  the length of head and body. Lower parts smooth.

Pale grey or greyish brown above, uniform or with small brown or black spots; a more or less distinct dark bar between the eyes; sometimes a dark  $\wedge$  between the shoulders; a dark brown or black canthal streak and a large temporal spot of the same colour involving the tympanum; limbs with dark cross-bars. Lower parts white, throat and breast closely spotted or marbled with grey or brown.

Male unknown.

Nasal bones rather small, oblique, separated from each other and from the frontoparietals, which do not cover the ethmoid in front.

*Measurements of types, in millimetres.*

|                    |    |     |     |     |    |
|--------------------|----|-----|-----|-----|----|
| From snout to vent | .. | 57  | 55  | 54  | 46 |
| Head ..            | .. | 19  | 18  | 18  | 16 |
| Width of head      |    | 19  | 18  | 18  | 16 |
| Snout              | .. | 6   | 6   | 6   | 5  |
| Eye                | .. | 6   | 6   | 6   | 5  |
| Interorbital width | .. | 3.5 | 3.5 | 3.5 | 3  |
| Tympanum           | .. | 4   | 5   | 4   | 4  |
| Fore limb          |    | 36  | 36  | 33  | 27 |
| First finger       | .. | 6   | 6   | 6   | 5  |
| Second finger      | .. | 6   | 6   | 6   | 5  |
| Third finger       | .. | 8   | 9   | 8   | 7  |
| Fourth finger      | .. | 6   | 6   | 6   | 5  |
| Hind limb          | .. | 100 | 98  | 94  | 80 |
| Tibia              | .. | 33  | 32  | 31  | 26 |
| Foot               | .. | 32  | 31  | 29  | 24 |
| Third toe          | .. | 17  | 17  | 16  | 13 |
| Fourth toe         | .. | 25  | 25  | 24  | 20 |
| Fifth toe          | .. | 19  | 19  | 18  | 16 |

*Habitat.* Kanshirei Village, Formosa, about 2,000 feet.

But for the less oblique loreal region and the dilated toes, this species resembles strikingly *R. japonica*.

## 72. *Rana nigrovittata*.

*Limnodytes nigrovittatus*, Blyth, *Journ. As. Soc. Beng.* XXIV, 1855, p. 718.

*Rana nigrovittata*, part., W. Sclater, *Proc. Zool. Soc.* 1892, p. 345.

*Rana nigrovittata*, Bouleng. *Ann. Mus. Genova* (2), XIII, 1893, p. 334, and *Ann. and Mag. N.H.* (7), XII, 1903, p. 186; S. Flower, *Proc. Zool. Soc.* 1899, p. 896; Bouleng. *Faun. Mal. Pen., Rept.* p. 242 (1913); Annand. *Mem. As. Soc. Beng.* VI, 1917, pp. 140, 144.

Vomerine teeth in oblique groups or short series on a level with or just behind the posterior borders of the choanæ, equally distant from each other and from the latter, or nearer each other.

Head as long as broad, much depressed; snout rounded or obtusely pointed, more or less projecting beyond the mouth, as long as the eye; canthus rostralis distinct; loreal region feebly oblique or nearly vertical, deeply concave; nostril equally distant from the eye and from the end of the snout or a little nearer the

latter; distance between the nostrils equal to or a little greater than the interorbital width, which is equal to or a little less than that of the upper eyelid; tympanum very distinct,  $\frac{3}{5}$  to  $\frac{5}{6}$  the diameter of the eye,  $1\frac{1}{2}$  to 3 times as long as its distance from the latter.

Fingers moderately long, with the tips swollen into very small discs which do not bear a groove; first finger a little longer than the second, third longer than the snout; subarticular tubercles large, very prominent.

Hind limb moderate or rather long, the tibio-tarsal articulation reaching the eye, the nostril, or between these two points, the heels overlapping when the limbs are folded at right angles to the body; tibia  $3\frac{1}{2}$  to 4 times as long as broad,  $1\frac{4}{5}$  to 2 times in length from snout to vent, shorter than the fore limb, as long as or a little longer than the foot. Toes with small discs, more developed than those of the fingers and bearing a groove separating the upper from the lower surface, the web reaching the discs of the third and fifth, two phalanges of fourth free; outer metatarsals separated nearly to the base; no tarsal fold; subarticular tubercles strong, inner metatarsal tubercle oval, prominent,  $\frac{2}{3}$  to  $\frac{1}{2}$  the length of the inner toe; a very prominent, round outer tubercle.

Skin smooth or granulate above, often warty on the sides, a rather broad and prominent glandular dorso-lateral fold from above the tympanum to the hip, its distance from its fellow, on the back,  $4\frac{1}{2}$  to  $5\frac{1}{2}$  times in length from snout to vent; a glandular fold from below the eye to the shoulder, followed by a glandule. Lower parts smooth.

Brown above, with or without darker spots; a dark brown or blackish band on each side of the head and body, bordering the canthus rostralis and the dorso-lateral fold; a whitish streak along the upper lip and the glands behind it; limbs with dark cross-bands; hinder side of thighs yellowish, with black spots or marblings. Lower parts white, often with small brown spots; throat usually brown.

Males with internal vocal sacs and a moderately large gland on the inner side of the arm.

Nasal bones rather small, separated from each other and from the frontoparietals; ethmoid exposed above, pointed in front, extending to the line of the posterior borders of the nasals.

Eggs measuring  $1\frac{1}{2}$  millim. in diameter in a female 54 millim. long from snout to vent.

### 73. *Rana leptoglossa*.

*Hylorana leptoglossa*, Cope, *Proc. Ac. Philad.* 1868, p. 139.

*Hylorana granulosa*, Anders. *Fourn. As. Soc. Beng.* XI, 1871, p. 23.

*Rana granulosa*, W. Sclater, *Proc. Zool. Soc.* 1892, p. 346; Bouleng. *Ann. Mus. Genova* (2) XIII, 1893, p. 333, pl. viii, fig. 2; Annand. *Rec. Ind. Mus.* VIII, 1912, p. 9, and *Mem. As. Soc. Beng.* VI, 1917, pp. 140, 142.

*Measurements, in millimetres.*

|                    |    | 1. | 2.  | 3. | 4.  | 5.  | 6.  | 7. | 8. | 9. | 10. | 11. | 12. | 13. | 14. | 15. | 16. | 17. | 18. | 19. | 20. | 21. | 22. | 23. | 24. |    |
|--------------------|----|----|-----|----|-----|-----|-----|----|----|----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|----|
|                    |    | ♂  | ♂   | ♂  | ♂   | ♂   | ♀   | ♀  | ♀  | ♀  | ♂   | ♂   | ♂   | ♂   | ♀   | ♀   | ♀   | ♀   | ♂   | ♀   | ♀   | ♂   | ♂   | ♀   | ♀   |    |
| From snout to vent | .. | 46 | 46  | 44 | 43  | 37  | 50  | 49 | 45 | 40 | 51  | 47  | 44  | 40  | 55  | 54  | 44  | 42  | 45  | 50  | 74  | 50  | 49  | 42  | 50  |    |
| Head               | .. | 16 | 16  | 16 | 16  | 14  | 17  | 17 | 16 | 14 | 18  | 17  | 16  | 14  | 19  | 18  | 15  | 14  | 16  | 17  | 26  | 19  | 19  | 15  | 17  |    |
| Width of head      | .. | .. | 16  | 16 | 16  | 16  | 14  | 17 | 17 | 16 | 14  | 18  | 17  | 16  | 14  | 19  | 18  | 15  | 14  | 16  | 17  | 26  | 19  | 19  | 15  | 17 |
| Snout              | .. | .. | 5.5 | 5  | 5.5 | 5   | 5   | 7  | 6  | 6  | 5   | 6   | 6   | 5   | 4.5 | 7   | 6   | 5.5 | 5   | 5   | 6   | 9   | 6.5 | 6.5 | 5.5 | 7  |
| Eye                | .. | .. | 5.5 | 5  | 5.5 | 5   | 5   | 7  | 6  | 6  | 5   | 6   | 6   | 5   | 4.5 | 7   | 6   | 5.5 | 5   | 5   | 6   | 9   | 6.5 | 6.5 | 5.5 | 7  |
| Interorbital width | .. | .. | 3   | 3  | 3.5 | 3   | 3   | 4  | 3  | 4  | 3   | 4   | 3   | 3   | 4   | 4   | 3   | 3   | 3   | 4   | 6   | 4   | 5   | 3.5 | 4   |    |
| Tympanum           | .. | .. | 4   | 4  | 4   | 3.5 | 3.5 | 4  | 4  | 4  | 3.5 | 5   | 4   | 3.5 | 3.5 | 5   | 4.5 | 4   | 3.5 | 3.5 | 4   | 7   | 5   | 5   | 3.5 | 5  |
| Fore limb          | .. | .. | 30  | 28 | 27  | 26  | 24  | 30 | 28 | 28 | 24  | 33  | 28  | 27  | 25  | 34  | 33  | 27  | 26  | 28  | 30  | 46  | 31  | 32  | 28  | 30 |
| First finger       | .. | .. | 6.5 | 6  | 6   | 6   | 5   | 7  | 7  | 7  | 5   | 7   | 6   | 6   | 5   | 7   | 7   | 6   | 5   | 6   | 7   | 11  | 7   | 7   | 6   | 7  |
| Second finger      | .. | .. | 5.5 | 5  | 5   | 5   | 4   | 6  | 6  | 6  | 4   | 6   | 5   | 5   | 4.5 | 6   | 6   | 5   | 4   | 5   | 6   | 9.5 | 6   | 6   | 5   | 6  |
| Third finger       | .. | .. | 8   | 7  | 7   | 7   | 6   | 8  | 8  | 8  | 6   | 9   | 7   | 8   | 6.5 | 9   | 9   | 7   | 7   | 8   | 9   | 13  | 9   | 9   | 8   | 9  |
| Fourth finger      | .. | .. | 5   | 5  | 5   | 5   | 4   | 5  | 5  | 6  | 4   | 5   | 5   | 5   | 4   | 6   | 6   | 5   | 4   | 5   | 6   | 8   | 6   | 6   | 5   | 6  |
| Hind limb          | .. | .. | 73  | 69 | 72  | 68  | 61  | 79 | 76 | 76 | 63  | 85  | 73  | 71  | 63  | 89  | 84  | 72  | 66  | 73  | 81  | ?   | 85  | 81  | 73  | 80 |
| Tibia              | .. | .. | 24  | 23 | 23  | 22  | 19  | 26 | 25 | 25 | 20  | 28  | 25  | 24  | 20  | 28  | 27  | 23  | 21  | 24  | 26  | 41  | 28  | 26  | 23  | 27 |
| Foot               | .. | .. | 23  | 22 | 23  | 22  | 19  | 24 | 23 | 23 | 19  | 27  | 23  | 21  | 20  | 27  | 26  | 22  | 21  | 22  | 25  | 38  | 27  | 26  | 22  | 24 |
| Third toe          | .. | .. | 14  | 12 | 12  | 11  | 10  | 13 | 12 | 13 | 11  | 14  | 12  | 11  | 11  | 14  | 14  | 12  | 11  | 12  | 14  | 21  | 15  | 14  | 13  | 12 |
| Fourth toe         | .. | .. | 20  | 19 | 20  | 18  | 15  | 21 | 19 | 20 | 17  | 22  | 18  | 17  | 16  | 23  | 22  | 17  | 17  | 18  | 21  | 33  | 23  | 23  | 19  | 20 |
| Fifth toe          | .. | .. | 15  | 14 | 14  | 12  | 11  | 15 | 15 | 14 | 12  | 16  | 13  | 12  | 12  | 16  | 15  | 13  | 12  | 14  | 16  | 24  | 16  | 15  | 14  | 14 |

1-9. Man Son Mts., Tonkin. 10-17. Dong Phya Fai, Siam. 18-19. Klong Bang Lai, Siam. 20. Koh Chung Id., S.E. Siam. 21-22. Slope of Byinzyi Mts., W. Karenni, Burma. 23. Karenni hills, Burma. 24. Mergui, Tenasserim.

Vomerine teeth in short transverse or oblique series between the choanæ, sometimes extending a little beyond the level of their posterior borders, equally distant from each other and from the choanæ, or nearer to each other.

Head as long as broad or a little longer than broad, much depressed snout a little longer than the eye, rounded or obtusely pointed and prominent; canthus rostralis obtuse; loreal region feebly oblique, deeply concave; nostril a little nearer the end of the snout than the eye; distance between the nostrils equal to the interorbital width, which nearly equals that of the upper eyelid; tympanum very distinct,  $\frac{3}{4}$  to nearly once the diameter of the eye, 3 to 8 times as long as its distance from the latter.

Fingers rather long, with very small discs without or with a very indistinct transverse groove; first finger much longer than the second, third longer than the snout; subarticular tubercles large, very prominent.

Hind limb rather long, the tibio-tarsal articulation reaching the eye or between the eye and the nostril, heels strongly overlapping when the limbs are folded at right angles to the body; tibia 4 to  $4\frac{1}{2}$  times as long as broad,  $1\frac{5}{8}$  to 2 times in length from snout to vent, shorter than the fore limb, as long as or slightly longer than the foot. Toes with small discs more developed than those of the fingers, bearing a groove separating the upper from the lower surface,  $\frac{1}{2}$  to  $\frac{2}{3}$  webbed, the web not quite reaching the discs of the third and fifth, 3 phalanges of fourth free; outer metatarsals separated nearly to the base; subarticular tubercles strong; no tarsal fold; inner metatarsal tubercle oval, about  $\frac{1}{3}$  the length of the inner toe; a very prominent, round outer tubercle.

Skin strongly granulate on the head and back, often with larger warts on the sides; a strong and broad glandular dorso-lateral fold from above the tympanum to the hip, its distance from its fellow 5 to 6 times in length from snout to vent; a glandular fold from below the eye to the shoulder, followed by a glandule. Lower parts smooth.

Brown above, with small or large black spots or marblings; sides sometimes black, with white spots or marblings; loreal and temporal regions dark brown or black, tympanum reddish brown; canthus rostralis, dorso-lateral fold, and upper lip white; limbs with blackish cross-bands; hinder side of thighs marbled black and white. Lower parts white, spotted or marbled with brown.

Males with a large, greyish external vocal sac on each side below the mandible, extending from below the centre of the eye to the fore limb; a large gland on the inner side of the arm.

Nasal bones small, widely separated from each other and from the frontoparietals; ethmoid largely exposed above, truncate in front, not extending to between the nasals.

## Measurements, in millimetres.

|                    |    | 1.<br>♀ | 2.<br>♂ | 3.<br>♂ | 4.<br>♂ | 5.<br>♂ | 6.<br>♀ |
|--------------------|----|---------|---------|---------|---------|---------|---------|
| From snout to vent | .. | 61      | 60      | 60      | 53      | 51      | 57      |
| Head               | .. | 22      | 22      | 22      | 19      | 19      | 20      |
| Width of head      | .. | 20      | 21      | 21      | 18      | 18      | 18      |
| Snout              | .. | 8       | 8       | 8       | 7       | 7       | 7       |
| Eye                | .. | 7       | 7       | 7       | 6.5     | 6.5     | 6       |
| Interorbital width | .. | 4       | 4       | 4       | 3       | 3       | 4       |
| Tympanum           | .. | 5.5     | 6       | 6       | 5       | 5       | 5       |
| Fore limb          | .. | 37      | 37      | 38      | 35      | 35      | 37      |
| First finger       | .. | 9       | 9       | 10      | 8.5     | 8       | 9       |
| Second finger      | .. | 7       | 7       | 7.5     | 6       | 6       | 7       |
| Third finger       | .. | 10      | 10      | 11      | 9       | 9       | 10      |
| Fourth finger      | .. | 7       | 7       | 7       | 6       | 6       | 7       |
| Hind limb          | .. | 103     | 93      | 95      | 83      | 85      | 95      |
| Tibia              | .. | 32      | 30      | 30      | 26      | 26      | 31      |
| Foot               | .. | 32      | 28      | 29      | 26      | 26      | 29      |
| Third toe          | .. | 17      | 16      | 16      | 14      | 15      | 15      |
| Fourth toe         | .. | 28      | 24      | 25      | 23      | 23      | 25      |
| Fifth toe          | .. | 20      | 17      | 18      | 15      | 15      | 17      |

1. Sibsagar, Assam. 2-5. Karenni hills, Burma. 6. Mt. Mooleyit, Tenasserim.

*Habitat.* Assam and Burma.

I have little hesitation in recognizing in Cope's *H. leptoglossa*, from Rangoon, Burma (Theobald collection), Anderson's *H. granulosa*. Cope's definition, including the "tongue narrow, not filling rami of jaws" (not a specific character) applies sufficiently well to some of our specimens, which is not the case if we compare it with Annandale's account of his *R. leptoglossa*, which I refer to the synonymy of *R. alticola*.

Since writing the above, I have asked Dr. T. Barbour to be so kind as to examine the types of *Hylorana leptoglossa* in the Museum of Comp. Zoology, Cambridge, Mass. He writes (May 1, 1918) that these are badly preserved but agree well with my figure of *R. granulosa* in the Annals of the Genoa Museum. "The back is slightly granular and there is no sign whatever of a white mark directed upwards between the eye and the tympanum as shown by Annandale." He adds, "I think there is no possible question as to the fact that *leptoglossa* will have to replace *granulosa* as the specific name."

74. *Rana humeralis*.

*Rana humeralis*, Bouleng. *Ann. Mus. Genova* (2) V, 1887, p. 420, pl. iv, fig. 1, and *Faun. Ind., Rept.* p. 460 (1890).

Vomerine teeth in strong oblique series between the choanæ, nearly touching the anterior corners of the latter.

Head as long as broad, much depressed; snout obtusely pointed, projecting beyond the mouth, longer than the eye; canthus rostralis obtuse; loreal region moderately oblique, concave; nostril much nearer the tip of the snout than the eye; distance between the nostrils equal to the interorbital width, which equals that of the upper eyelid; tympanum very distinct, about  $\frac{3}{4}$  the diameter of the eye, twice its distance from the latter.

Fingers long and rather slender, with a distinct dermal border, the tips dilated into very small discs, which are longer than broad, with a horseshoe-shaped groove between the upper and the lower surface; first finger longer than the second, third shorter than the snout; subarticular tubercles strong, prominent.

Hind limb rather long, the tibio-tarsal articulation reaching the nostril, the heels strongly overlapping when the limbs are folded at right angles to the body; tibia 4 times as long as broad, a little more than half the length of head and body, shorter than the fore limb or than the foot. Toes long, with the tips dilated like those of the fingers, nearly entirely webbed; outer metatarsals separated nearly to the base; subarticular tubercles moderate, prominent; no tarsal fold; inner metatarsal tubercle oval, moderately prominent,  $\frac{1}{3}$  the length of the inner toe; no outer tubercle.

Skin smooth; a narrow glandular dorso-lateral fold from above the tympanum to the hip; another from below the eye to the shoulder, followed by a prominent glandule.

Grey-brown or pale olive above, greenish on the flanks, glandular dorso-lateral folds not lighter; loreal and temporal regions usually darker; upper lip whitish; no cross-bands on the limbs; hinder side of thighs blackish, or marbled with blackish. Lower parts white.

Male with an external vocal sac on each side of the throat, and a large oval gland on the arm; a moderately large pad on the inner side of the first finger.

*Measurements of types, from Teinzo, in millimetres.*

|                    | 1.  | 2.  |
|--------------------|-----|-----|
|                    | ♂   | ♀   |
| From snout to vent | 71  | 73  |
| Head ..            | 24  | 24  |
| Width of head      | 24  | 24  |
| Snout ..           | 11  | 10  |
| Eye ..             | 8   | 8   |
| Interorbital width | 5   | 5   |
| Tympanum ..        | 5.5 | 5.5 |
| Fore limb          | 45  | 50  |
| First finger       | 10  | 11  |
| Second finger      | 9   | 10  |
| Third finger ..    | 14  | 15  |
| Fourth finger ..   | 10  | 11  |
| Hind limb .. ..    | 123 | 127 |
| Tibia ..           | 37  | 40  |
| Foot ..            | 40  | 43  |
| Third toe ..       | 22  | 25  |
| Fourth toe ..      | 33  | 36  |
| Fifth toe          | 26  | 27  |

*Habitat.* Bhamo and Teinzo, Upper Burma.

### 75. *Rana miopus*.

*Rana humeralis* (non Boulenger), Malcolm Smith, *Journ. N.H. Soc. Siam*, II, 1916, p. 167.

*Rana miopus*, Boulenger. *Journ. N.H. Soc. Siam*, III, 1918, p. 11.

Vomerine teeth in strong slightly oblique series between the choanæ, nearly touching the anterior corners of the latter.

Head as long as broad, much depressed; snout obtusely pointed, feebly projecting beyond the mouth, slightly longer than the eye; canthus rostralis obtuse; loreal region oblique, concave; nostril a little nearer the tip of the snout than the eye; distance between the nostrils a little greater than the interorbital width, which is a little less than that of the upper eyelid; tympanum very distinct,  $\frac{3}{4}$  the diameter of the eye, 3 times its distance from the latter.

Fingers moderately long, the tips dilated into very small discs, which are longer than broad, with a horseshoe-shaped groove between the upper and the lower surface; first finger much longer than the second, nearly as long as the third, which is longer than the snout; subarticular tubercles strong, very prominent.

Hind limb moderately long, the tibio-tarsal articulation reaching the centre of the eye, the heels overlapping when the limbs are folded at right angles to the body; tibia 4 times as long as broad, a little less than half the length of head and body, shorter than the fore limb, a little longer than the foot. Toes with very small discs,  $\frac{2}{3}$  webbed; outer metatarsals separated nearly to the base; subarticular tubercles large, very prominent; no tarsal fold; inner metatarsal tubercle elliptic, very prominent, slightly compressed,  $\frac{1}{3}$  to  $\frac{2}{5}$  the length of the inner toe; no outer tubercle.

Skin smooth; a narrow glandular dorso-lateral fold from above the tympanum to the hip; another from below the eye to the shoulder.

Grey above, uniform or blotched with pink and blackish; loreal and temporal regions darker; upper lip white; limbs with rather indistinct dark cross-bands; groin and hinder side of thighs black, speckled or vermiculate with white; lower parts white. Young pinkish grey above, with the canthus rostralis, the superciliary edge and the dorso-lateral fold bright pink, the side of the head and body black.

Secondary sexual characters of male apparently as in *R. humeralis*.

*Measurements of type, in millimetres.*

|                    |    |    |    |    |     |
|--------------------|----|----|----|----|-----|
|                    |    |    |    |    | ♀   |
| From snout to vent |    | .. |    |    | 73  |
| Head               | .. | .. | .. | .. | 25  |
| Width of head      | .. |    | .. |    | 25  |
| Snout              | .. | .. | .. | .. | 9   |
| Eye                | .. | .. | .. | .. | 8   |
| Interorbital width |    |    | .. | .. | 5   |
| Tympanum           | .. | .. | .. |    | 6   |
| Fore limb          |    |    |    | .. | 46  |
| First finger       | .. | .. | .. |    | 11  |
| Second finger      |    | .. | .. |    | 8   |
| Third finger       |    |    |    | .. | 12  |
| Fourth finger      | .. |    | .. | .. | 7   |
| Hind limb          | .  | .. | .. | .. | 108 |
| Tibia              | .. | .. | .. | .. | 35  |
| Foot               |    | .. |    | .. | 33  |
| Third toe          | .. | .. | .. | .. | 16  |
| Fourth toe         | .. | .. | .. | .. | 27  |
| Fifth toe          | .. | .. | .. | .. | 18  |

*Habitat*. Peninsular Siam (Khao Bang Lai and Nakon Sitalamarat).

Distinguished from *R. humeralis* by the shorter limbs, the much shorter and less strongly webbed foot, the proportions of the fingers, the more oblique loreal region, and the narrower inter-orbital space.

#### 76. *Rana oatesii*.

*Rana oatesii*, Bouleng. *Ann. and Mag. N.H.* (6) IX, 1892, p. 141, pl. ix.

Vomerine teeth in strong oblique series on a level with the anterior borders of the choanæ, nearly touching the latter.

Head longer than broad, much depressed, snout pointed, strongly projecting beyond the mouth, longer than the eye; canthus rostralis obtuse, loreal region feebly oblique, deeply concave; nostril much nearer the tip of the snout than the eye; distance between the nostrils equal to the interorbital width, or the width of the upper eyelid, tympanum very distinct,  $\frac{2}{3}$  to  $\frac{3}{4}$  the diameter of the eye,  $2\frac{1}{2}$  to 4 times its distance from the latter.

Fingers long and slender, the tips dilated into scarcely developed discs with a groove separating the upper from the lower surface; first finger longer than the second, third a little longer than the snout; subarticular tubercles moderately developed.

Hind limb rather long, the tibio-tarsal articulation reaching between the eye and the tip of the snout, the heels strongly overlapping when the limbs are folded at right angles to the body; tibia 4 to  $4\frac{1}{2}$  times as long as broad,  $\frac{1}{2}$  or a little more than  $\frac{1}{2}$  the length of head and body, shorter than the fore limb, as long as the foot. Toes with the tips dilated into very small discs, same as the fingers, nearly entirely webbed; outer metatarsals separated nearly to the base; subarticular tubercles small, feebly prominent; no tarsal fold; inner metatarsal tubercle oval, feebly prominent,  $\frac{1}{4}$  to  $\frac{1}{3}$  the length of the inner toe, no outer tubercle.

Skin finely granulate above; a prominent glandular dorso-lateral fold from above the tympanum to the hip, about half as broad as the upper eyelid, the distance between these folds, on the back, 6 times in length of head and body; another glandular fold from below the eye to the shoulder, followed by a prominent glandule. Lower parts smooth.

Black above, uniform or marbled with pale brown, and with five whitish streaks, the middle extending from between the nostrils to above the vent, the upper pair running along the glandular lateral folds, the lower pair from the end of the snout along the upper lip, which is edged with brown, to the groin, sides of upper surface of snout and upper eyelids pale brown; limbs pale bronzy brown, with small black spots or marblings, which are confluent into longitudinal streaks on the sides of the tibia; hinder side of thighs black, spotted or marbled with white. Lower parts white, uniform or spotted with brown.

Males with a large, blackish external vocal sac on each side below the mandible, extending from below the centre of the eye to the fore limb, a large oval gland on the arm.

## Measurements of types, in millimetres.

|                    |    |    | ♂   | ♂   | ♀   | ♀   |
|--------------------|----|----|-----|-----|-----|-----|
| From snout to vent | .. | .. | 80  | 63  | 78  | 50  |
| Head               | .. | .. | 26  | 22  | 27  | 18  |
| Width of head      | .. | .. | 24  | 19  | 24  | 16  |
| Snout              | .. | .. | 11  | 9   | 12  | 7   |
| Eye                | .. | .. | 8   | 7   | 8   | 6   |
| Interorbital width |    |    | 5   | 4   | 5   | 3.5 |
| Tympanum           | .. |    | 6   | 5.5 | 6   | 4   |
| Fore limb          |    |    | 49  | 40  | 49  | 32  |
| First finger       |    |    | 11  | 9   | 12  | 7.5 |
| Second finger      | .. |    | 9   | 8   | 10  | 6   |
| Third finger       |    | .. | 14  | 11  | 14  | 9   |
| Fourth finger      | .. |    | 8   | 7   | 10  | 6   |
| Hind limb          |    |    | 126 | 101 | 125 | 83  |
| Tibia              | .. | .. | 40  | 32  | 39  | 25  |
| Foot               |    |    | 40  | 32  | 39  | 25  |
| Third toe          |    | .. | 22  | 18  | 22  | 15  |
| Fourth toe         | .. | .. | 36  | 28  | 35  | 22  |
| Fifth toe          |    | .. | 21  | 20  | 26  | 17  |

*Habitat.* Toungoo, Burma.

Differs from *R. humeralis* in the much smaller digital discs, in which respect, as well as in the coloration, it resembles *R. macrodactyla*.

77. *Rana erythræa*.

*Hyla erythræa*, Schleg. *Abbild.* p. 27, pl. ix, fig. 3 (1837).

*Hylarana erythræa*, Tschüdi, *Class. Batr.* pp. 37, 78 (1838); Günth. *Cat. Batr. Sal.* p. 73 (1858), *Rept. Brit. Ind.* p. 425 (1864); Stoliczka, *Proc. As. Soc. Beng.* 1872, p. 104; Anders. *Anat. Zool. Res. Yunnan*, p. 846 (1879).

*Limnodytes erythræus*, Dum. et Bibr. *Erp. Gén.* VIII, p. 511, pl. lxxxviii, fig. 1 (1841); Cantor, *Cat. Mal. Rept.* p. 141 (1847).

*Hylorana tytleri*, Theob. *Cat. Rept. As. Soc. Mus.* p. 84 (1868).

*Rana erythræa*, Bouleng. *Cat. Batr. Ecaud.* p. 65 (1882), *Ann. and Mag. N.H.* (5) XIV, 1884, p. 287, and *Faun. Ind., Rept.* p. 460 (1890); W. Sclater, *Proc. Zool. Soc.* 1892, p. 345; Werner, *Fahresb. Nat. Ver. Magdeb.* 1892, p. 253, and *Verh. zool.-bot. Ges. Wien*, XLIII, 1893, p. 357; S. Flower, *Proc. Zool. Soc.* 1896, p. 902, pl. xlv, fig. 2, and 1899, p. 895; Laidlaw, *Proc. Zool. Soc.* 1900, p. 885; A. L. Butler, *Fourn. N.H. Soc. Bomb.* XV, 1903, p. 198; van Kampen, in M. Weber, *Zool. Ergebn. Nied. O.-Ind.* IV, p. 390 (1907), and *Nat. Tijdschr. Ned. Ind.* I.XIX, 1909, p. 35; Bouleng. *Faun. Mal. Pen., Rept.* p. 241 (1912); Malcolm Smith, *Fourn. N.H. Soc. Siam*, II, 1917, p. 267.

*Rana taipehensis*, Van Denb. *Proc. Cal. Ac.* III, 1909, p. 56.

*Rana tytleri*, part., Annand. *Mem. As. Soc. Beng.* VI, 1917, p. 141.

Vomerine teeth in short transverse or oblique series between the choanæ, equally distant from each other and from the choanæ or a little nearer the latter.

Head longer than broad, much depressed; snout more or less pointed, more or less projecting beyond the mouth, usually longer than the eye; canthus rostralis strong; loreal region very feebly oblique, concave; nostril nearer the tip of the snout than the eye; distance between the nostrils equal to the interorbital width, which equals or a little exceeds that of the upper eyelid; tympanum very distinct,  $\frac{2}{3}$  to nearly once the diameter of the eye, 2 to 4 times its distance from the latter.

Fingers rather slender, the tips dilated into small discs, which are longer than broad and bear a groove separating the upper from the lower surface; a more or less distinct lateral dermal margin; first finger as long as or a little longer than the second, third longer than the snout; subarticular tubercles rather large and prominent.

Hind limb rather long, the tibio-tarsal articulation reaching the eye or the tip of the snout, or between these two points, the heels strongly overlapping when the limbs are folded at right angles to the body; tibia 4 to  $4\frac{1}{2}$  times as long as broad,  $1\frac{3}{4}$  to 2 times in length from snout to vent, shorter than the fore limb, as long as or a little shorter than the foot. Toes rather slender, with discs same as those of the fingers, webbed to the discs of the third and fifth, two phalanges of fourth free, the web shorter in the young; outer metatarsals separated nearly to the base, subarticular tubercles rather large and prominent; no tarsal fold; inner metatarsal tubercle oval or elliptic,  $\frac{1}{4}$  to  $\frac{1}{3}$  the length of the inner toe; a small outer tubercle very rarely present.

Skin smooth, a broad and prominent glandular dorso-lateral fold from above the tympanum to the hip, its distance from its fellow, on the back,  $5\frac{1}{2}$  to 7 times in length from snout to vent; a glandular fold from below the eye to the shoulder, followed by a gland situated a little higher up and sometimes continued as an interrupted lateral fold.

Bright green, dull green, or yellowish brown above, rarely with a very narrow light vertebral streak; a dark brown stripe, generally darker or black at the edges, along each side of the head and body; tympanum usually reddish brown; dorso-lateral fold white or yellowish white, sometimes with a black streak or broad band on the inner side, a white or yellowish streak on the upper lip and another from the shoulder to the groin; limbs reddish-buff or yellowish brown, without dark cross-bands, often speckled or finely streaked with dark brown. Lower parts white; often a blackish line along the lower lip.

Males with internal vocal sacs and stronger fore limbs.

Nasal bones narrow, oblique, widely separated from each other and from the frontoparietals, which are broad and flat; ethmoid largely uncovered, truncate in front, not produced between the nasals; zygomatic process of squamosal short. Terminal phalanges feebly expanded at the end.

The tadpole has been described by van Kampen. Tail about twice as long as body, pointed. Beak narrowly edged with black; a single, marginal, series of upper labial horny teeth, and two series of lower labials, the outer uninterrupted, the inner narrowly interrupted in the middle. Large specimens (body 18 millim., tail 40) have three white streaks along the body.

*Habitat.* Lower Bengal, Assam, Yunnan, Burma, Siam, Cochinchina, Malay Peninsula and Archipelago as far East as Celebes.

I cannot regard *R. taipehensis*, Van Denb., from Formosa, as more than a variety of *R. erythræa*. The two specimens which the

Measurements, in millimetres.

|                    |    | 1.  | 2.  | 3.  | 4.  | 5.  | 6.  | 7.  | 8.  | 9.  | 10. | 11. | 12. | 13. | 14. | 15. | 16. | 17. | 18. | 19. | 20. | 21. | 22. | 23. | 24. | 25. | 26. | 27. | 28. |
|--------------------|----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
|                    |    | ♀   | ♀   | ♀   | ♀   | ♀   | ♀   | ♀   | ♀   | ♀   | ♀   | ♀   | ♂   | ♀   | ♀   | ♂   | ♂   | ♂   | ♂   | ♀   | ♂   | ♂   | ♀   | ♀   | ♀   | ♂   | ♀   | ♀   | ♀   |
| From snout to vent | .. | 58  | 73  | 68  | 58  | 68  | 75  | 78  | 69  | 66  | 65  | 55  | 40  | 67  | 60  | 39  | 37  | 37  | 41  | 63  | 38  | 37  | 63  | 63  | 69  | 40  | 67  | 55  | 58  |
| Head               | .. | 19  | 23  | 23  | 21  | 23  | 24  | 27  | 24  | 23  | 23  | 20  | 16  | 25  | 21  | 15  | 15  | 14  | 16  | 22  | 14  | 14  | 22  | 21  | 24  | 15  | 23  | 19  | 21  |
| Width of head      | .. | 17  | 20  | 21  | 19  | 20  | 22  | 25  | 20  | 21  | 20  | 17  | 13  | 22  | 19  | 13  | 13  | 12  | 13  | 19  | 12  | 12  | 19  | 19  | 21  | 12  | 21  | 16  | 19  |
| Snout              | .. | 9   | 10  | 9   | 8   | 10  | 10  | 12  | 10  | 9   | 10  | 8   | 6   | 10  | 8   | 6   | 6   | 5   | 6   | 9   | 5.5 | 5.5 | 9   | 8   | 10  | 6   | 10  | 8   | 8   |
| Eye                | .. | 6   | 7   | 7   | 6   | 7   | 7   | 8   | 7   | 7   | 7   | 6   | 5   | 7   | 6   | 5   | 5   | 5   | 5.5 | 7   | 5   | 5   | 7   | 7   | 8   | 5   | 7   | 6   | 7   |
| Interorbital width |    | 4   | 5   | 5   | 4   | 4   | 5   | 5   | 5   | 5   | 4   | 4   | 3   | 4   | 4   | 2.5 | 2.5 | 2.5 | 3   | 5   | 3   | 3   | 5   | 4   | 5   | 3   | 5   | 4   | 4   |
| Tympanum           | .. | 5   | 6   | 5   | 4   | 5   | 6   | 6   | 6   | 5   | 5   | 5   | 4   | 5   | 5   | 4   | 4   | 4   | 5   | 6   | 4   | 4   | 5   | 5   | 6   | 4   | 6   | 5   | 6   |
| Fore limb          | .. | 37  | 42  | 46  | 38  | 45  | 46  | 52  | 43  | 46  | 42  | 37  | 26  | 43  | 40  | 26  | 26  | 25  | 27  | 37  | 25  | 25  | 40  | 38  | 45  | 28  | 48  | 35  | 37  |
| First finger       | .. | 8.5 | 10  | 10  | 9   | 10  | 10  | 11  | 10  | 10  | 9   | 8   | 5   | 10  | 9   | 5   | 5   | 5   | 5.5 | 9   | 5   | 5.5 | 9   | 9   | 10  | 6   | 10  | 8   | 8   |
| Second finger      | .. | 7.5 | 9   | 9.5 | 9   | 9   | 10  | 10  | 9   | 10  | 8   | 8   | 5   | 9   | 8   | 5   | 5   | 5   | 5   | 9   | 5   | 5.5 | 8.5 | 8.5 | 10  | 6   | 10  | 8   | 8   |
| Third finger       | .. | 11  | 12  | 15  | 13  | 14  | 15  | 16  | 14  | 15  | 12  | 11  | 8   | 13  | 12  | 7   | 7   | 7   | 8   | 12  | 7   | 8   | 13  | 12  | 14  | 9   | 15  | 12  | 12  |
| Fourth finger      | .. | 7   | 9   | 10  | 9   | 10  | 10  | 11  | 10  | 10  | 9   | 8   | 5   | 10  | 9   | 5   | 5   | 5   | 5   | 9   | 5   | 5.5 | 9   | 9   | 10  | 6   | 10  | 8   | 8   |
| Hind limb          | .. | 95  | 115 | 118 | 100 | 111 | 120 | 133 | 114 | 115 | 105 | 96  | 62  | 113 | 112 | 62  | 61  | 62  | 65  | 107 | 65  | 63  | 107 | 102 | 117 | 70  | 121 | 92  | 98  |
| Tibia              | .. | 30  | 37  | 37  | 32  | 37  | 38  | 40  | 35  | 36  | 34  | 30  | 20  | 36  | 34  | 20  | 20  | 20  | 21  | 34  | 20  | 20  | 33  | 32  | 36  | 22  | 39  | 30  | 31  |
| Foot               | .. | 32  | 39  | 39  | 34  | 38  | 40  | 45  | 38  | 39  | 34  | 31  | 21  | 37  | 35  | 22  | 21  | 21  | 23  | 35  | 21  | 21  | 35  | 34  | 39  | 24  | 41  | 31  | 33  |
| Third toe          | .. | 17  | 22  | 22  | 19  | 21  | 24  | 24  | 22  | 22  | 18  | 17  | 12  | 20  | 18  | 13  | 12  | 12  | 13  | 20  | 12  | 11  | 20  | 19  | 22  | 14  | 24  | 17  | 19  |
| Fourth toe         | .. | 27  | 35  | 35  | 29  | 33  | 35  | 39  | 33  | 34  | 29  | 26  | 18  | 33  | 30  | 19  | 18  | 18  | 19  | 30  | 18  | 17  | 30  | 29  | 34  | 20  | 35  | 26  | 29  |
| Fifth toe          | .. | 20  | 25  | 26  | 22  | 25  | 26  | 30  | 25  | 26  | 23  | 21  | 13  | 23  | 22  | 14  | 14  | 14  | 14  | 12  | 13  | 12  | 24  | 23  | 26  | 16  | 27  | 20  | 22  |

1. Bangkok, Siam. 2. Paknam Kabin, Siam. 3. Nakon Si Tamarat, Siam. 4. Penang. 5. Perak. 6. Kuala Lipis, Pahang. 7. Kampong Nabok, Jalor. 8-11. Singapore. 12. Deli, Sumatra. 13-14. Sumatra. 15-17. Nias. 18-19. Great Natuna. 20-21. Sarawak. 22. Padas, N. Borneo. 23. Bongon, N. Borneo. 24. Philippines. 25-27. Java. 28. Macassar, Celebes.

British Museum has received under that name from the California Academy are young (24 and 28 millim. long from snout to vent) and are distinguished by a shorter web, not reaching the discs of the third and fifth toes and leaving three phalanges of the fourth free; they have a small outer metatarsal tubercle and the back of the thighs streaked with black and white. I find the two last characters combined in a young from Ok Yam, S.E. Siam, which, in the extent of the web between the toes, is intermediate between the typical *R. erythræa* and *R. taipehensis*. Similar young have been noticed by Annandale under the name of *R. tytleri*. I have also seen young specimens from Siam, typical in coloration, but with the web not more developed than in *R. taipehensis*. Werner (*Verh. Zool.-bot. Ges. Wien*, 1893, p. 357) records an adult specimen from Borneo with "Zehen mit Ausnahme der vierten mit  $\frac{3}{4}$  Schwimmhäuten."

[This species, which is particularly common in rice-fields in the Malay Peninsula, usually sits on floating water-plants or in bushes at the edge of water, into which it leaps when disturbed. I have also seen it—if the Indian form is really synonymous with the Malay one—on stones forming the inner coating of a well in Orissa. N. A.]

### 78. *Rana macrodactyla*.

*Hylarana macrodactyla*, Günth. *Cat. Batr. Sal.* p. 72, pl. ii, fig. C. (1858), and *Rept. Brit. Ind.* p. 424 (1864); Stoliczka, *Proc. As. Soc. Beng.* 1872, p. 104.

*Rana trivittata*, Hallow. *Proc. Ac. Philad.* 1860, p. 504.

? *Hylarana subcærulea*, Cope, *Proc. Ac. Philad.* 1868, p. 110.

*Rana macrodactyla*, Bouleng. *Cat. Batr. Ecaud.* p. 54 (1882); Boettg. *Ber. Offenb. Ver. Nat.* 1888, p. 96; Bouleng. *Faun. Ind., Rept.* p. 465 (1890); S. Flower, *Proc. Zool. Soc.* 1899, p. 895; Laidlaw, *Proc. Zool. Soc.* 1900, p. 885; Bouleng. *Faun. Mal. Pen., Rept.* p. 238 (1912); Malcolm Smith, *Journ. N.H. Soc. Siam*, II, 1917, p. 265, pl.—, fig. 3.

Vomerine teeth in more or less oblique groups or short series between the choanæ, nearer to each other than to the latter or equally distant.

Head moderately depressed, much longer than broad; snout pointed, strongly projecting beyond the mouth, longer than the eye; canthus rostralis obtuse; loreal region not very oblique, concave; nostril much nearer the tip of the snout than the eye; distance between the nostrils equal to the interorbital width, which equals or exceeds that of the upper eyelid, tympanum very distinct,  $\frac{3}{8}$  to once the diameter of the eye, 2 to 4 times its distance from the latter.

Fore limb slender; fingers long and slender, the tips dilated into very small discs with a groove separating the upper from the lower surface; first and second fingers equal, third as long as or longer than the snout; subarticular tubercles moderately large, prominent.

Hind limb very long and slender; the tibio-tarsal articulation reaches the tip of the snout or a little beyond, the heels strongly overlap when the limbs are folded at right angles to the body;

tibia  $4\frac{1}{2}$  to  $5\frac{1}{2}$  times as long as broad,  $1\frac{3}{8}$  to  $1\frac{9}{10}$  times in length from snout to vent, as long as or a little shorter than the fore limb, as long as or shorter than the foot, which is nearly as long as the distance between tympanum and vent. Toes very long and slender, the tips dilated into very small discs similar to those of the fingers,  $\frac{1}{2}$  webbed, 3 phalanges of fourth and 2 of third and fifth free; outer metatarsals cleft almost to the base; subarticular tubercles moderately large, prominent; no tarsal fold; inner metatarsal tubercle oval, very small, about  $\frac{1}{6}$  the length of the inner toe; a very small, more or less distinct, round outer tubercle.

Skin smooth; a narrow glandular dorso-lateral fold, from above the tympanum to the groin; the distance between the dorso-lateral folds  $\frac{1}{7}$  to  $\frac{1}{6}$  the length of head and body; another glandular fold often extending from behind the tympanum to the side of the body, continuous or interrupted, and a third from below the eye to a little beyond the angle of the mouth. Lower parts smooth, thighs granulate near the vent.

Colour, in life, above rich dark brown, spotted with black and, in some individuals, mottled with dull yellow and vivid green, with 4 or 5 very distinct longitudinal lines, which are white with golden shades; the median line (rarely absent) from the tip of the snout to the vent, the next on the dorso-lateral fold, the outer from the tympanum to the hind limb; upper surface of limbs reddish yellow with dark brown markings, forming short cross-bars on the thigh and the sides of the tibia and 2 or 3 longitudinal lines on the back of the thigh. Head and body white beneath, limbs yellowish. Iris, golden.

Males without secondary sexual characters.

Nasal bones small, oblique, widely separated from each other and from the ethmoid, which is largely exposed and truncate in front; zygomatic branch of squamosal rather long. Terminal phalanges feebly expanded at the end.

Ova measuring 1 millimetre in diameter.

The tadpole has been described by Malcolm Smith. Tail pointed, twice as long as the body. Beak narrowly edged with black; lips with the papilla short at the sides and long below; one long uninterrupted series of horny teeth above, two below, the outer short and uninterrupted, the inner long and narrowly interrupted.

*Measurements, in millimetres.*

|                       | 1.  | 2. | 3.  | 4. | 5. | 6. | 7. | 8.  | 9.  | 10. | 11. | 12. | 13. | 14. |
|-----------------------|-----|----|-----|----|----|----|----|-----|-----|-----|-----|-----|-----|-----|
|                       | ♂   | ♀  | ♀   | ♀  | ♀  | ♀  | ♀  | ♂   | ♂   | ♀   | ♀   | ♂   | ♀   | ♀   |
| From snout to vent    | 26  | 39 | 32  | 37 | 44 | 41 | 36 | 28  | 27  | 37  | 41  | 32  | 37  | 35  |
| Head ..               | 10  | 14 | 12  | 13 | 15 | 14 | 13 | 11  | 11  | 13  | 15  | 12  | 13  | 13  |
| Width of head ..      | 8   | 11 | 9   | 10 | 12 | 12 | 10 | 8   | 8   | 10  | 11  | 9   | 10  | 9   |
| Snout ..              | 4   | 6  | 5   | 6  | 6  | 6  | 5  | 4.5 | 4.5 | 6   | 6   | 5   | 6   | 6   |
| Eye ..                | 3   | 4  | 4   | 4  | 4  | 4  | 4  | 3.5 | 3.5 | 4   | 4   | 3.5 | 4   | 4   |
| Interorbital width .. | 2.5 | 3  | 3   | 3  | 3  | 3  | 3  | 2   | 2.5 | 2.5 | 3   | 2.5 | 2.5 | 2.5 |
| Tympanum              | 3   | 4  | 3   | 3  | 4  | 4  | 3  | 3   | 3   | 3   | 3.5 | 2.5 | 3   | 3   |
| Fore limb ..          | 15  | 23 | 20  | 22 | 25 | 26 | 22 | 17  | 17  | 22  | 25  | 20  | 22  | 21  |
| First finger ..       | 3   | 5  | 4   | 4  | 5  | 5  | 4  | 3.5 | 3.5 | 4.5 | 5   | 4   | 5   | 5   |
| Second finger ..      | 3   | 5  | 3.5 | 4  | 5  | 5  | 4  | 3.5 | 3.5 | 4.5 | 5   | 4   | 5   | 5   |
| Third finger ..       | 5.5 | 7  | 6.5 | 7  | 8  | 8  | 7  | 6   | 5.5 | 6   | 8   | 6.5 | 7.5 | 7   |

|               | 1. | 2. | 3. | 4. | 5. | 6. | 7. | 8. | 9.  | 10. | 11. | 12. | 13. | 14. |
|---------------|----|----|----|----|----|----|----|----|-----|-----|-----|-----|-----|-----|
|               | ♂  | ♀  | ♀  | ♀  | ♀  | ♀  | ♀  | ♂  | ♂   | ♀   | ♀   | ♂   | ♀   | ♀   |
| Fourth finger | .. | 3  | 5  | 4  | 4  | 5  | 5  | 4  | 3.5 | 3.5 | 4.5 | 5   | 4   | 5   |
| Hind limb     | .. | 50 | 81 | 66 | 74 | 82 | 72 | 62 | 52  | 49  | 63  | 73  | 60  | 72  |
| Tibia ..      | .. | 15 | 24 | 20 | 23 | 25 | 22 | 19 | 17  | 15  | 20  | 23  | 19  | 22  |
| Foot          | .. | 18 | 27 | 22 | 25 | 27 | 25 | 20 | 17  | 16  | 20  | 24  | 20  | 24  |
| Third toe     |    | 9  | 12 | 11 | 12 | 14 | 12 | 11 | 9   | 8   | 11  | 12  | 10  | 12  |
| Fourth toe    |    | 15 | 23 | 19 | 21 | 24 | 21 | 18 | 14  | 14  | 18  | 20  | 17  | 20  |
| Fifth toe     | .. | 10 | 16 | 13 | 15 | 18 | 15 | 13 | 10  | 9   | 13  | 14  | 12  | 14  |

1. Hong Kong. 2-3. Hong Kong (types). 4. China (type). 5-7. Man Son Mts., Tonkin. 8. Bangkok. 9-10. Sapatoom, Siam. 11. Pera-kan, Camboja. 12-14. Kedah, Malay Peninsula.

*Habitat.* Southern China, Tonkin, Burma, Siam, Malay Peninsula.

### 79. *Rana aurantiaca*.

*Rana aurantiaca*, Bouleng. *Journ. Bomb. N.H. Soc.* XV, 1904, p. 430, pl.—, fig. 1.

Vomerine teeth in short oblique series between the choanæ, nearer the latter than to each other.

Head much depressed, longer than broad; snout obtusely pointed, a little longer than the eye, scarcely projecting beyond the mouth; canthus rostralis distinct; loreal region nearly vertical, concave; nostril much nearer the tip of the snout than the eye; distance between the nostrils equal to the interorbital width, which is a little greater than that of the upper eyelid; tympanum very distinct,  $\frac{3}{4}$  the diameter of the eye and 3 times its distance from the latter.

Fingers long and rather slender, the tips dilated into very small discs which are longer than broad and have the upper surface separated from the lower by a groove; first finger a little longer than the second, third a little longer than the snout; sub-articular tubercles moderate.

Hind limb rather long and slender, the tibio-tarsal articulation reaching between the eye and the tip of the snout, the heels strongly overlapping when the limbs are folded at right angles to the body; tibia 6 times as long as broad,  $\frac{1}{2}$  the length of head and body, shorter than the fore limb, as long as the foot. Toes with the tips dilated like the fingers,  $\frac{2}{3}$  webbed; outer metatarsals separated nearly to the base; subarticular tubercles rather small; no tarsal fold; inner metatarsal tubercle oval, feebly prominent,  $\frac{1}{4}$  the length of the inner toe; a small, round outer tubercle.

Skin smooth; a narrow glandular dorso-lateral fold, from above the tympanum to the hip, its distance from its fellow, on the back, 6 times in the length from snout to vent.

Orange above, without spots on the back or bars on the limbs; a black band along each side of the head and body; upper lip, canthus rostralis, and dorso-lateral fold white; terminal discs of toes black; lower parts white.

Nasal bones small, oblique, widely separated from each other and from the ethmoid, the upper part of which is uncovered and very obtusely pointed in front.

Male unknown.

*Measurements of type.*

|                    |    |    |    |    |            |
|--------------------|----|----|----|----|------------|
| From snout to vent | .. | .. | .. | .. | 38 millim. |
| Head               | .. | .. | .. | .. | 14 "       |
| Width of head      |    | .. | .. | .. | 10 "       |
| Snout              | .. | .. | .. | .. | 5 "        |
| Eye                | .. | .. | .. | .. | 4 "        |
| Interorbital width |    | .. | .. | .. | 3 "        |
| Tympanum           | .. | .. | .. | .. | 3 "        |
| Fore limb          |    | .. | .. | .. | 25 "       |
| Hind limb          | .. | .. | .. | .. | 61 "       |
| Tibia              |    | .. | .. | .. | 19 "       |
| Foot               | .. | .. | .. | .. | 19 "       |

*Habitat.* Travancore. This species is known from a single specimen found near Trivandrum by Capt. H. S. Ferguson.

It is now preserved in the British Museum.

**80. *Rana sanguinea.***

*Rana sanguinea*, Boettg. *Zool. Anz.* 1893, p. 364.

Vomerine teeth in oblique series between the choanæ and extending beyond the level of the posterior borders of the latter.

Head longer than broad; snout  $1\frac{1}{2}$  times as long as the eye, rounded and obliquely truncate in front and projecting beyond the mouth; canthus rostralis strong; loreal region nearly vertical, concave; nostril much nearer the tip of the snout than the eye; interorbital space broader than the upper eyelid; tympanum very distinct, more than  $\frac{3}{4}$  the size of the eye.

Fingers slender, with the tips dilated into very small discs, first longer than the second.

Hind limb very long, the tibio-tarsal articulation reaching far beyond the tip of the snout; tibia as long as the distance between the eye and the vent, longer than the fore limb, shorter than the foot. Toes with the tips dilated like the fingers,  $\frac{3}{4}$  webbed, 2 phalanges of fourth free; subarticular tubercles very strong, conical; no tarsal fold; two subequal metatarsal tubercles, inner oval, outer round.

Skin smooth; a prominent but narrow glandular dorso-lateral fold from above the temple to the sacral region; an oval gland below the tympanum.

Uniform carmine red above, dark reddish grey on the sides, a black band on the loreal region and a black temporal spot; upper lip white; limbs with rather indistinct, very oblique dark cross-bands; hinder side of thighs yellow, marbled with black. Throat whitish, with dark spots near the jaw; a dark spot on each side of the breast; belly sulphur yellow; lower surface of hind limbs fleshy red.

From snout to vent 44 millim.; head 15.5; width of head 13; fore limb 29; hind limb 95; tibia 32; foot 41.5.

*Habitat.* Calamianes Ids., Philippines.

Known from a single female specimen preserved in the Senckenberg Museum.

81. *Rana temporalis*.

*Hylarana malabarica* (non Tschudi), Kelaart, *Prodr. Faun. Zeyl.* I, p. 191 (1852).

? *Rana flavescens*, Jerdon, *Fourn. As. Soc. Beng.* XXII, 1854, p. 531.

*Rana malabarica*, part., Günth. *Cat. Batr. Sal.* p. 11 (1858).

*Hylarana malabarica*, part., Günth. *op. cit.* pp. 131, 142.

*Hylorana temporalis*, Günth. *Rept. Brit. Ind.* p. 427, pl. xxvi. fig. G (1864), and *Proc. Zool. Soc.* 1875, p. 569.

*Hylorana flavescens*, Jerdon, *Proc. As. Soc. Beng.* 1870, p. 83.

*Rana temporalis*, Bouleng. *Cat. Batr. Ecaud.* p. 63 (1882), and *Faun. Ind., Rept.* p. 459 (1890).

Vomerine teeth in short oblique series originating between the choanæ and extending beyond the level of their posterior borders, equally distinct from each other and from the latter or a little closer together.

Head as long as broad or a little longer than broad, much depressed; snout rounded or obtusely pointed, more or less projecting beyond the mouth, as long as the eye or a little longer; canthus rostralis well marked; loreal region feebly oblique or nearly vertical, concave; nostril nearer the tip of the snout than the eye; distance between the nostrils equal to or a little greater than the interorbital width, which is equal to or a little less than that of the upper eyelid; tympanum very distinct,  $\frac{2}{3}$  to  $\frac{3}{4}$  the diameter of the eye,  $1\frac{1}{2}$  to 3 times as long as its distance from the latter.

Fingers long and slender, terminating in small discs which are longer than broad and bear a groove separating the upper from the lower surface; first finger longer than the second, third longer than the snout; subarticular tubercles large and very prominent.

Hind limb long and rather slender, the tibio-tarsal articulation reaching the nostril, the tip of the snout, or a little beyond, the heels strongly overlapping when the limbs are folded at right angles to the body, tibia 4 to  $4\frac{1}{2}$  times as long as broad,  $1\frac{2}{3}$  to  $1\frac{7}{8}$  times in length from snout to vent, shorter than the fore limb, longer than the foot. Toes ending in small discs, similar to those of the fingers, web extending to the discs of the third and fifth, two phalanges of fourth free; outer metatarsals separated nearly to the base; sub-articular tubercles rather large and prominent; no tarsal fold, inner metatarsal tubercle oval or elliptic, about  $\frac{1}{3}$  the length of the inner toe; a small, round outer tubercle.

Skin smooth or finely granulate above; a moderately broad and very prominent glandular dorso-lateral fold from above the tympanum to the hip, its distance from its fellow, on the back,  $4\frac{1}{2}$  to 5 times in length from snout to vent; a glandular fold from below the eye to the shoulder. Lower parts smooth.

Yellowish brown to dark brown above, usually without, exceptionally with, small darker spots; dorso-lateral fold usually with a dark outer edge; a dark brown or black streak below the canthus rostralis, continued on the temporal region, and sometimes on the side of the body; a more or less distinct light streak on the upper lip and below the temporal spot; limbs with dark

brown cross-bands. Lower parts white, uniform or spotted or mottled with brown on the throat and breast.

Males with internal vocal sacs, with the fore limb strong and a large flat gland on the inner side of the arm; a strong pad on the inner side of the first finger, covered during the breeding season with a greyish brown velvet-like horny layer.

Nasal bones narrow, widely separated from each other and from the frontoparietals; ethmoid largely exposed above, truncate or rounded in front, not extending to between the nasals. Terminal phalanges with short transverse distal expansion.

*Measurements, in millimetres.*

|                       | 1.  | 2. | 3.  | 4.  | 5.  | 6. | 7.  | 8.  | 9.  | 10. | 11. | 12. | 13. | 14. | 15. | 16. | 17. |
|-----------------------|-----|----|-----|-----|-----|----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
|                       | ♂   | ♂  | ♀   | ♀   | ♂   | ♂  | ♀   | ♀   | ♂   | ♂   | ♂   | ♀   | ♀   | ♀   | ♀   | ♂   | ♀   |
| From snout to vent .. | 57  | 51 | 77  | 75  | 57  | 55 | 74  | 70  | 56  | 55  | 54  | 77  | 65  | 64  | 57  | 60  | 81  |
| Head ..               | 21  | 19 | 25  | 25  | 20  | 20 | 25  | 24  | 20  | 20  | 19  | 26  | 23  | 22  | 20  | 21  | 26  |
| Width of head ..      | 21  | 19 | 25  | 25  | 20  | 20 | 25  | 23  | 20  | 20  | 19  | 26  | 23  | 22  | 18  | 20  | 26  |
| Snout ..              | 8   | 7  | 9   | 10  | 8   | 7  | 10  | 9   | 8   | 8   | 7   | 10  | 9   | 9   | 8   | 8   | 11  |
| Eye ..                | 8   | 6  | 9   | 9   | 7   | 7  | 8   | 8   | 8   | 8   | 7   | 9   | 8   | 8   | 7   | 8   | 9   |
| Interorbital width .. | 4.5 | 4  | 6   | 6   | 4   | 4  | 6   | 5   | 4.5 | 4.5 | 4   | 6   | 5   | 5   | 5   | 4.5 | 7   |
| Tympanum ..           | 5   | 4  | 6   | 6   | 4.5 | 4  | 6   | 6   | 4.5 | 4.5 | 4   | 6   | 5   | 5   | 4.5 | 5   | 6   |
| Fore limb ..          | 38  | 34 | 46  | 47  | 36  | 37 | 46  | 43  | 38  | 38  | 36  | 53  | 42  | 42  | 36  | 38  | 52  |
| First finger ..       | 9   | 9  | 11  | 12  | 9   | 10 | 11  | 11  | 9   | 8   | 7.5 | 13  | 11  | 11  | 9   | 8   | 13  |
| Second finger ..      | 7   | 8  | 10  | 10  | 7   | 8  | 10  | 9   | 7   | 7   | 6.5 | 12  | 9   | 9   | 8   | 7   | 11  |
| Third finger ..       | 11  | 12 | 15  | 13  | 11  | 12 | 14  | 14  | 11  | 11  | 10  | 17  | 13  | 13  | 12  | 11  | 16  |
| Fourth finger ..      | 7   | 6  | 8   | 9   | 7   | 8  | 9   | 8   | 7   | 7   | 6   | 11  | 9   | 8   | 7   | 7   | 10  |
| Hind limb ..          | 95  | 90 | 128 | 122 | 93  | 97 | 126 | 120 | 100 | 96  | 94  | 142 | 118 | 114 | 97  | 101 | 136 |
| Tibia ..              | 31  | 30 | 42  | 40  | 31  | 31 | 42  | 40  | 32  | 31  | 30  | 45  | 39  | 38  | 31  | 32  | 45  |
| Foot ..               | 29  | 27 | 37  | 37  | 28  | 30 | 39  | 37  | 30  | 29  | 28  | 43  | 35  | 36  | 29  | 31  | 41  |
| Third toe ..          | 15  | 16 | 21  | 21  | 16  | 17 | 20  | 19  | 15  | 16  | 16  | 23  | 19  | 18  | 15  | 16  | 22  |
| Fourth toe ..         | 23  | 22 | 31  | 30  | 22  | 25 | 31  | 31  | 24  | 23  | 23  | 37  | 29  | 29  | 24  | 26  | 37  |
| Fifth toe ..          | 16  | 16 | 21  | 23  | 17  | 17 | 23  | 23  | 17  | 17  | 16  | 26  | 21  | 20  | 17  | 19  | 25  |

1-4. Ceylon (types). 5-7. Punduloya, Ceylon. 8. Piermerd, Travancore. 9-15. Bolumputti Anamalis. 16-17. Malabar.

*Habitat.* Malabar and Ceylon.

This frog should perhaps be regarded as a variety of the African *R. albilabris*, Hallow.

[This species is found chiefly at the edge of rocky streams at no great altitude. It sits exposed on flat rocks and stones and leaps, often for a considerable distance, into the water when disturbed. *N. A.*]

## 82. *Rana florensis*.

*Rana florensis*, Bouleng. *Ann. and Mag. N.H.* (6) XIX, 1897, p. 508.

Vomerine teeth in short oblique groups between the choanæ, nearer to the latter than to each other.

Head as long as broad or a little longer than broad, much depressed; snout truncate and projecting beyond the mouth, as long as the eye or a little longer; canthus rostralis strong; loreal region nearly vertical, deeply concave; nostril nearer the tip of the snout than the eye; distance between the nostrils equal to the interorbital width or the width of the upper eyelid; tympanum very distinct,  $\frac{2}{3}$  to  $\frac{3}{4}$  the diameter of the eye and 3 to 5 times its distance from the latter.

Fingers long and slender, terminating in small discs, which are a little longer than broad, measuring  $\frac{2}{3}$  to  $\frac{1}{2}$  the diameter of the tympanum, and bear a horseshoe-shaped groove separating the upper from the lower surface; first finger longer than the second, third much longer than the snout; subarticular tubercles large and very prominent.

Hind limb long and rather slender; tibio-tarsal articulation reaching the tip of the snout, heels strongly overlapping when the limbs are folded at right angles to the body; tibia 5 to  $5\frac{1}{2}$  times as long as broad, about  $1\frac{3}{4}$  times in length from snout to vent, shorter than the fore limb, a little longer than the foot. Toes ending in well-developed discs, similar to those of the fingers; web reaching the discs of the third and fifth, two phalanges of fourth free; outer metatarsals separated nearly to the base; subarticular tubercles large and prominent; no tarsal fold; inner metatarsal tubercle oval, about  $\frac{1}{3}$  the length of the inner toe; a round outer tubercle.

Skin smooth above, or rough with small granular asperities; a narrow glandular dorso-lateral fold from above the tympanum to the hip, stronger in front; the distance between the dorso-lateral folds, on the back, 5 to 6 times in length of head and body; a glandular fold from below the eye to the shoulder. Lower parts smooth.

Grey or olive above, sides of head darker; tympanum brown; dorso-lateral fold not darker; limbs with dark cross-bands. Lower parts much spotted or marbled with dark brown, the throat and breast nearly entirely of a dark brown.

Males with internal vocal sacs; fore limb very strong, with a flat gland on the inner side of the arm.

Nasal bones narrow, oblique, widely separated from each other and from the frontoparietals; ethmoid largely exposed above, extending to between the nasals.

Eggs 2 millim. in diameter.

*Measurements of types, in millimetres.*

|                       | ♂   | ♂   | ♂   | ♀   |
|-----------------------|-----|-----|-----|-----|
| From snout to vent .. | 66  | 64  | 61  | 78  |
| Head .. ..            | 22  | 22  | 21  | 26  |
| Width of head ..      | 19  | 20  | 18  | 26  |
| Snout ..              | 8   | 8   | 8   | 9   |
| Eye .. ..             | 8   | 8   | 7   | 9   |
| Interorbital width .. | 5   | 5   | 4.5 | 7   |
| Tympanum .. ..        | 5   | 6   | 5   | 6   |
| Fore limb .. ..       | 46  | 43  | 44  | 50  |
| First finger ..       | 9   | 9   | 10  | 12  |
| Second finger ..      | 8   | 8   | 8   | 10  |
| Third finger ..       | 14  | 14  | 14  | 18  |
| Fourth finger ..      | 9   | 10  | 10  | 12  |
| Hind limb. ..         | 112 | 110 | 110 | 132 |
| Tibia .. ..           | 37  | 37  | 35  | 45  |
| Foot .. ..            | 35  | 34  | 34  | 43  |
| Third toe .. ..       | 18  | 18  | 17  | 21  |
| Fourth toe. ..        | 27  | 26  | 28  | 36  |
| Fifth toe .. ..       | 21  | 20  | 20  | 25  |

*Habitat.* Flores, above 3,000 feet.

Distinguished from *R. temporalis* by the smaller groups of vomerine teeth, which do not extend posteriorly beyond the choanæ, and by the larger discs.

### 83. *Rana nicobariensis*.

*Hylorana nicobariensis*, Stoliczka, *Journ. As. Soc. Beng.* XXXIX, 1870, p. 150, pl. ix, fig. 2.

*Rana macularia*, var. *javanica*, Horst, *Notes Leyd. Mus.* V, 1883, p. 243.

*Rana nicobariensis*, Bouleng. *Ann. and Mag. N.H.* (5) XVI, 1885, p. 389, *Faun. Ind., Rept.* p. 459 (1890), *Ann. and Mag. N.H.* (6) VIII, 1891, p. 391; Vincig. *Ann. Mus. Genova* (2) XII, 1892, p. 525; van Kampen, *Zool. Jahrb., Syst.* XXII, 1905, p. 704; Bouleng. *Faun. Mal. Pen., Rept.* p. 240 (1912); Annand. *Mem. As. Soc. Beng.* VI, 1917, pp. 140, 142.

*Rana erythræa*, var. *elongata*, Werner, *Fahresb. Nat. Ver. Magdeb.* 1892, p. 253.

*Rana lemniscata*, Boettz. *Zool. Anz.* 1893, p. 337.

*Rana tytleri*, part., Isenschmid, *Mitth. Nat. Ges. Bern*, 1903, p. 9.

*Rana javanica*, van Kampen, in M. Web. *Zool. Ergebn. Reise Nied. O.-Ind.* IV, p. 392 (1907) and *Nat. Tijdschr. Ned. Ind.* LXIX, 1909, p. 36; Annand. *Journ. Fed. Mal. St. Mus.* VII, 1917, p. 108.

Vomerine teeth in oblique groups or short series between the choanæ, or extending a little beyond the level of their posterior borders, equally distant from each other or a little nearer the latter.

Head longer than broad, much depressed; snout more or less pointed, more or less projecting beyond the mouth, longer than the eye; canthus rostralis strong; loreal region nearly vertical, deeply concave; nostril nearer the tip of the snout than the eye; distance between the nostrils equal to the interorbital width, which equals or a little exceeds that of the upper eyelid; tympanum very distinct,  $\frac{3}{5}$  to  $\frac{1}{5}$  the diameter of the eye, 3 to 5 times its distance from the latter.

Fingers long and slender, with a feeble dermal border, terminating in rather small discs which are as long as broad,  $\frac{1}{3}$  to  $\frac{2}{3}$  the diameter of tympanum, with the upper surface separated from the lower by a horseshoe-shaped groove; first finger longer than the second, third longer than the snout; subarticular tubercles moderately large, very prominent.

Hind limb rather long and slender, the tibio-tarsal articulation reaching the nostril or the tip of the snout, the heels strongly overlapping when the limbs are folded at right angles to the body; tibia 5 to  $5\frac{1}{2}$  times as long as broad,  $1\frac{2}{3}$  to 2 times in length from snout to vent, a little shorter than the fore limb, as long as or a little longer than the foot. Toes ending in rather small discs, same as those of the fingers,  $\frac{1}{2}$  to  $\frac{2}{3}$  webbed, 2 or 3 phalanges of fourth free; the web rarely reaching the discs of the third and fifth toes; outer metatarsals separated nearly to the base; subarticular tubercles rather small, prominent; no tarsal fold; inner metatarsal tubercle oval,  $\frac{1}{5}$  to  $\frac{1}{3}$  the length of the inner toe; a round outer tubercle.

Skin smooth or finely granulate above, with or without small warts; a strong, narrow or moderately broad glandular dorso-

lateral fold from above the tympanum to the hip, its distance from its fellow, on the back, 5 to 6 times in the length of head and body. Lower parts smooth, posterior part of thighs granulate.

Greyish or reddish brown above, uniform or spotted with darker<sup>1</sup>; sides of head dark brown or black, which shade may be prolonged on the sides of the body below the lateral folds; a white streak on the upper lip; limbs with dark cross-bands. White beneath, uniform or spotted with brown, throat and breast brown in the males.

Males with internal vocal sacs; fore limb strong, with a flat oval gland on the inner side of the arm and a moderately strong pad on the inner side of the first finger.

Nasal bones narrow, oblique, widely separated from each other and from the frontoparietals; ethmoid largely exposed above, extending to between the nasals.

Tadpoles from Tenasserim, received under the name of *R. nicobariensis* from the Indian Museum, have the tail obtusely pointed and  $1\frac{1}{2}$  to  $1\frac{3}{4}$  times as long as the body, and bear black dots and light-edged black ocellar spots; the beak is narrowly edged with black and there are 6 or 7 upper and as many lower series of labial teeth, the 2 or 3 outer upper and all but the inner lower uninterrupted.

Eggs measure  $1\frac{1}{2}$  millim. in diameter in a female 42 millim. long from snout to vent.

*Habitat.* Nicobars, Tenasserim, Malay Peninsula, Sumatra and neighbouring islands, Borneo, Mentavei, and Java.

The web between the toes varies in extent, sometimes reaching the discs of the third and fifth, sometimes not extending beyond the basal phalanx, but these two extremes are connected by every degree.

*Rana nicobariensis* and *R. varians*, Blgr., are two closely allied species, which may be distinguished as follows:—

*R. nicobariensis*.—Nostril considerably nearer the tip of the snout than the eye; tibio-tarsal articulation reaching the nostril or the tip of the snout; toes  $\frac{1}{2}$  to  $\frac{3}{4}$  webbed, 2 phalanges of third and fifth free, male with a flat gland on the inner side of the arm.

*R. varians*.—Nostril equally distant from the eye and the tip of the snout, or a little nearer the latter; tibio-tarsal articulation reaching beyond the tip of the snout; web reaching the discs of the third and fifth toes; male without humeral gland.

In 1891 (*Ann. and Mag. N.H.* VIII, p. 291) I identified *R. macularia*, var. *javanica*, Horst, with *R. nicobariensis*, but both van Kampen (in M. Weber, *Zool. Ergebn. Reis. Nied. O.-Ind.* IV, p. 392) and Annandale (*Journ. Fed. Mal. St. Mus.* VII, 1917, p. 108) have demurred to this identification and regard the Java frog as a distinct species, *R. javanica*, which is stated to differ in the nostril being only a little nearer the tip of the snout than the eye, in the broader interorbital region ( $1\frac{1}{2}$  times the width of the upper

<sup>1</sup> Annandale mentions a specimen from Java with a faint light vertebral line.

*Measurements, in millimetres.*

|                       | 1. | 2. | 3. | 4. | 5. | 6. | 7. | 8. | 9. | 10. | 11. | 12. | 13. | 14. | 15. | 16. | 17. | 18. | 19. | 20. | 21. |
|-----------------------|----|----|----|----|----|----|----|----|----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
|                       | ♂  | ♂  | ♂  | ♂  | ♀  | ♀  | ♀  | ♀  | ♀  | ♂   | ♂   | ♂   | ♀   | ♀   | ♂   | ♀   | ♀   | ♂   | ♀   | ♀   | ♀   |
| From snout to vent .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | ..  | ..  | ..  | ..  | ..  | ..  | ..  | ..  | ..  | ..  | ..  | ..  |
| Head ..               | .. | .. | .. | .. | .. | .. | .. | .. | .. | ..  | ..  | ..  | ..  | ..  | ..  | ..  | ..  | ..  | ..  | ..  | ..  |
| Width of head ..      | .. | .. | .. | .. | .. | .. | .. | .. | .. | ..  | ..  | ..  | ..  | ..  | ..  | ..  | ..  | ..  | ..  | ..  | ..  |
| Snout ..              | .. | .. | .. | .. | .. | .. | .. | .. | .. | ..  | ..  | ..  | ..  | ..  | ..  | ..  | ..  | ..  | ..  | ..  | ..  |
| Eye ..                | .. | .. | .. | .. | .. | .. | .. | .. | .. | ..  | ..  | ..  | ..  | ..  | ..  | ..  | ..  | ..  | ..  | ..  | ..  |
| Interorbital width .. | .. | .. | .. | .. | .. | .. | .. | .. | .. | ..  | ..  | ..  | ..  | ..  | ..  | ..  | ..  | ..  | ..  | ..  | ..  |
| Tympanum ..           | .. | .. | .. | .. | .. | .. | .. | .. | .. | ..  | ..  | ..  | ..  | ..  | ..  | ..  | ..  | ..  | ..  | ..  | ..  |
| Fore limb ..          | .. | .. | .. | .. | .. | .. | .. | .. | .. | ..  | ..  | ..  | ..  | ..  | ..  | ..  | ..  | ..  | ..  | ..  | ..  |
| First finger ..       | .. | .. | .. | .. | .. | .. | .. | .. | .. | ..  | ..  | ..  | ..  | ..  | ..  | ..  | ..  | ..  | ..  | ..  | ..  |
| Second finger ..      | .. | .. | .. | .. | .. | .. | .. | .. | .. | ..  | ..  | ..  | ..  | ..  | ..  | ..  | ..  | ..  | ..  | ..  | ..  |
| Third finger ..       | .. | .. | .. | .. | .. | .. | .. | .. | .. | ..  | ..  | ..  | ..  | ..  | ..  | ..  | ..  | ..  | ..  | ..  | ..  |
| Fourth finger ..      | .. | .. | .. | .. | .. | .. | .. | .. | .. | ..  | ..  | ..  | ..  | ..  | ..  | ..  | ..  | ..  | ..  | ..  | ..  |
| Hind limb ..          | .. | .. | .. | .. | .. | .. | .. | .. | .. | ..  | ..  | ..  | ..  | ..  | ..  | ..  | ..  | ..  | ..  | ..  | ..  |
| Tibia ..              | .. | .. | .. | .. | .. | .. | .. | .. | .. | ..  | ..  | ..  | ..  | ..  | ..  | ..  | ..  | ..  | ..  | ..  | ..  |
| Foot ..               | .. | .. | .. | .. | .. | .. | .. | .. | .. | ..  | ..  | ..  | ..  | ..  | ..  | ..  | ..  | ..  | ..  | ..  | ..  |
| Third toe ..          | .. | .. | .. | .. | .. | .. | .. | .. | .. | ..  | ..  | ..  | ..  | ..  | ..  | ..  | ..  | ..  | ..  | ..  | ..  |
| Fourth toe ..         | .. | .. | .. | .. | .. | .. | .. | .. | .. | ..  | ..  | ..  | ..  | ..  | ..  | ..  | ..  | ..  | ..  | ..  | ..  |
| Fifth toe ..          | .. | .. | .. | .. | .. | .. | .. | .. | .. | ..  | ..  | ..  | ..  | ..  | ..  | ..  | ..  | ..  | ..  | ..  | ..  |

1-2. Nicobars. 3-4. Burma. 5. Kuala Tahan, Pahang. 6. Kuala Lumpur, Selangor. 7-8. Deli, Sumatra. 9. Nias. 10-14. Engano. 15-16. Bongon, N. Borneo. 17. Serainu, Mentawai. 18-19. Pengalengan, Java. 20-21. Salak, Java.

eyelid), and in the shorter web between the toes, reaching only the end of the basal phalanx of the third and fifth toes.

An examination of 5 specimens from Java proves this distinction to break down.

[It is curious that all the specimens of this frog found in the Malay Peninsula have been captured in or close to the large limestone caves characteristic of many districts of that country. In the Jalor caves I have seen individuals well inside the mouth of the Goah Glap. N A.]

#### 84. *Rana varians*.

*Rana varians*, Bouleng. *Ann. and Mag. N.H.* (6) XIV, 1894, p. 86, and *Proc. Zool. Soc.* 1897, p. 231; Boettg. *Abh. Senck. Ges.* XXV, 1901, p. 366, pl. xv, fig. 8.

*Rana moluccana*, Boettg. *Zool. Anz.* 1895, p. 132; Barbour, *Mem. Mus. Comp. Zool.* XLIV, 1912, p. 66, fig., pl. v, fig. 12.

Vomerine teeth in strong oblique series between the choanæ or extending beyond the level of their posterior borders, equally distant from each other and from the latter.

Head longer than broad, much depressed; snout rounded or more or less pointed, projecting beyond the mouth, usually longer than the eye; canthus rostralis strong; loreal region nearly vertical, deeply concave; nostril equidistant from the eye and from the tip of the snout, or a little nearer the latter; distance between the nostrils equal to or greater than the interorbital width, which is equal to or a little less than that of the upper eyelid; tympanum very distinct,  $\frac{2}{3}$  to  $\frac{5}{8}$  the diameter of the eye,  $1\frac{1}{2}$  to 4 times its distance from the latter.

Fingers long and slender, terminating in small discs which are a little longer than broad, with the upper surface separated from the lower by a horseshoe-shaped groove; first finger longer than the second, third as long as or longer than the snout; subarticular tubercles large and very prominent.

Hind limb very long and slender, the tibio-tarsal articulation reaching beyond the tip of the snout, the heels strongly overlapping when the limbs are folded at right angles to the body; tibia 5 to 6 times as long as broad,  $1\frac{1}{2}$  to  $1\frac{3}{4}$  times in length from snout to vent, as long as or a little longer or a little shorter than the fore limb, longer than the foot. Toes ending in small discs, same as those of the fingers; web reaching the discs of the third and fifth, usually 2 phalanges of fourth free; subarticular tubercles large and prominent; outer metatarsals separated nearly to the base; no tarsal fold; inner metatarsal tubercle oval,  $\frac{1}{4}$  to  $\frac{1}{3}$  the length of the inner toe; a small, round outer tubercle.

Skin smooth or finely granulate above, with or without small warts; a narrow but very prominent glandular dorso-lateral fold from above the tympanum to the hip, its distance from its fellow, on the back, 5 to  $6\frac{1}{2}$  times in the length of head and body. Lower parts smooth, posterior part of thighs granulate.

Brown, pink, or grey above; a dark brown or black streak below the canthus rostralis and a temporal blotch; a whitish streak along the upper lip; some specimens with a pale vertebral line and another along the upper surface of the tibia; limbs with dark cross-bands; hinder side of thighs brown or marbled with brown. Lower parts white, throat and breast sometimes dark brown; often a blackish spot on each side of the breast.

Males with internal vocal sacs; fore limb very strong, with a moderately strong pad on the inner side of the first finger, covered, during the breeding season, with a yellowish horny layer.

Nasal bones narrow, oblique, widely separated from each other and from the frontoparietals; ethmoid largely exposed above, extending to between the nasals.

Eggs measuring  $1\frac{1}{2}$  millim. in female 62 millim. long.

*Measurements, in millimetres.*

|                       | 1.  | 2.  | 3.  | 4.  | 5.  | 6.  | 7.  | 8.  | 9.  | 10. | 11. | 12. | 13. |
|-----------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
|                       | ♂   | ♂   | ♀   | ♀   | ♀   | ♀   | ♀   | ♂   | ♀   | ♀   | ♀   | ♀   | ♀   |
| From snout to vent .. | 42  | 42  | 73  | 72  | 68  | 66  | 66  | 46  | 56  | 69  | 64  | 62  | 55  |
| Head ..               | 16  | 16  | 25  | 23  | 25  | 23  | 23  | 17  | 21  | 23  | 23  | 21  | 20  |
| Width of head ..      | 14  | 13  | 22  | 22  | 23  | 21  | 21  | 15  | 17  | 20  | 20  | 18  | 15  |
| Snout ..              | 7   | 7   | 11  | 9   | 11  | 10  | 10  | 6   | 8   | 10  | 10  | 9   | 8   |
| Eye ..                | 6   | 6   | 8   | 8   | 8   | 8   | 8   | 6   | 7   | 7   | 7   | 7   | 6.5 |
| Interorbital width .. | 2.5 | 2.5 | 4   | 4   | 4   | 4   | 4   | 3   | 4   | 4   | 4   | 4   | 3.5 |
| Tympanum ..           | 5   | 5   | 6   | 5   | 6   | 5   | 5   | 4.5 | 4.5 | 6   | 5   | 5   | 5   |
| Fore limb ..          | 25  | 28  | 46  | 45  | 45  | 44  | 43  | 30  | 40  | 48  | 44  | 42  | 35  |
| First finger ..       | 5.5 | 6   | 11  | 11  | 11  | 11  | 10  | 8   | 10  | 14  | 12  | 11  | 10  |
| Second finger ..      | 5   | 5.5 | 9   | 9   | 9   | 9   | 8   | 6   | 8   | 11  | 9   | 8   | 7   |
| Third finger ..       | 7   | 8   | 13  | 13  | 13  | 13  | 12  | 9   | 11  | 15  | 13  | 12  | 11  |
| Fourth finger ..      | 5   | 5   | 8   | 9   | 8   | 8   | 8   | 7   | 8   | 11  | 10  | 8   | 7   |
| Hind limb ..          | 76  | 84  | 137 | 130 | 133 | 124 | 122 | 81  | 115 | 128 | 122 | 119 | 96  |
| Tibia ..              | 26  | 28  | 48  | 44  | 45  | 41  | 42  | 26  | 35  | 43  | 40  | 37  | 31  |
| Foot ..               | 21  | 25  | 37  | 36  | 36  | 36  | 34  | 24  | 32  | 36  | 35  | 32  | 29  |
| Third toe ..          | 12  | 13  | 20  | 19  | 20  | 20  | 19  | 14  | 16  | 20  | 19  | 18  | 16  |
| Fourth toe..          | 18  | 20  | 33  | 31  | 31  | 30  | 29  | 21  | 26  | 32  | 30  | 27  | 25  |
| Fifth toe ..          | 12  | 14  | 24  | 23  | 24  | 22  | 21  | 15  | 19  | 23  | 21  | 20  | 17  |

1-7. Palawan (types). 8-9. Masarang, Celebes. 10-13. Batjan.

*Habitat.* First described from Palawan, this species has since been found in Luzon, in Celebes, and in Batjan, Halmaheira, and Ternate.

Our material shows the characters on which Barbour based his distinction of *R. moluccana* from *R. varians* to be merely individual, not geographical. Some specimens from Palawan answer his definition of *R. moluccana* (shorter web, smaller tympanum).

### 85. *Rana alticola*.

*Hylorana tytleri* (non Theob.), Stoliczka, *Journ. As. Soc. Beng.* XXXIX, 1870, p. 148, pl. ix, fig. 1.

*Hylorana pipiens*, Jerdon, *Proc. As. Soc. Beng.* 1870, p. 83.

*Rana alticola*, Bouleng. *Cat. Batr. Ecaud.* p. 52, fig. (1882); Annand. *Rec. Ind. Mus.* VIII, 1912, p. 22, pl. iv, fig. 1; Malcolm Smith, *Journ. N.H. Soc. Siam*, II, 1916, p. 167; Annand. *Mem. As. Soc. Beng.* V.I, 1917, pp. 140, 144.

*Rana tytleri*, part., Bouleng. *Faun. Ind., Rept.* p. 458 (1890); Annand. *Mem. As. Soc. Beng.* VI, 1917, p. 141.

*Rana nigrovittata*, part., W. Slater, *Proc. Zool. Soc.* 1892, p. 345.

*Rana alticola*, part., Annand. *Rec. Ind. Mus.* VIII, 1912, p. 8.

*Rana leptoglossa* (non Cope), Annand. *Mem. As. Soc. Beng.* VI, 1917, p. 140, fig.

Vomerine teeth in short oblique series between the choanæ or extending a little beyond the level of their posterior borders, equally distant from each other and from the latter.

Head longer than broad, much depressed; snout a little longer than the eye, more or less obtusely pointed, moderately or feebly projecting beyond the mouth, canthus rostralis strong; loreal region feebly oblique, concave; nostril nearer the end of the snout than the eye; distance between the nostrils equal to or a little less than the interorbital region, which equals or exceeds that of the upper eyelid; tympanum very distinct.  $\frac{3}{5}$  to nearly once the diameter of the eye, 2 to 5 times as long as its distance from the latter.

Fore limb slender, fingers long and slender, with small discs which are longer than broad and bear a groove separating the upper from the lower surface; first finger a little longer than the second, third longer than the snout; subarticular tubercles large, very prominent.

Hind limb long and slender; tibio-tarsal articulation reaching the tip of the snout or beyond; heels strongly overlapping when the limbs are folded at right angles to the body; tibia 5 to 6 times as long as broad,  $1\frac{2}{3}$  to  $1\frac{6}{7}$  times in length from snout to vent, as long as or a little shorter than the fore limb, considerably longer than the foot. Toes slender, with discs same as those of the fingers but a little broader, webbed to the discs of the third and fifth, two phalanges (rarely one only) of fourth free; outer metatarsals separated nearly to the base; subarticular tubercles large and prominent; no tarsal fold; inner metatarsal tubercle oval, about  $\frac{1}{4}$  the length of the inner toe; a more or less distinct outer tubercle.

Skin smooth; a feebly prominent, narrow glandular dorso-lateral fold from above the tympanum to the hip, its distance from its fellow, on the back, 6 to  $6\frac{1}{2}$  times in length from snout to vent; another, sometimes indistinct, from behind the tympanum to the shoulder.

Light brown above, scarcely or not spotted, sides dark brown<sup>1</sup>; a light vertebral streak may be present above the coccyx; dorso-lateral fold whitish, black-edged on the outer side; upper lip whitish with a dark margin; limbs with or without narrow dark cross-bands. Lower parts white, the throat brown or with crowded brown spots, usually with a light median line.

Males with internal vocal sacs; no other secondary sexual characters.

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<sup>1</sup> The light bar ascending from the upper lip between the eye and the tympanum, regarded by Annandale as a specific character of *R. leptoglossa*, is present in one of the specimens from Klong Beng Lai.

Nasal bones narrow, oblique, widely separated from each other; ethmoid exposed above, obtusely pointed in front, not extending to the nasals.

Tadpole remarkable for the presence of a parotoid-like porous flat oval gland on each side of the body and sometimes a third near the base of the tail. Tail pointed,  $1\frac{2}{3}$  to 2 times as long as head. Mouth moderately large; beak broadly edged with black; 7 or 8 upper and as many lower series of horny labial teeth, the outer upper marginal and uninterrupted, the second upper also uninterrupted, the others paired; the lower series all uninterrupted or the innermost narrowly interrupted. A blackish, light-edged ocellar spot on each side of the muscular part of the tail, near its base.

*Measurements, in millimetres.*

|                    | 1. | 2.  | 3.  | 4.  | 5. | 6.  | 7.  | 8.  | 9.  | 10. | 11. | 12. |
|--------------------|----|-----|-----|-----|----|-----|-----|-----|-----|-----|-----|-----|
|                    | ♂  | ♀   | ♀   | ♀   | ♀  | ♂   | ♂   | ♂   | ♀   | ♀   | ♂   | ♀   |
| From snout to vent | 39 | 50  | 49  | 49  | 48 | 39  | 38  | 37  | 50  | 63  | 53  | 58  |
| Head ..            | .. | 15  | 18  | 17  | 18 | 17  | 15  | 14  | 18  | 23  | 19  | 20  |
| Width of head ..   | .. | 13  | 15  | 15  | 15 | 14  | 12  | 11  | 15  | 20  | 16  | 19  |
| Snout ..           | .. | 6   | 7   | 6.5 | 8  | 6.5 | 5.5 | 5   | 7   | 9   | 7   | 8   |
| Eye ..             | .. | 5   | 6   | 6   | 6  | 5.5 | 5   | 4.5 | 6   | 7   | 6   | 7   |
| Interorbital width | .. | 4   | 4.5 | 4   | 4  | 4   | 3.5 | 3.5 | 3   | 4   | 5   | 4   |
| Tympanum           | .. | 4   | 4.5 | 3.5 | 4  | 3.5 | 4   | 4   | 3.5 | 4   | 5   | 4.5 |
| Fore limb ..       | .. | 26  | 34  | 34  | 34 | 32  | 27  | 25  | 25  | 33  | 39  | 37  |
| First finger       | .. | 5.5 | 6   | 6.5 | 7  | 6.5 | 5.5 | 5   | 5   | 6.5 | 8   | 8   |
| Second finger      | .. | 5   | 5.5 | 6   | 6  | 6   | 5   | 4   | 4.5 | 5.5 | 7   | 5.5 |
| Third finger ..    | .. | 9   | 10  | 11  | 10 | 10  | 9   | 7   | 8   | 10  | 12  | 9   |
| Fourth finger      | .. | 5   | 6   | 6.5 | 7  | 6   | 5   | 4   | 4.5 | 5.5 | 7   | 5.5 |
| Hind limb ..       | .. | 66  | 90  | 89  | 89 | 80  | 71  | 63  | 62  | 82  | 115 | 92  |
| Tibia ..           | .. | 22  | 31  | 31  | 30 | 27  | 24  | 21  | 21  | 28  | 40  | 31  |
| Foot ..            | .. | 19  | 23  | 23  | 24 | 22  | 20  | 17  | 17  | 22  | 35  | 26  |
| Third toe ..       | .. | 9   | 11  | 12  | 12 | 11  | 10  | 8   | 8   | 11  | 20  | 13  |
| Fourth toe ..      | .. | 15  | 19  | 19  | 20 | 18  | 16  | 14  | 14  | 18  | 29  | 22  |
| Fifth toe          | .. | 11  | 13  | 13  | 14 | 13  | 11  | 8   | 8   | 11  | 22  | 15  |

1-3. Shillong, Assam (types). 4-5. Cheera Punjee, Khasi hills. 6. Khasi hills. 7-9. Klong Beng Lai, Siam. 10. Man Son Mts., Tonkin. 11-12. Pegu (Ind. Mus.).

*Habitat.* Hills of Assam, Siam and Tonkin (near the Kwangsi frontier), Pegu. A recently transformed young, labelled as from Moulmein, is preserved in the British Museum and appears to be referable to the species described and figured by Stoliczka as *Hylorana tyleri*.

I believe the specimens referred by Annandale to *R. leptoglossa*, Cope, belong to this species. According to Annandale's short description they differ from Cope's type by the longer hind limb (tibio-tarsal articulation reaching end of snout or beyond instead of to front of orbit) and the dorso-lateral fold is represented as narrow (instead of 'heavy'). No mention is made by Cope of the interruption in the dark band extending from the tip of the snout to behind the tympanum; his description is "Above olivaceous, with a blackish band from end of muzzle to groin, margined with yellow below, from below eye to axilla."

Dr. Annandale has been so kind as to send me three specimens from Pegu, from Stoliczka's collection, representing his *Rana*

*leptoglossa*. Measurements of two of them are given above, columns 11 and 12. The only difference I can detect between them and the more northern specimens on which *R. alticola* is founded is the presence of a light vertical bar between the eye and the tympanum, to which Dr. Annandale has drawn attention.

[This frog, to judge from the prevalence of the tadpoles in spring, is common round Shillong, but the adult conceals itself at this season even in rainy weather and I have never succeeded in finding a specimen. In March and April the tadpoles, which are gregarious, are to be seen in every pool with a muddy bottom in the larger streams in the neighbourhood of the station. They are diurnal in habits and largely carnivorous. In the evening they conceal themselves, but as soon as the sun is well up they may be seen to emerge from under the banks and to feed on insect larvae in the mud. Though very conspicuous in lateral view, from above they appear entirely dark, of a deep olivaceous shade, and the large ocellus on the tail is only visible in lateral view. In life it is deep orange yellow and black. The parotoid glands pour out a profuse milky secretion when the tadpole is irritated.

The tadpole with more than one ocellus on the tail is, I now believe, distinct. In large numbers examined at Shillong none were found with more than one ocellus, whereas in larval specimens of this type from Burma at least two such markings are always present on the tail. Perhaps these Burmese tadpoles are those of *R. nicobariensis*. There must surely have been some confusion about those specimens in the Indian Museum labelled as being from the Pamirs. *N A.*]

### 86. *Rana celebensis*.

*Rana celebensis*, Peters, *Mon. Berl. Ac.* 1872, p. 585; van Kampen, in M. Weber, *Zool. Ergebn. Reis. Nied. O.-Ind.* IV, p. 395 (1907).

Vomerine teeth in short series extending a little beyond the level of the posterior borders of the choanæ.

Head longer than broad; snout rounded, projecting beyond the mouth, as long as the orbit; canthus rostralis strong; loreal region nearly vertical, concave; nostril nearer the tip of the snout than the eye; interorbital space as broad as the upper eyelid; tympanum very distinct, nearly as large as the eye.

Fingers with small but very distinct discs, first longer than the second; subarticular tubercles well developed.

The tibio-tarsal articulation reaches the nostril; tibia more than  $\frac{1}{2}$  length of head and body, shorter than the fore limb.

Toes with discs similar to those of the fingers, webbed to the discs of the third and fifth, two phalanges of fourth free; no tarsal fold; inner metatarsal tubercle oval, outer round and not much smaller.

Skin of upper parts finely granulate, with or without large warts on the back; a broad glandular dorso-lateral fold, as in *R. erythræa*. Lower parts smooth.

Brown above; loreal and temporal regions, dorsal warts and dorso-lateral folds darker; a white streak along the upper lip; limbs with dark cross-bands.

From snout to vent 46 millim.

*Habitat.* Celebes.

According to van Kampen, who has examined the type specimen, this species is very near *R. varians*, and he thinks it possible that both may have to be united. The shorter hind limb and the broad dorso-lateral fold are, I think, characters sufficient to maintain the separation.

Van Kampen also thinks that the specimen, of unknown origin, which I have described in the Catalogue Batr. Ecaud., p. 70 (1882) and in the Proc. Zool. Soc. 1897, p. 232, must belong to a different species. Of this I am not convinced, as the specimen agrees in most particulars with the above description, the differences not exceeding those distinguishing individuals in various species of this group of *Rana*. These differences are:—Vomerine teeth not extending posteriorly beyond the choanæ (equally distant from each other and from the latter); first finger not longer than the second; several large, prominent oval glands on the sides below the dorso-lateral fold. The tibia is  $3\frac{2}{3}$  times as long as broad.

#### Measurements.

|                       |    |            |
|-----------------------|----|------------|
| From snout to vent    | .. | 45 millim. |
| Head ..               | .. | 17         |
| Width of head ..      | .. | 16         |
| Snout ..              | .. | 6          |
| Eye ..                | .. | 6          |
| Interorbital width .. | .. | 3          |
| Tympanum ..           | .. | 4.5        |
| Fore limb ..          | .. | 27         |
| First finger ..       | .. | 5          |
| Second finger ..      | .. | 5          |
| Third finger ..       | .. | 7          |
| Fourth finger ..      | .. | 4          |
| Hind limb ..          | .. | 74         |
| Tibia ..              | .. | 25         |
| Foot ..               | .. | 22         |
| Third toe ..          | .. | 12         |
| Fourth toe ..         | .. | 19         |
| Fifth toe ..          | .. | 14         |

The specimen is a male, with internal vocal sacs, strong fore limbs, and an oval flat gland on the inner side of the arm.

#### 87. *Rana garoensis*, sp. n.

Vomerine teeth in short oblique series between the choanæ.

Head longer than broad, much depressed; snout pointed, strongly projecting beyond the mouth, as long as the eye; canthus rostralis strong; loreal region not very oblique, concave; nostril equidistant from the eye and from the tip of the snout; distance between the nostrils a little greater than the interorbital width, which equals that of the upper eyelid; tympanum very distinct,

$\frac{1}{2}$  the diameter of the eye,  $1\frac{1}{2}$  to 2 times its distance from the latter.

Fingers rather slender, the tips dilated into very small discs with a groove separating the upper from the lower surface; first and second fingers equal, third a little longer than the snout; sub-articular tubercles moderately large, prominent.

Hind limb long, the tibio-tarsal articulation reaching a little beyond the tip of the snout, the heels strongly overlapping; tibia  $4\frac{1}{2}$  to 5 times as long as broad,  $1\frac{2}{3}$  times in length from snout to vent, as long as the fore limb, longer than the foot. Toes with the tips more strongly dilated than those of the fingers, entirely webbed; outer metatarsals separated nearly to the base; sub-articular tubercles small but very prominent; no tarsal fold; inner metatarsal tubercle oval,  $\frac{1}{4}$  the length of the inner toe; a round outer tubercle.

Skin granulate above; a feebly prominent, narrow, interrupted glandular dorso-lateral fold, from above the tympanum to the hip; lower parts smooth.

Greyish brown above, blackish brown on the sides, the latter shade sharply defined above by the canthus rostralis and the dorso-lateral fold; a white streak along the upper lip; limbs with dark cross bars. Lower parts white.

Male unknown.

#### Measurements.

|                     |            |
|---------------------|------------|
| From snout to vent  | 38 millim. |
| Head .. ..          | 14         |
| Width of head .. .. | 12         |
| Snout .. ..         | 5          |
| Eye .               | 5          |
| Interorbital width  | 3          |
| Tympanum            | 2.5        |
| Fore limb .. ..     | 23         |
| First finger .. ..  | 5          |
| Second finger       | 5          |
| Third finger        | 7          |
| Fourth finger       | 5          |
| Hind limb           | 67         |
| Tibia .. ..         | 23         |
| Foot .. ..          | 20         |
| Third toe           | 11         |
| Fourth toe ..       | 17         |
| Fifth toe           | 12         |

This species is founded on two specimens which Dr. Annandale had referred to a new species under the above name, and which he has generously passed on to me for description. They were obtained by Mr. and Mrs. Kemp in the Garo hills, Assam, above Tura, at an altitude of 3,500 to 3,900 feet. The specimens were captured leaping about in long grass.

#### 88. *Rana nasica*.

*Rana nasica*, Bouleng. *Ann and Mag. N.H.* (7) XII, 1903, p. 187.

Vomerine teeth in short or moderately long oblique series between the choanæ.

Head longer than broad, much depressed; snout pointed, very prominent, as long as the eye, which is large; canthus rostralis sharp; loreal region not very oblique, deeply concave; nostril equidistant from the eye and from the tip of the snout; distance between the nostrils a little greater than the interorbital width, which nearly equals that of the upper eyelid; tympanum very distinct,  $\frac{1}{2}$  or slightly more than  $\frac{1}{2}$  the diameter of the eye,  $1\frac{1}{2}$  to 2 times its distance from the latter.

Fingers rather slender, the tips dilated into well-developed discs with a groove separating the upper from the lower surface; first finger longer than the second, third a little longer than the snout; subarticular tubercles moderately large, prominent.

Hind limb long, the tibio-tarsal articulation reaching the tip of the snout or a little beyond, the heels strongly overlapping; tibia 4 to  $4\frac{1}{2}$  times as long as broad,  $1\frac{2}{3}$  to  $1\frac{1}{3}$  times in length from snout to vent, a little shorter than the fore limb, a little longer than the foot. Toes with the tips dilated like the fingers, entirely webbed, outer metatarsals separated nearly to the base; subarticular tubercles small but very prominent; no tarsal fold; inner metatarsal tubercle oval,  $\frac{1}{4}$  to  $\frac{1}{3}$  the length of the inner toe; a small, round outer tubercle.

Skin smooth, with granular tubercles on the pelvic region; a feebly prominent, narrow glandular dorso-lateral fold from above the tympanum to the sacral region.

Greyish olive or brown above, with or without blackish spots; canthus rostralis, temple, and outer edge of glandular fold blackish; upper lip, from below the nostril, white; tympanum reddish; limbs with numerous regular dark cross-bands. Lower parts white, uniform or dotted with brown.

Males with a large external vocal sac on each side of the throat.

Nasal bones small, oblique, separated from each other and from the frontoparietals; ethmoid largely exposed above, pointed in front and extending to between the nasals.

*Measurements of types, in millimetres.*

|                    |    |    | ♂   | ♂   | ♂   | ♂   |
|--------------------|----|----|-----|-----|-----|-----|
| From snout to vent | .. | .. | 46  | 45  | 42  | 41  |
| Head               | .. | .. | 15  | 16  | 16  | 15  |
| Width of head      | .. | .. | 13  | 13  | 13  | 12  |
| Snout              | .. | .. | 6   | 6   | 6   | 5.5 |
| Eye                | .. | .. | 6   | 6   | 6   | 5.5 |
| Interorbital width | .. | .. | 2.5 | 2.5 | 3   | 3   |
| Tympanum           | .. | .. | 3   | 3   | 3   | 3   |
| Fore limb          | .. | .. | 29  | 27  | 28  | 26  |
| First finger       | .. | .. | 6   | 5   | 5.5 | 5   |
| Second finger      | .. | .. | 5   | 4   | 5   | 4.5 |
| Third finger       | .. | .. | 7   | 7   | 7   | 6   |
| Fourth finger      | .. | .. | 5   | 4   | 5   | 4   |
| Hind limb          | .. | .. | 80  | 75  | 80  | 71  |
| Tibia              | .. | .. | 26  | 25  | 26  | 24  |
| Foot               | .. | .. | 24  | 23  | 24  | 21  |
| Third toe          | .. | .. | 13  | 13  | 13  | 11  |
| Fourth toe         | .. | .. | 21  | 20  | 21  | 17  |
| Fifth toe          | .. | .. | 14  | 14  | 14  | 13  |

*Habitat.* Man-Son Mountains, Tonkin, 3,000-4,000 ft. Closely allied to *R. alticola*, which differs in the less prominent snout and the less deeply concave loreal region.

### 89. *Rana arfaki*.

*Rana arfaki*, A. B. Meyer, *Mon. Berl. Ac.* 1874, p. 138; van Kampen, *Nova Guinea*, V, *Zool.* p. 165 (1906), and IX, *Zool.* p. 36 (1909); Bouleng. *Ann. and Mag. N.H.* (9) I, 1918, p. 239.

*Limnodytes arfaki*, part., Peters et Doria, *Ann. Mus. Genova*, XIII, 1878, p. 418.

*Rana macroscelis*, Bouleng. *Ann. and Mag. N.H.* (6) I, 1888, p. 345; *Ann. Mus. Genova*, (2) XVIII, 1898, p. 706; Roux, *Abh. Senck. Ges.* XXXIII, 1910, p. 226; Bouleng., *Tr. Zool. Soc.* XX, 1914, p. 249.

*Rana waigeensis*, van Kampen, *Bijdr. Dierk.* XIX, 1913, p. 90, and *Nova Guinea*, IX, *Zool.* p. 459, pl. xi, fig. 2 (1913).

Vomerine teeth in straight or feebly curved, more or less oblique series between the choanæ or extending a little beyond the level of the posterior borders of the latter, usually nearer each other than the choanæ.

Head much depressed, as long as broad or broader than long; snout rounded or obtusely pointed, feebly projecting beyond the mouth, as long as or a little longer than the eye; canthus rostralis distinct; loreal region oblique, deeply concave; nostril equidistant from the eye and from the tip of the snout or a little nearer the latter; distance between the nostrils equal to or greater than the interorbital region, which is usually slightly concave and measures  $\frac{2}{3}$  to  $\frac{3}{4}$ , or rarely nearly equals, the width of the upper eyelid; tympanum very distinct,  $\frac{2}{5}$  or  $\frac{2}{3}$  the diameter of the eye, once to twice its distance from the latter.

Fingers rather long, the tips dilated into small discs which are longer than broad and with a groove separating the upper from the lower surface, first much longer than the second, third longer than the snout, second and third with more or less distinct dermal margin; subarticular tubercles large and prominent.

Hind limb long, the tibio-tarsal articulation reaching between the eye and the tip of the snout, the tip of the snout or slightly beyond; the heels feebly overlapping; tibia 3 to 4 times as long as broad,  $1\frac{3}{4}$  to a little more than 2 times in length of head and body, shorter than the fore limb, as long as or longer than the foot. Toes with the tips dilated into small discs similar to those of the fingers, webbed to the discs; outer metatarsals separated nearly to the base; subarticular tubercles rather large, prominent; no tarsal fold; inner metatarsal tubercle elliptic, moderately prominent,  $\frac{1}{3}$  to  $\frac{2}{3}$  the length of the inner toe; outer tubercle absent or flat and rather indistinct.

Upper parts smooth or shagreened, with or without small flat warts, or granulate with large elongate warts with small horny spinules; a glandular fold above the temple. Lower parts smooth, posterior half of thigh granulate.

Olive or brown above, uniform or with darker and lighter spots, or reddish brown with scattered small yellow spots; tympana-

num often reddish; limbs without or with very indistinct dark cross-bands. Whitish beneath, throat and breast usually spotted or marbled with dark brown.

Males with an external vocal sac on each side of the throat and a large oval gland on the inner side of the arm; a moderately strong pad on the inner side of the first finger, covered, during the breeding season, with a velvety greyish horny layer.

Nasal bones small, oblique, widely separated from each other and from the frontoparietals; ethmoid largely exposed above, extending to the anterior borders of the nasals; zygomatic process of squamosal longer than the posterior.

*Measurements, in millimetres.*

|                    | 1.     | 2.  | 3.  | 4.  | 5.  | 6.  | 7.  | 8.  | 9.  | 10. | 11. | 12. | 13. |
|--------------------|--------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
|                    | ♂      | ♀   | ♀   | ♀   | ♀   | ♀   | ♂   | ♂   | ♀   | ♀   | ♂   | ♀   | ♀   |
| From snout to vent | .. 76  | 162 | 142 | 140 | 120 | 148 | 103 | 103 | 147 | 140 | 84  | 123 | 152 |
| Head               | .. 28  | 52  | 49  | 47  | 40  | 50  | 36  | 36  | 49  | 50  | 30  | 42  | 53  |
| Width of head      | .. 28  | 57  | 51  | 55  | 42  | 59  | 39  | 36  | 55  | 55  | 34  | 50  | 58  |
| Snout              | .. 11  | 20  | 19  | 17  | 17  | 17  | 14  | 13  | 18  | 18  | 12  | 16  | 20  |
| Eye                | .. 11  | 20  | 18  | 16  | 15  | 17  | 14  | 13  | 18  | 18  | 11  | 15  | 20  |
| Interorbital width | .. 5   | 11  | 13  | 11  | 10  | 10  | 6   | 7   | 12  | 11  | 7   | 8   | 12  |
| Tympanum           | .. 5   | 10  | 10  | 10  | 7   | 9   | 8   | 7   | 9   | 8   | 5   | 7   | 10  |
| Fore limb          | .. 47  | 95  | 86  | 84  | 72  | 95  | 62  | 64  | 90  | 89  | 54  | 77  | 91  |
| First finger       | .. 12  | 24  | 22  | 22  | 20  | 25  | 15  | 16  | 21  | 21  | 15  | 22  | 25  |
| Second finger      | .. 10  | 20  | 19  | 19  | 18  | 20  | 12  | 13  | 19  | 19  | 12  | 18  | 19  |
| Third finger       | .. 13  | 28  | 26  | 25  | 23  | 28  | 18  | 18  | 27  | 27  | 17  | 24  | 27  |
| Fourth finger      | .. 9   | 19  | 19  | 18  | 17  | 19  | 13  | 14  | 19  | 19  | 12  | 18  | 20  |
| Hind limb          | .. 122 | 250 | 235 | 220 | 205 | 250 | 177 | 175 | 248 | 240 | 140 | 217 | 267 |
| Tibia              | .. 41  | 83  | 75  | 73  | 66  | 83  | 54  | 55  | 81  | 80  | 44  | 70  | 85  |
| Foot               | .. 41  | 79  | 71  | 68  | 64  | 78  | 54  | 53  | 78  | 73  | 45  | 70  | 80  |
| Third toe          | .. 22  | 44  | 37  | 35  | 34  | 41  | 27  | 28  | 40  | 39  | 25  | 39  | 49  |
| Fourth toe         | .. 35  | 67  | 56  | 54  | 53  | 65  | 45  | 43  | 63  | 60  | 37  | 60  | 68  |
| Fifth toe          | .. 25  | 53  | 42  | 42  | 41  | 49  | 33  | 33  | 49  | 46  | 28  | 44  | 55  |

1-2. Mimika R., Dutch New Guinea. 3-5. Soghere, Brit. New Guinea (types of *R. macroscelis*). 6. Soghere District. 7-10. Haveri, Brit. New Guinea. 11. Albert Edward Range, B.N.G. 12. Madew, B.N.G. 13. Astrolabe Mts., B.N.G.

*Habitat.* New Guinea, Waigeou and Aru Islands.

In this and the 10 following species, I regard the absence of the dorso-lateral glandular fold as secondary, these species being, in my opinion, derived from the *Ranae typicae* group of the subgenus *Rana*.

**90. *Rana andersonii*.**

*Polypedates yunnanensis*, Anders. *Anat. Zool. Res. Yunn.* p. 846, pl. lxxviii, fig. 3 (1879).

*Rana andersonii*, Bouleng. *Cat. Batr. Ecaud.* p. 55 (1882), *Faun. Ind., Rept.* p. 447 (1890), and *Proc. Zool. Soc.* 1899, pp. 168 and 960.

Vomerine teeth in transverse or slightly oblique series between the choanæ or extending a little beyond the level of the posterior borders of the latter.

Head as long as broad or slightly broader than long, much depressed; snout rounded or obtusely pointed, feebly projecting beyond the mouth, as long as the eye or a little shorter; canthus rostralis obtuse; loreal region feebly oblique, concave; nostril equidistant from the eye and from the tip of the snout or a little nearer the former; the distance between the nostrils equals or a

little exceeds the interorbital width, or that of the upper eyelid ; tympanum very distinct,  $\frac{2}{3}$  to  $\frac{1}{2}$  the diameter of the eye and  $1\frac{1}{3}$  to 2 times its distance from the latter.

Fingers rather long, terminating in small discs, which are longer than broad and divided by a groove into an upper and a lower portion ; first finger as long as or a little longer than the second, third much longer than the snout ; subarticular tubercles moderately large, moderately prominent.

Hind limb long ; tibio-tarsal articulation reaching the tip of the snout or a little beyond ; heels overlapping when the limbs are folded at right angles to the body ; tibia 4 to 5 times as long as broad,  $1\frac{3}{4}$  to  $1\frac{1}{2}$  times in length from snout to vent, as long as or a little shorter than the fore limb, slightly or a little longer than the foot. Toes ending in small discs, same as those of the fingers, webbed to the discs ; subarticular tubercles rather small, moderately prominent ; no tarsal fold ; inner metatarsal tubercle rather small, feebly prominent,  $\frac{1}{3}$  to  $\frac{2}{3}$  the length of the inner toe ; no outer tubercle.

Back finely areolate or granulate, sides often with large flat warts ; males with minute white spinose tubercles on the sides. Lower parts smooth.

Olive above, with large roundish brown spots, the ground colour sometimes forming a mere network between them ; sides with black spots ; limbs with numerous dark cross-bands ; hinder side of thighs yellow, spotted or marbled with black. Lower parts white, throat sometimes marbled with brown.

Males with internal vocal sacs ; fore limb much thickened, the inner finger with a large pad, covered, during the breeding season, with a velvety grey horny layer.

Nasals small and widely separated from each other and from the frontoparietals ; upper part of ethmoid largely uncovered anteriorly.

*Measurements, in millimetres.*

|                       | 1.<br>♂ | 2.<br>♂ | 3.<br>♀ | 4.<br>♀ | 5.<br>♀ |
|-----------------------|---------|---------|---------|---------|---------|
| From snout to vent .. | 53      | 66      | 82      | 82      | 95      |
| Head ..               | 18      | 23      | 29      | 28      | 30      |
| Width of head ..      | 18      | 22      | 30      | 29      | 32      |
| Snout .. ..           | 6       | 7       | 10      | 10      | 11      |
| Eye .. ..             | 7       | 8       | 10      | 10      | 11      |
| Interorbital width .. | 4.5     | 5       | 7       | 6       | 7       |
| Tympanum              | 3.5     | 4       | 4       | 5       | 5       |
| Fore limb ..          | 35      | 47      | 61      | 51      | 57      |
| First finger          | 7       | 9       | 14      | 11      | 12      |
| Second finger ..      | 6.5     | 9       | 14      | 10      | 11.5    |
| Third finger          | 10      | 12      | 16      | 15      | 17      |
| Fourth finger ..      | 6       | 8       | 12      | 11      | 12      |
| Hind limb. ..         | 100     | 121     | 156     | 155     | 168     |
| Tibia ..              | 32      | 38      | 51      | 51      | 55      |
| Foot .. ..            | 31      | 37      | 50      | 48      | 48      |
| Third toe ..          | 16      | 21      | 26      | 25      | 27      |
| Fourth toe ..         | 24      | 30      | 41      | 38      | 40      |
| Fifth toe             | 18      | 23      | 30      | 39      | 30      |

1. Hotha Valley, Yunnan (type). 2-3. Kakhien hills, Upper Burma. 4. Kuatun, N.-W. Fokien. 5. Foochow.

*Habitat.* Upper Burma, Yunnan, Fokien, Hainan.

This species appears to be related to *R. grahami* in exactly the same degree as *R. adenopleura* to *R. pleuraden*, thus pointing to a polyphyletic origin for the subgenus *Hylorana*.

The fact that a glandular dorso-lateral fold is sometimes present in *R. grahami* justifies my belief that its absence in *R. andersonii*, as well as in other species which I group with it, is secondary.

### 91. *Rana schmackeri*.

*Rana schmackeri*, Boettg. *Katal. Batr. Samml. Senck. Ges.* p. 11 (1892).

Vomerine teeth in strong, very oblique series originating between the anterior corners of the choanæ and extending considerably beyond the level of their posterior borders.

Snout hardly longer than the orbit, somewhat pointed; canthus rostralis obtuse; loreal region oblique, somewhat concave; nostril a little nearer the end of the snout than the eye; interorbital region a little narrower than the upper eyelid; tympanum very distinct,  $\frac{3}{4}$  the size of the eye.

First finger a little longer than the second; tips of fingers dilated into small discs.

Tibio-tarsal articulation reaching the tip of the snout; tibia  $1\frac{3}{5}$  times in length of head and body; toes entirely webbed; tarsal fold feebly indicated; a very feeble and indistinct inner metatarsal tubercle; no outer tubercle.

Skin smooth or finely corrugated; a feeble glandular fold above the tympanum; a glandular fold from below the eye to the shoulder; posterior part of belly feebly granulate.

Bluish green-grey above, with black marblings and larger rounded dark spots, which may be somewhat light-edged; sides with sharply defined round black spots; limbs with numerous dark cross-bars; sides of head with black spots, the glandular fold below the tympanum greenish white. Lower parts dirty white, limbs orange.

From snout to vent 42 millim.

*Habitat:* Ichang, C. China.

This species was described from a single specimen in the Senckenberg Museum. It appears to be allied to *R. andersonii*, from which it differs in the vomerine dentition and in the larger tympanum.

### 92. *Rana ijimæ*.

*Buergeria ijimæ*, Stejneger. *Proc. Biol. Soc. Washingt.* XIV, 1901, p. 190.

*Rana ijimæ*, Stejneger. *Herp. Japan*, p. 121, fig. (1907); T. Vogt, *Sitzb. Ges. Nat. Fr. Berl.* 1913, p. 179.

Vomerine teeth in slightly oblique series on a line with the posterior borders of the choanæ.

Snout rounded, somewhat projecting; canthus rostralis rather abruptly bent; loreal region concave; nostril much nearer the tip of the snout than the eye; interorbital space slightly narrower

than the upper eyelid; tympanum very distinct,  $\frac{1}{2}$  the diameter of the eye.

First finger extending slightly beyond the second; tips of fingers dilated into small discs, that of the third less than half the diameter of the tympanum.

The tibio-tarsal articulation reaches considerably beyond the tip of the snout; heels strongly overlapping; tibia  $1\frac{1}{5}$  times in length from snout to vent, shorter than the fore limb; toes about  $\frac{3}{4}$  webbed, 2 phalanges of fourth free; discs slightly smaller than those of the fingers; subarticular tubercles very prominent; no tarsal fold; inner metatarsal tubercle oval, not prominent, about  $\frac{2}{3}$  the length of the inner toe; a small outer metatarsal tubercle.

Skin of upper parts obscurely shagreened, with a few scattered pustules on the back and many on the sides; three large glandular warts behind the corner of the mouth; from the posterior corner of the eye a somewhat indistinct dorso-lateral fold, which on the shoulder seems broken up into a series of shorter longitudinal glands; sides of head and upper surface of tibia with numerous small white asperities. Lower parts smooth.

Dark chocolate brown above, apparently nearly uniform, dorso-lateral folds and upper surface of limbs paler; a whitish line under the eye and on the posterior part of the upper lip, which is mottled with brown along the edge; flanks pale brownish, with irregular blackish spots; limbs with dark brown cross-bars; hinder side of thighs mottled with dark brown. Lower parts whitish, with very faint brown mottlings on the throat, on the chest, and on the hind limbs.

From snout to vent 68 millim.

*Habitat.* Okinawa Shima, Loo Choo Islands; Formosa.

The above description is derived from Stejneger's, based on a single specimen preserved in the Science Collection at Tokyo.

Formosa has been added to the habitat by T. Vogt.

### 93. *Rana signata*.

*Polypedates signatus*, Günth. *Proc. Zool. Soc.* 1872, p. 600, pl. xl, fig. c.

*Polypedates similis*, Günth. *Proc. Zool. Soc.* 1873, p. 171.

*Rana signata*, Bouleng. *Cat. Batr. Ecaud.* p. 71 (1882), and *Ann. and Mag. N.H.* (6) VII, 1891, p. 342; Werner, *Zool. Jahrb., Syst.* XIII, 1900, p. 493; Laidlaw, *Proc. Zool. Soc.* 1900, p. 886; Bouleng. *Faun. Mal. Pen., Rept.* p. 237 (1913).

*Rana similis*, Bouleng. *Cat.* p. 72.

*Rana obsoleta*, Mocquard, *Le Natur.* 1890, p. 155, *N. Arch. Mus. Paris* (3) II, 1890, p. 147, and *Mém. Soc. Zool. France*, V, 1892, p. 198.

Vomerine teeth in small oblique groups close together, on a level with the posterior borders of the choanæ or just behind them.

Head a little longer than broad, much depressed; snout rounded or subacuminate, feebly projecting beyond the mouth, a little shorter than the eye, which is very large and prominent; canthus rostralis distinct; loreal region very feebly oblique, deeply concave; nostril nearer the tip of the snout than the eye; distance between the nostrils equal to or a little greater than the inter-

orbital width, which is equal to or a little less than that of the upper eyelid; tympanum very distinct,  $\frac{3}{8}$  to  $\frac{3}{4}$  the diameter of the eye, close to the eye or not less than 3 times as long as its distance from it.

Fingers slender, the tips dilated into very small discs, which bear a groove separating the upper from the lower surface; first finger a little longer than the second, third longer than the snout; subarticular tubercles moderately large, very prominent.

Tibio-tarsal articulation reaching the tip of the snout or between the eye and the tip of the snout; heels overlapping when the limbs are folded at right angles to the body; tibia 4 to  $5\frac{1}{2}$  times as long as broad,  $1\frac{3}{4}$  to a little less than 2 times in length from snout to vent, shorter than the fore limb, a little longer than the foot. Toes slender, the tips with very small discs similar to those of the fingers, about  $\frac{3}{4}$  webbed, the web reaching or not quite reaching the discs of the third and fifth, two phalanges of fourth free; outer metatarsals separated nearly to the base; subarticular tubercles rather small but very prominent, no tarsal fold; inner metatarsal tubercle oval or elliptic,  $\frac{1}{3}$  to  $\frac{2}{5}$  the length of the inner toe; a round outer tubercle.

Upper parts smooth or with large flat granules; glandular dorso-lateral fold absent or flat and very indistinct, or represented by a chain of large warts; lower parts smooth.

Dark olive or blackish above, with yellowish spots, or olive largely spotted or marbled with black; a yellow or white streak from the tip of the snout along the canthus rostralis and the border of the upper eyelid, continued along each side of the back; sometimes a white line on the upper lip; hind limbs with black and light cross-bars, or orange spotted or barred with black. Brownish white or brown beneath, uniform or spotted with white.

Males with internal vocal sacs, strong fore limbs, with a more or less distinct oval gland on the inner side of the arm, and a small pad on the inner side of the first finger, covered, during the breeding season, with a yellowish velvety horny layer.

Eggs  $1\frac{1}{2}$  millim. in diameter in female 50 millim. from snout to vent, strongly pigmented in the upper third.

Nasal bones moderately large, separated from each other and in contact with the ethmoid, which is largely uncovered above and truncate in front.

*Measurements, in millimetres.*

|                       | 1.  | 2.  | 3.  | 4.  | 5.  | 6. | 7. | 8.  | 9.  |
|-----------------------|-----|-----|-----|-----|-----|----|----|-----|-----|
|                       | ♂   | ♂   | ♂   | ♂   | ♂   | ♀  | ♀  | ♂   | ♀   |
| From snout to vent .. | 40  | 40  | 40  | 39  | 36  | 58 | 50 | 35  | 38  |
| Head ..               | 15  | 15  | 15  | 15  | 14  | 21 | 18 | 14  | 14  |
| Width of head         | 14  | 14  | 14  | 13  | 12  | 20 | 17 | 12  | 12  |
| Snout .. ..           | 5   | 5   | 5   | 5   | 4   | 6  | 6  | 4   | 4   |
| Eye ..                | 6   | 6   | 6   | 6   | 5   | 7  | 7  | 5   | 5   |
| Interorbital width    | 3   | 3   | 3   | 3   | 3   | 4  | 4  | 3   | 3   |
| Tympanum              | 3.5 | 4   | 4   | 3.5 | 3   | 5  | 5  | 3.5 | 3.5 |
| Fore limb             | 28  | 28  | 28  | 26  | 25  | 40 | 35 | 25  | 26  |
| First finger          | 6   | 6   | 6   | 6   | 5.5 | 9  | 7  | 5.5 | 6   |
| Second finger ...     | 5.5 | 5.5 | 5.5 | 5.5 | 5   | 8  | 6  | 5   | 5   |

|               | 1. | 2. | 3. | 4. | 5. | 6. | 7. | 8. | 9. |
|---------------|----|----|----|----|----|----|----|----|----|
|               | ♂  | ♂  | ♂  | ♂  | ♂  | ♀  | ♀  | ♂  | ♀  |
| Third finger  | .. | 8  | 8  | 8  | 7  | 12 | 9  | 7  | 7  |
| Fourth finger |    | 6  | 5  | 6  | 6  | 5  | 7  | 6  | 5  |
| Hind limb     |    | 69 | 65 | 68 | 66 | 61 | 91 | 83 | 62 |
| Tibia         | .. | 22 | 21 | 22 | 22 | 20 | 30 | 26 | 20 |
| Foot          |    | 21 | 20 | 21 | 21 | 19 | 28 | 24 | 19 |
| Third toe     |    | 12 | 11 | 12 | 12 | 11 | 15 | 13 | 11 |
| Fourth toe    | .. | 17 | 16 | 17 | 17 | 15 | 23 | 19 | 16 |
| Fifth toe     |    | 12 | 11 | 12 | 12 | 11 | 16 | 13 | 11 |

1. Matang, Borneo (type). 2-7. Lanas, Brunei, Borneo. 8. Akar R., Sarawak.  
9. Laguna del Bay, Luzon (type of *R. similis*).

*Habitat.* Malay Peninsula (between Kedah and Perak), Sumatra, Borneo, Luzon.

#### 94. *Rana picturata*, sp. n.

Vomerine teeth in oblique groups or short series between the choanæ, close together or equally distant from each other and from the latter.

Head as long as broad, much depressed; snout rounded or obtusely pointed, feebly projecting beyond the mouth, shorter than the eye; canthus rostralis distinct; loreal region feebly oblique, concave, nostril nearer the tip of the snout than the eye, distance between the nostrils equal to or a little less than the interorbital width, which is equal to or a little less than that of the upper eyelid; tympanum very distinct,  $\frac{2}{3}$  to  $\frac{3}{4}$  the diameter of the eye, 3 to 4 times as long as its distance from the latter.

Fingers rather long and slender, the tips dilated into small discs which are longer than broad and with a groove separating the upper from the lower surface; first finger longer than the second, third longer than the snout, subarticular tubercles large and very prominent.

Hind limb rather long, the tibio-tarsal articulation reaching the tip of the snout or between the eye and the tip of the snout, the heels overlapping when the limbs are folded at right angles to the body; tibia 4 to  $5\frac{1}{2}$  times as long as broad, a little more than half the length from snout to vent, much shorter than the fore limb, as long as or slightly longer than the foot. Toes with the tips dilated into small discs similar to those of the fingers, about  $\frac{3}{4}$  webbed, the web reaching or nearly reaching the discs of the third and fifth, two phalanges of fourth free; outer metatarsals separated nearly to the base; subarticular tubercles moderately large, very prominent; no tarsal fold; inner metatarsal tubercle oval or elliptic, moderately prominent,  $\frac{1}{3}$  to  $\frac{2}{5}$  the length of the inner toe; a round outer tubercle.

Upper parts more or less granulate, lower smooth.

Black above with numerous large yellow or pale brown round or irregular spots or marblings, the round spots sometimes with black centres; a yellow streak round the upper surface of the snout and the borders of the upper eyelids, sometimes continued on each side of the back; upper lip with small yellowish spots,

limbs with more or less irregular black and yellow or pale brown cross-bands. Lower parts brown, spotted with white, or brownish white with or without brown marblings.

Males with internal vocal sacs and an oval gland on the inner side of the arm.

Eggs  $1\frac{1}{2}$  millim. in diameter in female 68 millim. long from snout to vent.

Nasal bones narrow, oblique, separated from each other; ethmoid exposed above, truncate in front, not extending to between the nasals.

*Measurements, in millimetres.*

|                    | 1.    | 2.  | 3.  | 4. | 5.  | 6.  | 7. | 8.  | 9.  | 10. |
|--------------------|-------|-----|-----|----|-----|-----|----|-----|-----|-----|
|                    | ♂     | ♀   | ♀   | ♀  | ♂   | ♂   | ♂  | ♂   | ♂   | ♂   |
| From snout to vent | .. 46 | 70  | 68  | 59 | 44  | 43  | 43 | 44  | 40  | 37  |
| Head               | .. 16 | 23  | 22  | 20 | 15  | 15  | 15 | 15  | 14  | 12  |
| Width of head ..   | .. 16 | 23  | 22  | 20 | 15  | 15  | 15 | 15  | 14  | 12  |
| Snout              | .. 5  | 7   | 7   | 7  | 5   | 5   | 5  | 5   | 4   | 4   |
| Eye                | .. 6  | 8   | 8   | 8  | 6   | 6   | 6  | 6   | 5.5 | 5   |
| Interorbital width | .. 3  | 4   | 5   | 5  | 3   | 3   | 3  | 3.5 | 3   | 3   |
| Tympanum ..        | .. 4  | 5   | 6   | 5  | 3.5 | 3.5 | 4  | 4   | 3.5 | 3   |
| Fore limb          | .. 33 | 47  | 48  | 42 | 31  | 30  | 29 | 33  | 27  | 26  |
| First finger       | .. 8  | 12  | 12  | 10 | 7   | 7   | 7  | 7   | 6   | 5.5 |
| Second finger ..   | .. 7  | 10  | 10  | 9  | 6   | 6   | 6  | 6   | 5.5 | 5   |
| Third finger ..    | .. 10 | 13  | 14  | 11 | 9   | 9   | 9  | 9   | 8   | 7   |
| Fourth finger ..   | .. 7  | 9   | 10  | 9  | 6   | 6   | 6  | 6   | 5   | 5   |
| Hind limb          | .. 77 | 108 | 116 | 98 | 73  | 71  | 70 | (?) | 65  | 63  |
| Tibia              | .. 25 | 34  | 37  | 30 | 23  | 23  | 22 | 24  | 21  | 20  |
| Foot               | .. 24 | 34  | 35  | 30 | 23  | 22  | 22 | 24  | 20  | 20  |
| Third toe ..       | .. 13 | 19  | 19  | 16 | 11  | 11  | 11 | 12  | 10  | 10  |
| Fourth toe         | .. 20 | 29  | 30  | 27 | 19  | 18  | 18 | 20  | 17  | 17  |
| Fifth toe ..       | .. 14 | 20  | 21  | 18 | 12  | 12  | 12 | 14  | 11  | 11  |

1-4. Bidi Caves, Sarawak. 5-7. Sarawak. 8. Kina Balu. 9-10. Barabas, S.-E. Borneo.

*Habitat.* Borneo.

Intermediate between *R. signata* and *R. glandulosa*.

### 95. *Rana moellendorffi*.

*Rana moellendorffi*, Boettg. Zool. Anz. 1893, p. 363.

Vomerine teeth in small round groups on a level with the posterior borders of the choanæ, nearer to each other than to the latter.

Head as long as broad; snout obtuse, as long as the eye; canthus rostralis blunt; loreal region nearly vertical, deeply concave; nostril nearer the tip of the snout than the eye; eye large, very prominent; interorbital region nearly twice as broad as the upper eyelid; tympanum very distinct,  $\frac{3}{8}$  to  $\frac{3}{4}$  the size of the eye.

Fingers slender, the tips dilated into very small discs, which are longer than broad and provided with a lateral groove; first finger longer than the second; subarticular tubercles strong.

Tibio-tarsal articulation reaching the tip of the snout; tibia  $1\frac{3}{4}$  to  $1\frac{5}{8}$  times in length from snout to vent, shorter than the fore limb. Toes moderately long, the tips dilated like the fingers,

$\frac{3}{4}$  webbed; subarticular tubercles strong; a rather strong, elongate inner and a small round outer metatarsal tubercle.

Upper parts finely corrugated, with small warts on the posterior part of the upper eyelids and on the lumbar region; belly smooth.

Light bronzy or greyish green above, with numerous sharply defined black spots, the black predominating over the ground colour; lower parts dark brown or blackish, with numerous whitish spots.

Male unknown.

From snout to vent 49 millim.; hind limb 80.

*Habitat.* Culion Id., Calamianes, Philippines.

Types preserved in the Senckenberg Museum.

Appears to be closely allied to *R. signata*.

### 96. *Rana glandulosa*.

*Rana glandulosa*, Bouleng. *Cat. Batr. Ecaud.* p. 73, pl vii, (1882), *Ann. and Mag. N.H.* (6) VIII, 1891, p. 291, and XIV, 1894, p. 87; S. Flower, *Proc. Zool. Soc.* 1896, p. 905; A. L. Butler, *Journ. N.H. Soc. Bomb.* XV 1903, p. 200; Bouleng. *Faun. Mal. Pen., Rept.* p. 236 (1913); Annand. *Mem. As. Soc. Beng.* VI, 1917, p. 146.

Vomerine teeth in short oblique series between the choanæ or on a level with their posterior borders, equally distant from each other or nearer to the latter.

Head as long as broad or a little broader than long, much depressed; snout rounded or obtusely pointed, feebly projecting beyond the mouth, as long as or slightly longer than the eye; canthus rostralis obtuse; loreal region oblique, deeply concave; nostril nearer the tip of the snout than the eye; distance between the nostrils equal to or a little greater than the interorbital width, which is equal to or a little narrower than that of the upper eyelid; tympanum very distinct,  $\frac{3}{8}$  to  $\frac{3}{4}$  the diameter of the eye, 2 to 3 times as long as its distance from the latter.

Fingers rather long and slender, the tips dilated into small discs which are longer than broad and with a groove separating the upper from the lower surface; first finger much longer than the second, third longer than the snout; subarticular tubercles large and very prominent.

Hind limb moderately long, the tibio-tarsal articulation reaching the eye or between the eye and the nostril, the heels overlapping when the limbs are folded at right angles to the body; tibia 4 to  $4\frac{1}{2}$  times as long as broad,  $1\frac{5}{6}$  to  $2\frac{1}{3}$  times in length from snout to vent, much shorter than the fore limb, as long as or a little longer or a little shorter than the foot. Toes with the tips dilated into small discs similar to those of the fingers,  $\frac{1}{2}$  to  $\frac{2}{3}$  webbed; outer metatarsals separated nearly to the base; subarticular tubercles moderately large, very prominent; no tarsal fold; inner metatarsal tubercle oval or elliptic, moderately prominent,  $\frac{1}{3}$  to  $\frac{2}{5}$  the length of the inner toe; a round outer tubercle.

Skin of upper parts smooth or granulate, with large flat glandules, at least on the sides; a chain of glands sometimes representing the dorso-lateral fold; lower parts smooth.

Olive-brown or reddish brown above, often spotted and speckled with blackish; lips dark, with large whitish spots or bars; limbs with dark cross-bars more or less distinct. Lower parts whitish or buff, uniform or spotted with brown.

Males with an external vocal sac forming folds on each side of the throat, and a large oval gland on the inner side of the arm.

Nasal bones narrow, oblique, separated from each other; ethmoid exposed above, truncate in front, not extending to between the nasals.

Eggs 2 millim. in diameter in female measuring 66 millim. from snout to vent, unpigmented.

*Measurements, in millimetres.*

|                    | 1.  | 2.  | 3.  | 4.  | 5.  | 6. | 7.  | 8.  | 9.  | 10. | 11. |
|--------------------|-----|-----|-----|-----|-----|----|-----|-----|-----|-----|-----|
|                    | ♂   | ♀   | ♀   | ♀   | ♂   | ♀  | ♀   | ♀   | ♀   | ♀   | ♀   |
| From snout to vent | 92  | 72  | 66  | 60  | 80  | 59 | 82  | 83  | 60  | 48  | 50  |
| Head ..            | 30  | 25  | 24  | 19  | 27  | 20 | 27  | 28  | 20  | 16  | 17  |
| Width of head      | 36  | 25  | 24  | 19  | 27  | 20 | 29  | 28  | 20  | 16  | 17  |
| Snout ..           | 12  | 9   | 8   | 8   | 10  | 8  | 10  | 11  | 8   | 6   | 6   |
| Eye ..             | 12  | 9   | 8   | 7   | 10  | 8  | 10  | 10  | 8   | 6   | 6   |
| Interorbital width | 8   | 5   | 5   | 4   | 5   | 5  | 6   | 6   | 5   | 3   | 4   |
| Tympanum           | 7   | 6   | 6   | 4.5 | 6   | 5  | 7   | 7   | 5   | 4   | 4   |
| Fore limb..        | 62  | 48  | 43  | 41  | 51  | 39 | 50  | 54  | 43  | 30  | 32  |
| First finger       | 17  | 14  | 11  | 11  | 13  | 11 | 13  | 13  | 12  | 9   | 8   |
| Second finger      | 13  | 10  | 7   | 7   | 10  | 7  | 10  | 10  | 8   | 6   | 6   |
| Third finger       | 18  | 15  | 12  | 11  | 14  | 11 | 14  | 14  | 12  | 9   | 9   |
| Fourth finger      | 12  | 9   | 7   | 7   | 10  | 7  | 9   | 10  | 8   | 6   | 6   |
| Hind limb          | 139 | 111 | 103 | 97  | 118 | 99 | 113 | 127 | 102 | 73  | 78  |
| Tibia ..           | 43  | 34  | 34  | 31  | 36  | 32 | 35  | 38  | 32  | 24  | 25  |
| Foot ..            | 44  | 34  | 31  | 28  | 36  | 31 | 36  | 38  | 31  | 24  | 25  |
| Third toe          | 23  | 18  | 15  | 14  | 18  | 15 | 18  | 19  | 15  | 12  | 13  |
| Fourth toe         | 36  | 29  | 25  | 24  | 31  | 25 | 30  | 32  | 25  | 19  | 21  |
| Fifth toe          | 24  | 19  | 16  | 14  | 18  | 15 | 19  | 20  | 15  | 12  | 13  |

1. Kuala Lipis, Pahang. 2. Malacca. 3-4. Singapore. 5. Sarawak (type). 6. Sarawak. 7. Mt. Mubu, Sarawak. 8-9. Spitang, Sarawak. 10. Mt. Batu Song, Sarawak. 11. Bongon, N. Borneo.

*Habitat.* Northern Shan States (Burma), Malay Peninsula, Sumatra, Borneo, Palawan.

**97. *Rana baramica.***

*Rana baramica*, Boettg. *Abh. Senck Ges.* XXV, 1901, p. 391; van Kampen, in M. Web. *Zool. Ergebn. Reis. Nied. O.-Ind.* IV, 1907, p. 399.

This species appears, from the description, to be closely related to *R. glandulosa*, from which it differs principally in the head being a little longer than broad and the toes only  $\frac{1}{3}$  webbed.

Axial length 55 millim.; hind limb 90; tibia 28.

The types are from the Baram River, North Borneo, and the species has been recorded from Banka by van Kampen.

98. *Rana luctuosa*.

*Limnodytes luctuosus*, Peters, *Mon. Berl. Ac.* 1871, p. 579, and *Ann. Mus. Genova*, III, 1872, p. 43, pl. vi, fig. 1.

*Rana luctuosa*, Bouleng. *Cat. Batr. Ecaud.* p. 68 (1882) and *Ann. and Mag. N.H.* (3) II, 1890, p. 341; S. Flower, *Proc. Zool. Soc.* 1896, p. 904, pl. xlv, and 1899, p. 896; A. L. Butler, *Journ. N.H. Soc. Bomb.* XV, 1903, p. 199; Bouleng. *Faun. Mal. Pen., Rept.* p. 238 (1912)  
*Rana decorata*, Mocquard, *Le Natur.* 1890, p. 155, and *N. Arch. Mus.* (3) II, 1890, p. 145, pl. x, fig. 1.

Vomerine teeth in small oblique groups or short series between the choanæ, equally distant from each other and from the latter, or nearer together.

Head as long as broad, much depressed, snout rounded, as long as or a little shorter than the eye, feebly projecting beyond the mouth; canthus rostralis indistinct, loreal region scarcely oblique, feebly concave; nostril equally distant from the eye and from the tip of the snout; distance between the nostrils equal to or a little greater than the interorbital region, which is a little broader than the upper eyelid; tympanum very distinct,  $\frac{2}{3}$  to  $\frac{3}{4}$  the diameter of the eye, 2 to 3 times as long as its distance from the latter.

Fingers moderately long, the tips dilated into very small discs with a groove separating the upper from the lower surface; first finger longer than the second, third a little longer than the snout; subarticular tubercles moderate, prominent.

Hind limb rather long, tibio-tarsal articulation reaching the tip of the snout or between the eye and the tip of the snout, the heels overlapping when the limbs are folded at right angles to the body; tibia 3 to 4 times as long as broad, twice or a little less than twice in length from snout to vent, shorter than the fore limb, as long as or slightly longer or shorter than the foot. Toes with discs similar to but a little larger than those of the fingers,  $\frac{1}{3}$  webbed; outer metatarsals bound together in the basal third; subarticular tubercles moderate, prominent; no tarsal fold; inner metatarsal tubercle elliptic, 2 to  $2\frac{1}{2}$  times in the length of the inner toe; a very small outer tubercle.

Skin perfectly smooth.

Top of head and back bright red or rich dark chocolate-brown, bordered all round by a sharply defined white or yellow line; sides of head and body very dark brown or black; tympanum dark reddish brown; along the lower part of the side of the body a few white or yellow spots in an irregular line from the angle of the mouth to the thigh; limbs very dark brown or bluish black with bluish white or very pale grey or orange marblings or transverse lines. Throat brown or black, remainder of the lower parts dirty buff, darker on the limbs, sometimes with small light spots.

Males without secondary sexual characters.

Nasal bones very narrow, widely separated from each other by the ethmoid, which is broadly truncate in front and nearly reaches the premaxillaries.

Tadpole with the tail acutely pointed, nearly twice as long as the body. Beak broadly edged with black; upper lip with 5 or 6 series of horny teeth, only the outer uninterrupted; lower lip with 4 series of horny teeth, the innermost narrowly interrupted, the remainder uninterrupted.

*Measurements, in millimetres.*

|                    | 1.  | 2.  | 3.  | 4.  | 5. | 6.  | 7.  | 8.  | 9.  | 10. | 11. | 12. | 13. | 14. | 15. |
|--------------------|-----|-----|-----|-----|----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
|                    | ♂   | ♂   | ♂   | ♂   | ♀  | ♀   | ♀   | ♀   | ♂   | ♀   | ♀   | ♀   | ♀   | ♀   | ♀   |
| From snout to vent | 45  | 43  | 41  | 41  | 49 | 48  | 47  | 43  | 42  | 48  | 44  | 53  | 42  | 42  | 60  |
| Head               | 15  | 15  | 14  | 14  | 16 | 16  | 16  | 15  | 15  | 16  | 15  | 18  | 15  | 15  | 21  |
| Width of head      | 15  | 15  | 14  | 14  | 16 | 16  | 16  | 15  | 15  | 16  | 15  | 18  | 15  | 15  | 21  |
| Snout              | 6   | 5   | 5   | 5.5 | 6  | 6   | 6   | 5.5 | 5.5 | 6   | 5.5 | 6.5 | 5   | 5   | 7   |
| Eye                | 6   | 6   | 5.5 | 5.5 | 6  | 6   | 6   | 5.5 | 5.5 | 6   | 5.5 | 6.5 | 5   | 5   | 7   |
| Interorbital width | 4   | 4   | 4   | 4   | 4  | 4   | 4   | 4   | 4   | 4   | 4   | 4   | 3.5 | 4   | 5   |
| Tympanum           | 4   | 3.5 | 3.5 | 3.5 | 4  | 4   | 4   | 3.5 | 3.5 | 4   | 4   | 5   | 3.5 | 3.5 | 5   |
| Fore limb          | 28  | 25  | 24  | 25  | 29 | 28  | 28  | 25  | 25  | 30  | 26  | 33  | 25  | 25  | 38  |
| First finger       | 6   | 6   | 5.5 | 5.5 | 7  | 6.5 | 6.5 | 6   | 6   | 8   | 6.5 | 8   | 6   | 6   | 10  |
| Second finger      | 5.5 | 5.5 | 5   | 5   | 6  | 5.5 | 5.5 | 5   | 5   | 7   | 5.5 | 6.5 | 5   | 5   | 8   |
| Third finger       | 7   | 7   | 6   | 6.5 | 8  | 8   | 7.5 | 7   | 7   | 8   | 7   | 8   | 6   | 6   | 10  |
| Fourth finger      | 4.5 | 4   | 4   | 4.5 | 5  | 5   | 5   | 4.5 | 4.5 | 6   | 5   | 6   | 4   | 4   | 7   |
| Hind limb          | 74  | 68  | 66  | 68  | 80 | 78  | 77  | 68  | 71  | 80  | 72  | 83  | 70  | 70  | ?   |
| Tibia              | 23  | 21  | 21  | 21  | 25 | 24  | 25  | 21  | 23  | 25  | 23  | 26  | 22  | 22  | 31  |
| Foot               | 23  | 21  | 21  | 21  | 25 | 24  | 25  | 21  | 22  | 25  | 24  | 26  | 22  | 22  | 31  |
| Third toe          | 11  | 11  | 11  | 11  | 13 | 12  | 13  | 11  | 12  | 14  | 12  | 14  | 11  | 12  | 16  |
| Fourth toe         | 18  | 16  | 16  | 16  | 19 | 18  | 19  | 17  | 17  | 20  | 18  | 20  | 16  | 17  | 25  |
| Fifth toe          | 11  | 11  | 11  | 11  | 12 | 12  | 13  | 11  | 12  | 13  | 11  | 12  | 11  | 11  | 16  |

1-8. Penang hill. 9-11. Larut hills, Perak. 12. Akar R., Sarawak. 13-14. Matang, Sarawak. 15. Saia, Kina Balu, N. Borneo.

*Habitat.* Penang hill, between 2,000 and 2,200 feet; Larut hills, Perak, 4,000 feet, Borneo.

### 99. *Rana debussyi*.

*Rana debussyi*, van Kampen, *Nat. Tijdschr. Nederl. Ind.* LXIX, 1910, pp. 23, 40, pl. i, fig. 3.

Vomerine teeth in short oblique series between the choanæ.

Head considerably longer than broad; snout rounded, projecting beyond the mouth,  $1\frac{1}{2}$  times as long as the eye; canthus rostralis rather sharp; loreal region feebly oblique; nostril nearly equally distant from the eye and from the end of the snout; interorbital space broader than the upper eyelid; tympanum very distinct,  $\frac{2}{3}$  the size of the eye.

Fingers with small but distinct discs, first longer than the second; subarticular tubercles well developed.

Tibio-tarsal articulation reaching the tip of the snout; tibia 5 times as long as broad, more than  $\frac{1}{2}$  length from snout to vent. Toes with discs small but a little larger than those of the fingers, webbed only at the base, the web not reaching the basal subarticular tubercles; no tarsal fold; inner metatarsal tubercle small, elongate, outer smaller still, round.

Skin very finely granulate above.

Brown above, black on the side, the two shades separated by a white streak as in *R. luctuosa*; another white streak along the

upper lip and the side of the body to the groin ; limbs pale brown with dark cross-bars. Yellowish white beneath.

From snout to vent 50 millim.

*Habitat.* Sumatra.

This species is described as allied to *R. luctuosa*, but having much in common with *R. javanica (nicobariensis)*.

The single specimen is from Deli.

### 100. *Rana grisea*.

*Rana grisea*, van Kampen, *Nova Guinea*, IX, *Zool.* p. 460, pl. xi, fig. 3 (1913) ; Bouleng. *Tr. Zool. Soc.* XX, 1914, p. 250. and *Ann. and Mag. N.H.* (9) I, 1918, p. 239.

? *Rana novæ-britanniæ*, part., Werner, *Verh. Zool.-bot. Ges. Wien*, LI, 1901, p. 614.

Vomerine teeth in oblique groups or short series between the choanæ or extending a little beyond the level of their posterior borders, a little nearer to each other than to the latter.

Head as long as broad or a little longer than broad, much depressed ; snout rounded, projecting beyond the mouth, as long as the eye or a little longer ; canthus rostralis strong ; loreal region not very oblique, deeply concave ; nostril a little nearer the tip of the snout than the eye ; distance between the nostrils greater than the interorbital width, which equals  $\frac{2}{3}$  that of the upper eyelid ; tympanum very distinct,  $\frac{3}{5}$  to  $\frac{2}{3}$  the diameter of the eye and  $1\frac{1}{2}$  to 3 times its distance from the latter.

Fingers long and slender, terminating in small but very distinct discs, which are a little longer than broad and bear a horseshoe-shaped groove separating the upper from the lower surface ; first finger longer than the second, third much longer than the snout ; subarticular tubercles large and very prominent.

Hind limb long, the tibio-tarsal articulation reaching beyond the tip of the snout, the heels strongly overlapping when the limbs are folded at right angles to the body ; tibia 4 to  $4\frac{1}{2}$  times as long as broad,  $1\frac{3}{5}$  to  $1\frac{3}{4}$  times in length from snout to vent, slightly shorter or slightly longer than the fore limb, longer than the foot. Toes ending in well-developed discs, similar to but a little larger than those of the fingers, entirely webbed or two phalanges of fourth free ; outer metatarsals separated nearly to the base ; subarticular tubercles moderately large, prominent ; no tarsal fold ; inner metatarsal tubercle elliptic,  $\frac{2}{3}$  the length of the inner toe ; a round outer tubercle.

Skin of upper parts smooth or finely granulate, with a few scattered small warts and white spinulose tubercles, which are very crowded on the dorso-lateral folds ; a rather narrow glandular dorso-lateral fold from above the tympanum to the hip or not quite so far ; the distance between these folds, on the back, 5 times in the length of head and body ; a glandular fold from below the eye to the shoulder. Lower parts smooth.

Brown above, uniform or with small darker spots, loreal and temporal regions darker ; tympanum reddish brown ; limbs with

oblique or angular dark cross-bands; hinder side of thighs dark purplish brown. Lower parts brown, more or less spotted or marbled with brown.

Males with a large external vocal sac on each side of the throat; fore limb strong, with a flat gland on the inner side of the arm; a large pad on the inner side of the first finger, covered, during the breeding season, with a greyish, velvety horny layer.

*Measurements, in millimetres, of specimens from Utaqua River.*

|                    | ♂   | ♂   | ♂   |
|--------------------|-----|-----|-----|
| From snout to vent | 76  | 74  | 68  |
| Head ..            | 27  | 26  | 24  |
| Width of head      | 27  | 26  | 22  |
| Snout ..           | 11  | 10  | 9   |
| Eye ..             | 9   | 10  | 8   |
| Interorbital width | 5   | 4   | 4   |
| Tympanum           | 6   | 6   | 5   |
| Fore limb ..       | 48  | 49  | 40  |
| First finger       | 12  | 11  | 10  |
| Second finger. ..  | 10  | 9   | 9   |
| Third finger       | 15  | 14  | 14  |
| Fourth finger..    | 10  | 9   | 10  |
| Hind limb          | 133 | 135 | 125 |
| Tibia ..           | 46  | 46  | 42  |
| Foot ..            | 41  | 40  | 38  |
| Third toe ..       | 22  | 21  | 20  |
| Fourth toe ..      | 34  | 34  | 30  |
| Fifth toe ..       | 24  | 24  | 22  |

*Habitat.* Dutch New Guinea. The type is from the Went Mts. about 4,200 ft.; the specimens in the Brit. Mus. are from the Utaqua R., 2,500-3,000 ft.

Distinguished from *R. florensis* by the more oblique loreal region, the rather longer hind limbs, and the presence of external vocal sacs in the male; from *R. krefftii* by the longer hind limbs.

### 101. *Rana krefftii*.

*Hylorana erythraea*, part., Günth. *Cat. Batr. Sal.* p. 73 (1858).

*Rana krefftii*, Bouleng. *Cat. Batr. Ecaud.* p. 64, pl. iii, fig. 2 (1882), *Tr. Zool. Soc.* XII, 1886, p. 52, and *Ann. and Mag. N.H.* (9) 1, 1918, p. 240.

*Rana novæ-britanniæ*, Werner, *Zool. Anz.* XVII, 1894, p. 155, and *Mitt. Zool. Mus. Berl.* I, 1900, p. 111, fig.

Vomerine teeth in oblique groups or short series between the choanæ, equally distant from each other and from the latter.

Head a little longer than broad, much depressed; snout obtusely pointed, projecting beyond the mouth, as long as the eye or a little longer; canthus rostralis strong; loreal region not very oblique, deeply concave; nostril a little nearer the tip of the snout than the eye; distance between the nostrils greater than the interorbital width, which is equal to or a little less than that of the upper eyelid; tympanum very distinct, about  $\frac{3}{4}$  the diameter of the eye and  $2\frac{1}{2}$  to 4 times its distance from the latter.

Fingers long and slender, with narrow dermal border, terminating in small but very distinct discs, which are a little longer than broad and bear a horseshoe-shaped groove separating the

upper from the lower surface; first finger longer than the second, third longer than the snout; subarticular tubercles large and very prominent.

Hind limb moderately long, the tibio-tarsal articulation reaching the eye or between the eye and the nostril, the heels overlapping when the limbs are folded at right angles to the body; tibia 4 times as long as broad, 2 or a little more than 2 times in length from snout to vent, much shorter than the fore limb, as long as or slightly longer than the foot. Toes ending in well-developed discs, similar to but a little larger than those of the fingers, the web reaching the discs of the third and fifth, two phalanges of fourth free; outer metatarsals separated nearly to the base; subarticular tubercles moderately large, prominent; no tarsal fold; inner metatarsal tubercle oval or elliptic,  $\frac{1}{3}$  to  $\frac{2}{5}$  the length of the inner toe; a round outer tubercle.

Skin of upper parts smooth; a moderately broad or rather broad glandular dorso-lateral fold from above the tympanum to the hip, the distance between these folds, on the back, 5 to  $5\frac{1}{2}$  times in the length of head and body; a glandular fold from below the eye to the shoulder, followed by a small glandule. Lower parts smooth.

Uniform olive or chestnut-brown on the upper surface of the head and body, dark brown to blackish on the sides, the latter shade sharply defined above and below, a white streak extending along the upper lip; no spots; limbs with dark cross-bands; hinder side of thighs yellow, marbled with dark brown or black. White beneath, uniform or spotted or marbled with blackish brown.

Males with an external vocal sac on each side of the throat; a large flat gland on the anterior side of the arm; a moderately strong pad on the inner side of the first finger.

Osteological characters as in *R. papua*.

*Measurements, in millimetres.*

|                    | 1.<br>♂ | 2.<br>♀ | 3.<br>♀ | 4.<br>♀ | 5.<br>♀ | 6.<br>♀ | 7.<br>♀ |
|--------------------|---------|---------|---------|---------|---------|---------|---------|
| From snout to vent | 59      | 64      | 73      | 57      | 54      | 50      | 49      |
| Head               | 21      | 22      | 27      | 21      | 21      | 18      | 18      |
| Width of head      | 20      | 21      | 25      | 19      | 19      | 17      | 17      |
| Snout ..           | 8       | 9       | 11      | 8       | 8       | 6       | 6       |
| Eye ..             | 7.5     | 8       | 9       | 7       | 8       | 6       | 6       |
| Interorbital width | 3.5     | 4       | 4.5     | 4       | 3.5     | 3       | 3       |
| Tympanum           | 4.5     | 5       | 6       | 5       | 5       | 4       | 4       |
| Fore limb ..       | 39      | 43      | 48      | 36      | 35      | 31      | 33      |
| First finger       | 10      | 10      | 12      | 9       | 7       | 7       | 7       |
| Second finger ..   | 8.5     | 8.5     | 10      | 8       | 6       | 6       | 6       |
| Third finger       | 12      | 13      | 15      | 12      | 9       | 10      | 10      |
| Fourth finger      | 8       | 8.5     | 11      | 7       | 7       | 6       | 6       |
| Hind limb          | 94      | 104     | 116     | 92      | 78      | 75      | 74      |
| Tibia ..           | 29      | 32      | 37      | 29      | 25      | 23      | 23      |
| Foot ..            | 28      | 32      | 37      | 28      | 24      | 23      | 23      |
| Third toe          | 15      | 17      | 19      | 15      | 13      | 13      | 13      |
| Fourth toe ..      | 24      | 28      | 32      | 25      | 20      | 20      | 20      |
| Fifth toe ..       | 16      | 18      | 22      | 17      | 14      | 14      | 14      |

1. Solomon Ids. (type). 2. San Christoval (type). 3. Santa Anna. 4. Isabel.  
5-7. Guadalcanar.

*Habitat.* Solomon Islands.—Werner's original description of *R. novæ-britanniæ*, from New Britain, applies well to this species, except for the size of the tympanum, stated to be nearly as large as the eye. My suggestion as to the New Britain frog being referable to *R. krefftii* has been confirmed by Roux, *Rev. Suisse Zool.* XXVI, 1918, p. 411.

### 102. *Rana papua*.

- Rana papua*, Lesson, *Voy. Coquille*, *Zool.* II, i, p. 59, pl. vii, fig. 1 (1830); Boettg. in Semon, *Zool. Forsch.* p. 111 (1894); Méhely, *Term. Füzet.* Budapest, XX, 1897, p. 410; Werner, *Mitt. Zool. Mus. Berl.* I, 1900, p. 18; van Kampen, *Nova Guinea*, V. *Zool.* p. 164 (1906), and IX, *Zool.* p. 37 (1909), and p. 459 (1913); Bouleng. *Tr. Zool. Soc.* XX, 1914, p. 250, and *Ann. and Mag. N.H.* (9) I, 1918, p. 240.  
*Limnodytes waigiensis*, Dum. et Bibr. *Erp. Gén.* VIII, p. 514 (1841).  
*Limnodytes papuensis*, A. B. Mey. *Mon. Berl. Ac.* 1874, p. 52; Doria, *Ann. Mus. Genova*, VI, 1874, p. 356.  
*Limnodytes papua*, Peters et Doria, *Ann. Mus. Genova*, XIII, 1878, p. 418.  
*Limnodytes arfaki*, part., Peters et Doria, *l. c.*, pl. vi, fig. 1.  
*Rana papua*, part., Bouleng., *Cat. Batr. Ecaud.* p. 64 (1882); Roux, *Abh. Senck. Ges.* XXXIII, 1910, p. 224.  
*Rana arfaki*, part., van Kampen, *Bijdr. Dierk.* XIX, 1913, p. 90.  
*Rana fallax*, van Kampen, *Nova Guinea*, IX, *Zool.* p. 459 (1913).

Vomerine teeth in oblique groups or short series between the choanæ or extending posteriorly beyond them, equally distant from each other and from the latter or a little nearer each other.

Head as long as broad or longer than broad, much depressed; snout obtuse or more or less acutely pointed, projecting more or less beyond the mouth, as long as the eye or longer; canthus rostralis strong; loreal region moderately or feebly oblique, deeply concave; nostril nearer the tip of the snout than the eye; distance between the nostrils equal to or greater than the interorbital width, which is  $\frac{2}{3}$  to once that of the upper eyelid; tympanum very distinct,  $\frac{1}{2}$  to  $\frac{3}{4}$  the diameter of the eye,  $1\frac{1}{2}$  to 3 times its distance from the latter.

Fingers long and slender, sometimes with a feeble dermal border, terminating in small but very distinct discs, which are a little longer than broad and bear a horseshoe-shaped groove separating the upper from the lower surface; first finger longer than the second, third longer than the snout; subarticular tubercles large and very prominent.

Hind limb long, the tibio-tarsal articulation reaching the nostril, the tip of the snout, or, usually, beyond the tip of the snout; the heels strongly overlapping when the limbs are folded at right angles to the body; tibia 4 to  $5\frac{1}{2}$  times as long as broad,  $1\frac{1}{2}$  to  $1\frac{9}{10}$  times in length from snout to vent, as long as or a little longer or a little shorter than the fore limb, longer than the foot. Toes ending in well-developed discs, similar to but a little larger than those of the fingers, the web reaching the disc, or only the penultimate phalanx of the fourth; outer metatarsals separated nearly to the base; subarticular tubercles moderately large, prominent; no tarsal fold; inner metatarsal tubercle oval or elliptic,

*Measurements, in millimetres.*

|                    | 1.  | 2.  | 3.  | 4.  | 5.  | 6.  | 7.  | 8.  | 9.  | 10. | 11. | 12. | 13. | 14. | 15. | 16. | 17. | 18. | 19. | 20. | 21. | 22. | 23. | 24. | 25. | 26. | 27. | 28. |
|--------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
|                    | ♀   | ♀   | ♂   | ♂   | ♂   | ♂   | ♂   | ♂   | ♀   | ♀   | ♀   | ♀   | ♀   | ♂   | ♂   | ♂   | ♀   | ♀   | ♀   | ♂   | ♀   | ♀   | ♀   | ♂   | ♀   | ♀   | ♀   | ♀   |
| From snout to vent | 51  | 72  | 71  | 71  | 74  | 74  | 73  | 68  | 100 | 100 | 80  | 73  | 66  | 57  | 56  | 51  | 73  | 73  | 65  | 78  | 108 | 103 | 71  | 71  | 69  | 61  | 110 | 60  |
| Head ..            | 19  | 25  | 27  | 26  | 25  | 26  | 27  | 25  | 34  | 35  | 27  | 25  | 24  | 21  | 21  | 19  | 25  | 27  | 23  | 28  | 37  | 37  | 26  | 25  | 27  | 24  | 36  | 22  |
| Width of head      | 17  | 23  | 24  | 24  | 22  | 22  | 22  | 21  | 34  | 33  | 25  | 23  | 21  | 18  | 18  | 16  | 23  | 26  | 21  | 27  | 37  | 36  | 24  | 23  | 25  | 22  | 36  | 20  |
| Snout ..           | 6.5 | 9   | 11  | 10  | 11  | 11  | 11  | 10  | 12  | 12  | 11  | 10  | 10  | 8   | 7.5 | 8   | 10  | 11  | 9   | 11  | 14  | 15  | 10  | 10  | 10  | 9   | 15  | 8   |
| Eye ..             | 6.5 | 9   | 9   | 9   | 9   | 9   | 9   | 9   | 12  | 12  | 10  | 9   | 9   | 7   | 7.5 | 7   | 9   | 9   | 8   | 9   | 13  | 13  | 9   | 9   | 9   | 8   | 12  | 7   |
| Interorbital with  | 3   | 5   | 4   | 4   | 5   | 4   | 5   | 4   | 6   | 6   | 5   | 5   | 4   | 3.5 | 3.5 | 3   | 5   | 5   | 4   | 5   | 7   | 7   | 5   | 5   | 5   | 4   | 7   | 4   |
| Tympanum           | 4   | 6   | 6   | 5   | 6   | 6   | 6   | 5.5 | 6   | 6   | 7   | 6   | 6   | 5   | 4.5 | 4   | 6   | 6   | 6   | 6   | 7.5 | 7   | 6   | 6   | 6   | 5   | 8   | 4   |
| Fore limb          | 32  | 46  | 48  | 43  | 47  | 42  | 45  | 44  | 64  | 60  | 50  | 44  | 42  | 38  | 36  | 32  | 48  | 45  | 41  | 46  | 65  | 64  | 43  | 46  | 47  | 40  | 66  | 40  |
| First finger       | 7.5 | 12  | 10  | 9   | 10  | 10  | 11  | 10  | 15  | 15  | 12  | 10  | 10  | 9   | 9   | 8   | 12  | 11  | 11  | 10  | 16  | 15  | 11  | 11  | 11  | 9   | 15  | 10  |
| Second finger      | 6   | 9   | 9   | 8   | 9   | 9   | 9   | 9   | 12  | 13  | 10  | 9   | 8   | 8   | 8   | 7   | 9   | 9   | 9   | 9   | 12  | 12  | 9   | 9   | 9   | 8   | 12  | 8   |
| Third finger       | 9   | 14  | 13  | 12  | 13  | 13  | 14  | 14  | 18  | 19  | 16  | 13  | 12  | 11  | 11  | 10  | 14  | 14  | 13  | 12  | 19  | 17  | 13  | 13  | 13  | 11  | 17  | 12  |
| Fourth finger      | 6   | 9   | 8   | 8   | 8   | 8   | 9   | 9   | 12  | 13  | 11  | 9   | 8   | 8   | 7   | 6   | 8   | 9   | 8   | 8   | 13  | 12  | 8   | 9   | 8   | 8   | 12  | 8   |
| Hind limb          | 90  | 118 | 140 | 132 | 135 | 137 | 136 | 134 | 182 | 188 | 131 | 123 | 118 | 100 | 100 | 102 | 130 | 126 | 110 | 138 | 189 | 190 | 136 | 130 | 137 | 119 | 184 | 110 |
| Tibia ..           | 29  | 40  | 46  | 44  | 46  | 47  | 47  | 46  | 62  | 63  | 43  | 40  | 39  | 32  | 33  | 35  | 43  | 42  | 37  | 46  | 62  | 63  | 46  | 44  | 46  | 40  | 60  | 36  |
| Foot ..            | 26  | 36  | 40  | 40  | 38  | 38  | 38  | 38  | 52  | 55  | 40  | 35  | 33  | 30  | 29  | 27  | 38  | 36  | 34  | 40  | 56  | 55  | 40  | 39  | 40  | 35  | 54  | 35  |
| Third toe          | 14  | 20  | 21  | 21  | 22  | 21  | 21  | 22  | 29  | 30  | 22  | 18  | 18  | 15  | 16  | 14  | 21  | 20  | 19  | 21  | 30  | 30  | 21  | 21  | 21  | 19  | 31  | 19  |
| Fourth toe         | 23  | 30  | 36  | 36  | 33  | 33  | 33  | 33  | 45  | 48  | 35  | 32  | 29  | 25  | 25  | 23  | 33  | 31  | 28  | 34  | 49  | 47  | 34  | 34  | 34  | 29  | 47  | 29  |
| Fifth toe          | 15  | 22  | 23  | 23  | 25  | 24  | 24  | 24  | 31  | 34  | 24  | 20  | 19  | 18  | 18  | 15  | 23  | 21  | 20  | 25  | 34  | 33  | 24  | 25  | 25  | 21  | 35  | 20  |

1. Timor Laut. 2. Wakau, Aru. Ids. 3-4. Mansinam, Dutch New Guinea. 5-8. Fak Fak, Dutch N.G. 9-10. Utakwa R., Dutch N.G. 11-13. Mimika R., Dutch N.G. 14-19. Settkwa R., Dutch N.G. 20-22. Moroka, British N.G. 23-24. Dinawa, Brit. N.G. 25-26. Mt. Victoria, Owen Stanley Range. 27. Fergusson Id., Brit. N.G. 28. Murray Id., Torres Straits.

$\frac{1}{3}$  to  $\frac{2}{5}$  the length of the inner toe; a round outer tubercle, exceptionally very indistinct.

Skin of upper parts smooth or finely granulate, sometimes with scattered small warts; a narrow glandular dorso-lateral fold from above the tympanum to the sacrum or to the hip, the distance between these folds, on the back, 5 to 6 times in the length of head and body; a glandular fold from below the eye to the shoulder, sometimes followed by one or two glandules. Lower parts smooth.

Olive, brown, or grey above, usually uniform, sometimes with darker spots on the back and sides; the dorso-lateral fold often edged with dark brown or black on the outer side; a dark brown or black streak below the canthus rostralis and a large temporal spot; tympanum sometimes reddish-brown; the temporal spot often edged with whitish beneath; limbs with more or less distinct dark cross-bands, hinder side of thighs usually marbled with dark brown or black, sometimes with a light longitudinal streak. White or pale yellow beneath, throat and breast often spotted or marbled with brown.

Males with vocal sacs which are usually internal, but exceptionally external, though feebly developed, and forming folds on each side of the throat; fore limb strong, with a strong pad on the inner side of the first finger, covered, during the breeding season, with a velvety, greyish horny layer.

Nasal bones small, oblique, widely separated from each other and from the frontoparietals, which are grooved along the middle; ethmoid largely exposed above, extending to between the nasals; zygomatic process of squamosal longer than the posterior.

*Habitat.* New Guinea and neighbouring islands (Waigeou, Kei, Aru, Timor Laut, Fergusson, Murray, etc.).

I am unable to express an opinion on the specimens from Jobi, referred to *R. papua* by Barbour, Mem. Mus. Comp. Zool. XLIV, 1912, p. 65, pl. v, fig. 15, in which the male is provided with a humeral gland.

### 103. *Rana daemeli*.

*Hylorana erythraea*, part., Günth. *Ann. and Mag. N.H.* (3) XX, 1867, p. 56.

*Hylorana daemeli*, Steind. *Sitzb. Ak. Wien*, LVII, i, 1868, p. 532, pl. —.

*Hylorana nebulosa*, Macleay, *Proc. Linn. Soc. N.S.W.* II, 1877, p. 137.

*Rana papua*, part., Bouleng. *Cat. Batr. Ecaud.* p. 64 (1882), and *Ann. and Mag. N.H.* (5) XVI, 1885, p. 387; Roux, *Abh. Senck. Ges.* XXXIII, 1910, p. 224.

*Hyla nobilis*, De Vis, *Proc. R. Soc. Queensl.* I, 1884, p. 129.

*Rana daemeli*, Garman, *Bull. Mus. Comp. Zool.* XXXIX, 1901, p. 14; Bouleng. *Tr. Zool. Soc.* XX, 1914, p. 250, and *Ann. and Mag. N.H.* (9) I, 1918, p. 240.

*Rana novæ-guinææ*, van Kampen, *Nova Guinea*, IX, *Zool.* p. 37, pl. ii, fig. 5 (1909), and p. 459 (1913).

Vomerine teeth in oblique groups or short series between the choanæ or extending posteriorly a little beyond them, equally distant from each other and from the latter.

Head a little longer than broad, much depressed; snout obtusely pointed, projecting beyond the mouth, as long as the eye or longer; canthus rostralis strong; loreal region feebly oblique or nearly vertical, deeply concave; nostril a little nearer the tip of the snout than the eye; distance between the nostrils equal to or greater than the interorbital width, which is equal to or a little less than that of the upper eyelid; tympanum very distinct,  $\frac{2}{3}$  to  $\frac{3}{4}$  the diameter of the eye and 3 to 4 times its distance from the latter.

Fingers long and slender, sometimes with a narrow dermal border, terminating in small but very distinct discs, which are a little longer than broad and bear a horseshoe-shaped groove separating the upper from the lower surface; first finger longer than the second, third longer than the snout; subarticular tubercles large and very prominent.

Hind limb moderately long, the tibio-tarsal articulation reaching the eye or between the eye and the nostril; the heels feebly overlapping when the limbs are folded at right angles to the body, tibia  $3\frac{1}{2}$  to 4 times as long as broad, 2 to  $2\frac{1}{8}$  times in length from snout to vent, much shorter than the fore limb, as long as or slightly longer or shorter than the foot. Toes ending in well-developed discs, similar to but a little larger than those of the fingers, the web reaching the discs of the third and fifth, two phalanges of fourth free: outer metatarsals separated nearly to the base; subarticular tubercles moderately large, prominent; no tarsal fold; inner metatarsal tubercle oval or elliptic,  $\frac{2}{5}$  the length of the inner; a round outer tubercle.

Skin of upper parts smooth or with a few scattered small warts; a moderately broad glandular dorso-lateral fold, from above the tympanum to the hip, the distance between these folds, on the back, 5 to  $5\frac{1}{2}$  times in length of head and body; a glandular fold from below the eye to the shoulder, sometimes followed by one or two glandules. Lower parts smooth.

Greyish or reddish brown above, uniform or with small dark spots; flanks usually spotted or marbled with dark brown; loreal and temporal regions dark brown, tympanum reddish brown; a more or less distinct light streak along the upper lip, continued on the glandular fold behind the mouth; limbs with dark cross-bands; hinder side of thighs mottled or marbled with dark brown. White beneath, throat and breast sometimes marbled with brown.

Males with internal vocal sacs.

The eggs measure  $1\frac{1}{2}$  millim. in a female 76 millim. long.

*Measurements, in millimetres.*

|                    | 1. | 2. | 3. | 4. | 5. | 6. | 7.  |
|--------------------|----|----|----|----|----|----|-----|
|                    | ♂  | ♀  | ♀  | ♀  | ♀  | ♀  | ♀   |
| From snout to vent | 58 | 80 | 76 | 71 | 42 | 41 | 40  |
| Head ..            | 21 | 28 | 27 | 25 | 16 | 15 | 14  |
| Width of head ..   | 20 | 26 | 25 | 23 | 13 | 13 | 12  |
| Snout              | 9  | 11 | 11 | 9  | 6  | 6  | 5.5 |
| Eye ..             | 7  | 9  | 9  | 8  | 6  | 6  | 5.5 |

|                    |    | 1.<br>♂ | 2.<br>♀ | 3.<br>♀ | 4.<br>♀ | 5.<br>♀ | 6.<br>♀ | 7.<br>♀ |
|--------------------|----|---------|---------|---------|---------|---------|---------|---------|
| Interorbital width | .. | 4       | 5       | 5       | 4       | 3       | 3       | 3       |
| Tympanum           | .. | 5.5     | 6       | 6       | 6       | 4       | 4       | 3.5     |
| Fore limb          | .. | 35      | 47      | 46      | 44      | 26      | 25      | 24      |
| First finger       | .. | 9       | 12      | 11      | 11      | 6.5     | 6       | 5.5     |
| Second finger ..   |    | 7       | 9       | 10      | 9       | 6       | 5.5     | 5       |
| Third finger       | .. | 11      | 14      | 14      | 12      | 8       | 8       | 7       |
| Fourth finger      | .. | 7       | 9       | 9       | 8       | 5       | 5       | 5       |
| Hind limb          | .. | 91      | 123     | 115     | 110     | 65      | 62      | 60      |
| Tibia              | .. | 29      | 39      | 37      | 35      | 20      | 19      | 19      |
| Foot               | .. | 28      | 38      | 35      | 34      | 21      | 19      | 19      |
| Third toe          | .. | 14      | 19      | 18      | 18      | 11      | 10      | 10      |
| Fourth toe         | .. | 24      | 32      | 30      | 30      | 18      | 17      | 17      |
| Fifth toe          | .. | 15      | 22      | 22      | 22      | 12      | 11      | 11      |

1. Port Moresby. 2-4. Cape York. 5-7. Mimika R., Dutch New Guinea.

*Habitat.* Northern Queensland and New Guinea.

The shorter hind limbs distinguish this species from *R. papua*; in this respect there is complete agreement with *R. krefftii*, the male of which differs in the presence of external vocal sacs and of a humeral gland.

#### 104. *Rana swinhoana*.

*Rana swinhoana*, Bouleng. *Ann. and Mag. N.H.* (7) XII, 1903, p. 556; Stejneger. *Herp. Zap.* p. 132 (1907).

*Rana kosempensis*, Werner, *Mitth. Nat. Mus. Hamb.* XXX, 1913, p. 48.

Vomerine teeth in short oblique series between the choanæ or extending beyond the level of their posterior borders, nearer to each other than to the latter.<sup>1</sup>

Head as long as broad or slightly broader than long, much depressed; snout rounded, moderately projecting beyond the mouth, as long as the eye; canthus rostralis obtuse; loreal region moderately oblique, concave; nostril equally distant from the eye and the tip of the snout or a little nearer the latter; distance between the nostrils greater than the interorbital width, which is equal to or a little less than that of the upper eyelid; tympanum very distinct, half the diameter of the eye,  $1\frac{1}{2}$  to 2 times its distance from the latter.

Fingers moderately long, the tips dilated into moderately large discs with a groove separating the upper from the lower surface and measuring half the diameter of the tympanum; first finger as long as or slightly longer than the second; subarticular tubercles rather large and very prominent.

Hind limb long, the tibio-tarsal articulation reaching the tip of the snout or a little beyond, the heels overlapping; tibia  $3\frac{1}{2}$  to 5 times as long as broad,  $1\frac{2}{3}$  to 2 times in length from snout to vent, shorter than the fore limb, a little longer than the foot. Toes with discs similar to those of the fingers, entirely webbed or two phalanges of fourth free; outer metatarsals separated nearly to the base; subarticular tubercles moderately large and prominent; no tarsal fold; inner metatarsal tubercle oval, feebly

<sup>1</sup> In the larger female from Kosempo, the vomerine teeth present a curious anomaly: they form a single V-shaped group just behind the level of the choanæ.

prominent,  $\frac{1}{3}$  to  $\frac{1}{2}$  the length of the inner toe; outer tubercle small and very indistinct, or absent.

Skin smooth or finely granulate above; dorso-lateral fold absent or distinct only anteriorly; a glandular fold from below the eye to the shoulder, broken up behind; lower parts smooth, feebly granulate on the posterior part of the belly and of the thighs.

Brown or dark grey above, with small darker spots, flanks lighter, usually with black spots; a dark canthal streak and a dark temporal blotch; tympanum reddish brown; a whitish streak along the upper lip; limbs with rather indistinct dark cross-bands; hinder side of thighs yellowish, with black spots or marblings. Lower parts white.

Males with a large external vocal sac on each side of the throat in front of the arm; fore limb strong; a thick pad on the inner side of the first finger.

Nasal bones rather small, separated from each other; ethmoid largely exposed above, pointed in front, extending to between the nasals.

Eggs not pigmented, 3 millim. in diameter.

*Measurements, in millimetres.*

|                       | 1.  | 2.  | 3.  | 4.  | 5.  |
|-----------------------|-----|-----|-----|-----|-----|
|                       | ♀   | ♀   | ♂   | ♀   | ♀   |
| From snout to vent .. | 83  | 80  | 63  | 82  | 64  |
| Head ..               | 26  | 26  | 23  | 27  | 22  |
| Width of head ..      | 27  | 27  | 23  | 27  | 22  |
| Snout ..              | 10  | 10  | 8   | 10  | 8   |
| Eye ..                | 10  | 10  | 8   | 10  | 8   |
| Interorbital width .. | 6   | 6   | 4   | 5   | 5   |
| Tympanum ..           | 5   | 5   | 4   | 5   | 4   |
| Fore limb ..          | 49  | 48  | 40  | 48  | 42  |
| First finger ..       | 10  | 10  | 7   | 9.5 | 9   |
| Second finger ..      | 10  | 9   | 7   | 9   | 8.5 |
| Third finger ..       | 15  | 13  | 11  | 14  | 12  |
| Fourth finger ..      | 9   | 9   | 7   | 9   | 9   |
| Hind limb ..          | 130 | 132 | 102 | 124 | 119 |
| Tibia ..              | 42  | 43  | 34  | 40  | 39  |
| Foot ..               | 40  | 38  | 30  | 38  | 36  |
| Third toe ..          | 23  | 22  | 16  | 20  | 19  |
| Fourth toe ..         | 35  | 33  | 25  | 30  | 29  |
| Fifth toe ..          | 26  | 25  | 18  | 23  | 23  |

1-2. Bangkimtsing (types). 3-5. Kosempo.

*Habitat.* Formosa.

**105. *Rana cavitympanum*.**

*Rana cavitympanum*, Bouleng. *Proc. Zool. Soc.* 1893, p. 525, pl. xliii, fig. 1.

Vomerine teeth in short slightly oblique series between the choanæ, nearer to each other than to the latter.

Head as long as broad, much depressed; snout rounded, scarcely projecting beyond the mouth, a little shorter than the

eye; canthus rostralis strong; loreal region feebly oblique, deeply concave; nostril slightly nearer the eye than the tip of the snout; distance between the nostrils greater than the interorbital width, which is  $\frac{2}{3}$  that of the upper eyelid; tympanum very distinct, deeply sunk,  $\frac{1}{2}$  the diameter of the eye.

Fingers moderately long, the tips dilated into moderately large discs with a groove separating the upper from the lower surface, measuring  $\frac{1}{2}$  the diameter of the tympanum; first finger as long as the second, third longer than the snout; subarticular tubercles rather large and very prominent.

Hind limb extremely long, the tibio-tarsal articulation reaching far beyond the tip of the snout, the heels strongly overlapping when the limbs are folded at right angles to the body; tibia  $6\frac{1}{2}$  times as long as broad,  $1\frac{1}{2}$  times as long as head and body, longer than the fore limb and than the foot. Toes entirely webbed, the discs similar to those of the fingers; outer metatarsals separated nearly to the base; subarticular tubercles rather small, moderately prominent; no tarsal fold; inner metatarsal tubercle oval, not quite  $\frac{1}{3}$  the length of the inner toe; no outer tubercle.

Skin smooth; no dorso-lateral fold.

Pale grey-brown above; a broad dorsal area blackish brown, sharply defined on the sides; a dark bar between the eyes; a black streak from the lip to the shoulder, passing through the nostril and eye and above the tympanum, lips with black spots; limbs with narrow dark brown cross-bars. Lower parts white.

Male with an external vocal sac on each side of the throat, in front of the ear; inner finger thickened at the base.

Tadpole with a large ventral sucking disc, free on its borders, truncate in front. Horny beak black, very finely denticulate on the edge; lip much developed, not fringed, with 3 uninterrupted and 8 interrupted rows of horny teeth in front, and 4 uninterrupted and 1 interrupted rows behind.

*Measurements of type specimen (♂).*

|                    |    |    |    |    |         |
|--------------------|----|----|----|----|---------|
| From snout to vent | .. | .. | .. | 44 | millim. |
| Head               | .. | .. | .. | 16 | ..      |
| Width of head      | .. | .. | .. | 16 | ..      |
| Snout              | .. | .. | .. | 5  | ..      |
| Eye                | .. | .. | .. | 6  | ..      |
| Interorbital width | .. | .. | .. | 3  | ..      |
| Tympanum           | .. | .. | .. | 3  | ..      |
| Fore limb          | .. | .. | .. | 28 | ..      |
| First finger       | .. | .. | .. | 6  | ..      |
| Second finger      | .. | .. | .. | 6  | ..      |
| Third finger       | .. | .. | .. | 8  | ..      |
| Fourth finger      | .. | .. | .. | 6  | ..      |
| Hind limb          | .. | .. | .. | 90 | ..      |
| Tibia              | .. | .. | .. | 32 | ..      |
| Foot               | .. | .. | .. | 27 | ..      |
| Third toe          | .. | .. | .. | 14 | ..      |
| Fourth toe         | .. | .. | .. | 23 | ..      |
| Fifth toe          | .. | .. | .. | 17 | ..      |

*Habitat.* Mt. Kina Balu, Borneo.

106. *Rana whiteheadi*.

*Rana whiteheadi*, Bouleng. *Ann. and Mag. N.H.* (5) XX, 1887, p. 96 ; Mocquard, *N. Arch. Mus.* (3) II, 1890, p. 146, pl. x, fig. 2 ; Bouleng. *Ann. and Mag. N.H.* (6) VII, 1891, p. 344 ; Mocquard, *Mém. Soc. Zool. France*, V, 1892, p. 205 ; Bouleng. *Proc. Zool. Soc.* 1893, p. 526.

Vomerine teeth in short transverse or oblique series on a line with the posterior borders of the choanæ, or just behind them, equally distant from each other and from the latter, or closer together.

Head as long as broad or slightly longer than broad, much depressed ; snout rounded or obtusely pointed, feebly projecting beyond the mouth, as long as or a little longer or a little shorter than the eye, which is very large and prominent ; canthus rostralis strong ; loreal region feebly oblique, deeply concave, nostril nearer the tip of the snout than the eye ; distance between the nostrils equal to or a little greater than the interorbital width, which equals  $\frac{2}{3}$  to once that of the upper eyelid ; tympanum very distinct,  $\frac{2}{3}$  to  $\frac{3}{5}$  the diameter of the eye, 1 to  $2\frac{1}{2}$  times as long as its distance from the latter.

Fingers rather long and slender, the tips dilated into moderately large discs with a groove separating the upper from the lower surface, the discs as long as broad and measuring  $\frac{1}{2}$  to  $\frac{4}{5}$  the diameter of the tympanum ; first finger as long as or longer than the second, third longer than the snout ; subarticular tubercles rather large, very prominent.

Hind limb very long and slender, the tibio-tarsal articulation reaching far beyond the tip of the snout, the heels strongly overlapping when the limbs are folded at right angles to the body ; tibia 6 to 7 times as long as broad,  $1\frac{1}{3}$  to  $1\frac{1}{2}$  times in length from snout to vent, as long as or a little longer or a little shorter than the fore limb, much longer than the foot. Toes with the tips dilated into discs similar to those of the fingers, completely webbed, or two phalanges of fourth free ; outer metatarsals separated nearly to the base ; subarticular tubercles moderately large, very prominent ; no tarsal fold ; inner metatarsal tubercle oval or elliptic,  $\frac{1}{4}$  to  $\frac{1}{3}$  the length of the inner toe ; outer tubercle very small and rather indistinct, or absent.

Skin finely granulate or shagreened above ; a moderately prominent glandular fold above the tympanum, sometimes continued to about half-way between it and the second or followed by a series of warts. Lower parts smooth, or posterior part of belly and posterior half of thighs feebly granulate.

Dark grey, purplish brown, or reddish brown above, sometimes with darker spots or marblings, or with scattered small light spots ; a blackish streak below the canthus rostralis and on the supratemporal fold ; temporal region blackish or with blackish spots, the tympanum yellowish or pale brown with a dark brown or blackish central spot ; limbs with or without more or less distinct dark cross-bands ; hinder side of thighs purplish brown,

uniform or speckled with lighter. Lower parts white, uniform or spotted or marbled with brown.

Males with a small external vocal sac on each side of the throat, in front of the arm; fore limb strong; a large pad on the inner side of the first finger.

Nasal bones narrow, oblique, widely separated from each other; ethmoid largely exposed above, obtusely pointed in front, extending to between the nasals. Terminal phalanges T-shaped.

Tadpole with a large ventral sucking disc behind the mouth, free on its borders, truncate in front, tail obtusely pointed, the upper crest not extending to the base of the muscular part. Beak black, each mandible formed of two pieces, separated in the middle line by a considerable interspace; these pieces ribbed and strongly toothed; lips large, lower with a fringe of papillae; 2 uninterrupted and 3 lateral series of horny teeth in front, 4 uninterrupted and 1 lateral series behind.

Eggs 2 millim. in diameter.

*Measurements, in millimetres.*

|                    | 1.  | 2.  | 3.  | 4.  | 5.  | 6.  | 7.  | 8.  | 9.  | 10. | 11. | 12. |
|--------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
|                    | ♂   | ♂   | ♂   | ♀   | ♀   | ♀   | ♀   | ♀   | ♀   | ♀   | ♀   | ♀   |
| From snout to vent | 64  | 46  | 43  | 93  | 80  | 65  | 65  | 65  | 63  | 62  | 72  | 70  |
| Head ..            | 24  | 17  | 17  | 33  | 27  | 25  | 24  | 24  | 23  | 22  | 25  | 24  |
| Width of head ..   | 24  | 16  | 16  | 33  | 27  | 25  | 24  | 24  | 23  | 22  | 25  | 24  |
| Snout..            | 8   | 6   | 5.5 | 12  | 10  | 9   | 9   | 9   | 8   | 8   | 10  | 9   |
| Eye ..             | 8   | 7   | 6.5 | 12  | 10  | 9   | 9   | 9   | 8   | 8   | 9   | 8   |
| Interorbital width | 5   | 3.5 | 3   | 7   | 6   | 5   | 5   | 5   | 5   | 5   | 6   | 5   |
| Tympanum ..        | 4   | 4   | 3   | 5   | 4   | 4.5 | 4.5 | 4.5 | 4.5 | 4   | 5   | 4   |
| Fore limb ..       | 44  | 29  | 26  | 59  | 50  | 47  | 49  | 47  | 47  | 44  | 47  | 46  |
| First finger ..    | 10  | 6   | 6   | 15  | 12  | 11  | 11  | 12  | 11  | 10  | 10  | 9   |
| Second finger ..   | 10  | 6   | 6   | 14  | 11  | 10  | 10  | 10  | 10  | 9   | 8   | 9   |
| Third finger ..    | 14  | 10  | 10  | 19  | 15  | 14  | 15  | 15  | 15  | 13  | 13  | 13  |
| Fourth finger ..   | 10  | 6   | 6   | 14  | 9   | 9   | 10  | 11  | 11  | 9   | 9   | 9   |
| Hind limb ..       | 131 | 92  | 90  | 180 | 158 | 135 | 136 | 138 | 138 | 131 | 138 | 142 |
| Tibia ..           | 44  | 32  | 31  | 60  | 53  | 44  | 45  | 46  | 47  | 44  | 47  | 49  |
| Foot ..            | 37  | 26  | 25  | 52  | 45  | 38  | 38  | 38  | 39  | 38  | 37  | 37  |
| Third toe ..       | 20  | 14  | 14  | 30  | 25  | 21  | 21  | 22  | 22  | 20  | 22  | 22  |
| Fourth toe ..      | 32  | 22  | 21  | 44  | 38  | 32  | 32  | 32  | 34  | 33  | 31  | 31  |
| Fifth toe ..       | 24  | 16  | 16  | 35  | 30  | 23  | 24  | 24  | 25  | 24  | 25  | 25  |

1-10. Kina Balu. 11-12. Pata R.

*Habitat.* Borneo (Mt. Kina Balu, N. Borneo, and Pata River, Sarawak).

107. *Rana jerboa.*

*Hylorana jerboa*, Günth. *Proc. Zool. Soc.*, 1872, p. 599, pl. xl.

*Rana jerboa*, Bouleng. *Cat. Batr. Ecaud.* p. 67 (1882), *Proc. Zool. Soc.* 1893, p. 526, and *Ann. Mus. Genova* (2) XIII, 1893, p. 335; M. Weber, *Ann. Jard. Bot. Buitenz.*, *Suppl.* II, 1898, p. 10, fig.; S. Flower, *Proc. Zool. Soc.* 1899, p. 916; A. L. Butler, *Fourn. N.H. Soc. Bomb.* XV, 1903, p. 199; van Kampen, in M. Weber, *Zool. Ergebn. Reise Nied. O.-Ind.* IV, p. 397 (1907), and *Tijdschr. Ned. Ind.* LXIX, 1909, p. 39, pl. ii, figs. 3-6; Bouleng., *Faun. Mal. Pen.*, *Rept.* p. 244 (1912).

*Rana masonii*, Bouleng. *Ann. and Mag. N.H.* (5) XIII, 1884, p. 397; Boettg., *Ber. Offenb. Ver. Nat.* 1892, p. 138.

Vomerine teeth in short transverse or oblique series between the choanae or extending beyond the level of their posterior borders, equally distant from each other and from the choanae or a little nearer together.

Head as long as broad or a little longer than broad, much depressed ; snout rounded or obtusely pointed, scarcely projecting beyond the mouth, as long as or a little longer than the eye ; canthus rostralis strong ; loreal region feebly oblique and strongly concave ; nostril equally distant from the eye and from the tip of the snout, or a little nearer the latter ; distance between the nostrils equal to or a little greater than the interorbital width, which is equal to or a little less than that of the upper eyelid ; tympanum very distinct,  $\frac{1}{2}$  to  $\frac{2}{3}$  the diameter of the eye, 1 to 4 times as long as its distance from the latter.

Fingers rather long and slender, the tips dilated into moderately large discs with a groove separating the upper from the lower surface, the discs as long as broad, much smaller than the tympanum ( $\frac{1}{2}$  to  $\frac{2}{3}$  its diameter) ; first finger as long as or longer than the second, third longer than the snout ; subarticular tubercles large, very prominent.

Hind limb extremely long, slender, the tibio-tarsal articulation reaching far beyond the tip of the snout, the heels strongly overlapping when the limbs are folded at right angles to the body, tibia 6 to  $7\frac{1}{2}$  times as long as broad,  $1\frac{1}{4}$  to  $1\frac{1}{2}$  times in length from snout to vent, as long as or a little longer than the fore limb, much longer than the foot. Toes with discs similar to those of the fingers or a little larger, entirely webbed, the base of the discs of the third and fifth involved in the web ; outer metatarsals separated nearly to the base ; subarticular tubercles moderately large, prominent, no tarsal fold ; inner metatarsal tubercle oval or elliptic,  $\frac{1}{4}$  to  $\frac{1}{3}$  the length of the inner toe ; outer tubercle more or less distinct, rarely absent.

Skin of upper parts smooth or finely granulate ; a moderately broad, moderately prominent glandular dorso-lateral fold from above the tympanum to the hip, its distance from its fellow, on the back,  $4\frac{1}{2}$  to  $5\frac{1}{2}$  times in length from snout to vent. Lower parts smooth.

Pale brown, greyish brown, or reddish brown above, uniform or marbled with darker, dark brown on the sides of the head and sometimes of the body ; sometimes a black streak on the canthus rostralis and along the outer side of the dorso-lateral fold, with a downward process in front of and another behind the tympanum, which is yellowish or reddish brown with a dark brown central spot ; limbs with dark cross-bands, which may be very indistinct ; hinder side of thighs speckled or vermiculate with dark brown, or marbled with dark brown and yellow. Lower parts white, or belly yellow, uniform, or throat and breast spotted or speckled with brown.

Males with a small external vocal sac on each side of the

*Measurements, in millimetres.*

|                    | 1.  | 2.  | 3.  | 4.  | 5.  | 6.  | 7.   | 8.  | 9.  | 10. | 11. | 12. | 13. | 14. | 15. | 16. | 17. | 18. | 19. | 20. | 21. |
|--------------------|-----|-----|-----|-----|-----|-----|------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
|                    | ♀   | ♀   | ♀   | ♀   | ♀   | ♀   | ♀    | ♂   | ♀   | ♂   | ♂   | ♂   | ♂   | ♀   | ♀   | ♀   | ♀   | ♂   | ♀   | ♀   | ♂   |
| From snout to vent | 97  | 74  | 61  | 61  | 56  | 53  | 84   | 38  | 59  | 37  | 37  | 36  | 36  | 63  | 63  | 63  | 63  | 34  | 65  | 65  | 38  |
| Head ..            | 33  | 25  | 23  | 22  | 20  | 19  | 29   | 14  | 21  | 14  | 14  | 14  | 13  | 22  | 23  | 23  | 21  | 13  | 22  | 25  | 15  |
| Width of head ..   | 33  | 25  | 23  | 21  | 20  | 18  | 27   | 11  | 19  | 11  | 11  | 11  | 11  | 20  | 20  | 20  | 19  | 11  | 22  | 23  | 14  |
| Snout ..           | 13  | 11  | 9   | 9   | 8   | 7   | 11   | 5   | 9   | 5   | 5   | 5   | 5   | 9   | 9   | 9   | 9   | 4.5 | 9   | 9   | 5   |
| Eye ..             | 10  | 9   | 7   | 7   | 8   | 7   | 10   | 5   | 8   | 5   | 5   | 5   | 5   | 8   | 8   | 7   | 8   | 5   | 9   | 8   | 5   |
| Interorbital width | 7   | 6   | 5   | 5   | 4.5 | 4   | 6    | 3   | 5   | 3   | 3   | 3   | 3   | 5   | 5   | 5   | 5   | 3   | 5   | 5   | 3   |
| Tympanum ..        | 5   | 5   | 4   | 4   | 4   | 4   | 5    | 3.5 | 4.5 | 3.5 | 3   | 3.5 | 3   | 4   | 4   | 4   | 4   | 3   | 4.5 | 4.5 | 3   |
| Fore limb ..       | 61  | 48  | 44  | 45  | 42  | 39  | 55   | 24  | 36  | 25  | 24  | 25  | 24  | 41  | 39  | 40  | 41  | 22  | 43  | 47  | 22  |
| First finger ..    | 13  | 11  | 9   | 9   | 8   | 8   | 12   | 5   | 9   | 5.5 | 5.5 | 5   | 5.5 | 10  | 8   | 9   | 9   | 4.5 | 9   | 10  | 4.5 |
| Second finger ..   | 13  | 10  | 9   | 9   | 8   | 7   | 11.5 | 5   | 8   | 5   | 5   | 5   | 5   | 8   | 7   | 8   | 8   | 4   | 8   | 9.5 | 4   |
| Third finger ..    | 16  | 15  | 14  | 14  | 12  | 11  | 16   | 8   | 12  | 8   | 8   | 8   | 8   | 13  | 12  | 12  | 12  | 6   | 13  | 14  | 6   |
| Fourth finger ..   | 12  | 9   | 9   | 9   | 8   | 7   | 11   | 5   | 8   | 5   | 5   | 5   | 5   | 9   | 7   | 8   | 8   | 4   | 9   | 10  | 4   |
| Hind limb ..       | 189 | 152 | 136 | 136 | 132 | 126 | 172  | 82  | 123 | 77  | 75  | 77  | 78  | 135 | 130 | 132 | 130 | 71  | 138 | 145 | 71  |
| Tibia ..           | 66  | 52  | 44  | 45  | 45  | 42  | 60   | 28  | 43  | 27  | 26  | 26  | 27  | 47  | 45  | 46  | 44  | 25  | 47  | 47  | 25  |
| Foot ..            | 55  | 42  | 38  | 37  | 34  | 33  | 47   | 22  | 35  | 20  | 20  | 21  | 21  | 36  | 36  | 36  | 36  | 19  | 33  | 40  | 19  |
| Third toe ..       | 29  | 25  | 23  | 22  | 21  | 20  | 28   | 12  | 18  | 11  | 11  | 12  | 12  | 20  | 20  | 20  | 20  | 11  | 19  | 22  | 11  |
| Fourth toe ..      | 47  | 36  | 32  | 32  | 29  | 29  | 41   | 19  | 28  | 17  | 17  | 18  | 18  | 31  | 31  | 31  | 30  | 16  | 29  | 35  | 16  |
| Fifth toe ..       | 36  | 30  | 26  | 25  | 24  | 24  | 32   | 15  | 22  | 13  | 13  | 14  | 14  | 25  | 25  | 25  | 24  | 13  | 24  | 26  | 13  |

1. Kareni hills, Burma. 2. Me Wang, N. Siam. 3-4. Siolak Daru, Korinchi, Sumatra. 5-6. Matang, Sarawak (types). 7. Mt. Dulit, Sarawak. 8-9. Kidi district, Sarawak. 10-17. Sarawak. 18-19. Luras, Brunei, Borneo. 20. Batavia (type of *R. masoni*). 21. Tengger Mts., Java.

throat; fore limb strong, a moderately thick pad on the inner side of the first finger.<sup>1</sup>

Nasal bones small, widely separated from each other; ethmoid exposed above, truncate or rounded in front, not extending to the nasals. Terminal phalanges T-shaped.

Tadpole with a large ventral sucking disc behind the mouth, free on its borders, truncate in front; tail pointed, the upper crest not extending to the base of the muscular part. Beak black, the edge feebly denticulate; lip much developed, not fringed, with 4 series of horny teeth in front, the outermost uninterrupted, and 4 behind, only the inner interrupted. This definition is taken from specimens from Bantam, Java, which I have referred to *R. jerboa*.

Tadpoles obtained by Max Weber in Java, and referred to the same species by van Kampen, differ in having small papillae on the

edge of the lip and 8 upper and 8 lower series of labial teeth  $\left( \begin{smallmatrix} 4 \\ 4-4 \\ 1-1 \end{smallmatrix} \right)$

Which of the two tadpoles really belongs to *R. jerboa* is still a question, awaiting a solution until we know the larval form of *R. hosii*, which also inhabits Java, and the foot of which can hardly be distinguished from that of *R. jerboa*.

Eggs  $1\frac{1}{2}$  millim. in diameter, strongly pigmented.

*Habitat*. Burma (Karen hills), Siam, Malay Peninsula, Sumatra, Borneo, Java.

#### 108. *Rana hosii*.

*Rana hosii*, Bouleng. *Ann. and Mag. N.H.* (6), VIII, 1891, p. 290, and *Fourn. Fed. Mal. St. Mus.* III, 1908, p. 62; van Kampen, in M. Weber, *Zool. Ergebn. Reise Nied. O.-Ind.* IV, p. 398 (1907), and *Bull. Dép. Agric. Ind. Néerl.* XXV, 1909, p. 2; Bouleng. *Faun. Mal. Pen., Rept.* p. 243 (1912); van Kampen, *Notes Leyd. Mus.* XXXVI, 1914, p. 260, *Rana durheimi*, Baumann, *Zool. Jahrb., Syst.* XXXIV, 1913, p. 275, fig.

Vomerine teeth in strong oblique series between the choanae and extending beyond the level of their posterior borders, equally distant from each other and from the latter, or nearer together.

Head as long as broad or slightly longer than broad, much depressed; snout rounded or obtusely pointed, more or less projecting beyond the mouth, as long as or a little longer than the eye, canthus rostralis strong, loreal region slightly oblique or nearly vertical, deeply concave, nostril nearer the end of the snout than the eye, distance between the nostrils equal to or greater than the interorbital width, which is equal to or a little less than that of the upper eyelid, tympanum very distinct,  $\frac{2}{3}$  to  $\frac{3}{5}$  the diameter of the eye,  $1\frac{1}{3}$  to 3 times as long as its distance from the latter.

Fingers moderately long, the tips dilated into large discs with a groove separating the upper from the lower surface, those of the third and fourth as large as or a little smaller than the tympanum,

<sup>1</sup> The statement previously made by me that the vocal sacs are internal and that the tympanum is larger is due to a confusion with *R. hosii*.

first finger as long as the second, third longer than the snout; sub-articular tubercles large, very prominent.

Hind limb long and slender, the tibio-tarsal articulation reaching beyond the tip of the snout, the heels strongly overlapping when the limbs are folded at right angles to the body; tibia  $4\frac{1}{2}$  to  $5\frac{1}{2}$  times as long as broad,  $1\frac{1}{2}$  to  $1\frac{3}{4}$  times in length from snout to vent, shorter than the fore limb, longer than the foot. Toes with discs similar to but smaller than those of the fingers, the web extending to and involving the base of the discs; outer metatarsals separated nearly to the base; subarticular tubercles moderately large, prominent; no tarsal fold; inner metatarsal tubercle elliptic,  $\frac{2}{3}$  to  $\frac{1}{2}$  the length of the inner toe; no outer tubercle.

Upper parts feebly granulate; a feebly prominent, sometimes very indistinct, glandular dorso-lateral fold from above the tympanum to the sacrum or to the hip, its distance from its fellow, on the back, 5 to 6 times in length from snout to vent; a glandular fold from below the eye to the shoulder, often followed by one or two glandules. Lower parts smooth.

Uniform purplish brown above, darker on the sides, especially on the head; a white or whitish streak along the upper lip; limbs with darker cross-bands, which may be very indistinct. Lower parts white, uniform or spotted or marbled with brown.

Males with internal vocal sacs; fore limb strong; a moderately strong pad on the inner side of the first finger.

Nasal bones rather small, widely separated from each other and from the frontoparietals; ethmoid largely exposed above, truncate in front, not extending to between the nasals. Terminal phalanges T-shaped.

Eggs not pigmented, 2 to  $2\frac{1}{2}$  millim. in diameter.

*Measurements, in millimetres.*

|                    | 1.    | 2. | 3.  | 4.  | 5.  | 6.  | 7.  | 8. | 9. | 10. | 11. | 12. | 13. |
|--------------------|-------|----|-----|-----|-----|-----|-----|----|----|-----|-----|-----|-----|
|                    | ♂     | ♂  | ♀   | ♀   | ♂   | ♀   | ♀   | ♂  | ♂  | ♀   | ♀   | ♀   | ♀   |
| From snout to vent | .. 50 | 48 | 85  | 82  | 57  | 85  | 97  | 49 | 49 | 90  | 97  | 97  | 95  |
| Head               | .. 18 | 17 | 28  | 27  | 19  | 30  | 30  | 16 | 17 | 28  | 30  | 31  | 30  |
| Width of head      | .. 16 | 15 | 27  | 27  | 19  | 30  | 30  | 16 | 16 | 28  | 30  | 31  | 30  |
| Snout              | .. 7  | 7  | 11  | 11  | 8   | 12  | 13  | 7  | 8  | 12  | 12  | 12  | 12  |
| Eye                | .. 7  | 7  | 10  | 11  | 8   | 11  | 12  | 7  | 7  | 10  | 12  | 12  | 12  |
| Interorbital space | .. 4  | 4  | 6   | 6   | 5   | 7   | 6   | 4  | 4  | 6   | 7   | 7   | 7   |
| Tympanum           | .. 4  | 4  | 5   | 5   | 4   | 5   | 5   | 4  | 4  | 5   | 6   | 6   | 6   |
| Fore limb          | .. 33 | 33 | 53  | 55  | 39  | 63  | 63  | 32 | 32 | 58  | 66  | 66  | 63  |
| First finger       | .. 6  | 6  | 11  | 11  | 8   | 14  | 13  | 7  | 7  | 12  | 13  | 14  | 13  |
| Second finger      | .. 6  | 6  | 11  | 11  | 8   | 14  | 13  | 7  | 7  | 12  | 13  | 14  | 13  |
| Third finger       | .. 10 | 10 | 16  | 17  | 12  | 22  | 20  | 11 | 11 | 19  | 20  | 22  | 20  |
| Fourth finger      | .. 6  | 6  | 11  | 12  | 8   | 15  | 14  | 7  | 8  | 13  | 13  | 16  | 14  |
| Hind limb          | .. 98 | 87 | 156 | 155 | 110 | 173 | 167 | 90 | 90 | 158 | 176 | 178 | 167 |
| Tibia              | .. 33 | 29 | 51  | 50  | 36  | 56  | 55  | 31 | 31 | 51  | 58  | 60  | 56  |
| Foot               | .. 28 | 25 | 45  | 46  | 32  | 53  | 49  | 26 | 27 | 49  | 52  | 51  | 50  |
| Third toe          | .. 15 | 15 | 25  | 26  | 18  | 31  | 30  | 15 | 16 | 30  | 31  | 30  | 30  |
| Fourth toe         | .. 23 | 21 | 37  | 40  | 27  | 45  | 44  | 22 | 23 | 43  | 46  | 45  | 44  |
| Fifth toe          | .. 18 | 16 | 30  | 30  | 21  | 34  | 34  | 17 | 18 | 33  | 36  | 36  | 35  |

1. Bukit Itam, Selangor. 2-4. Kuthla Tehu, Pahang. 5-6. Siolak Daras, Korinchi, Sumatra. 7. Mt. Dulit, Sarawak (type). 8-10. Mt. Batu Song, Sarawak. 12-13. Sarawak.

*Habitat.* Malay Peninsula, Sumatra, Borneo, Java.

109. *Rana chalconota*.

*Hyla chalconota*, Schleg. *Abbild.* p. 24, pl. ix, fig. 1 (1837).

*Polypedates chalconotus*, Tschudi, *Class. Batr.* p. 34 (1838).

*Limnodytes chalconotus*, Dum. et Bibr. *Exp. Gén.* VIII, p. 513 (1841).

*Polypedates junghuhnii*, Bleek. *Nat. Tijdschr. Ned. Ind.* XI, 1856, p. 469.

*Hylarana chalconota*, Günth. *Cat. Batr. Sal.* p. 73 (1858).

*Rana chalconota*, Bouleng. *Cat. Batr. Ecaud.* p. 66, fig. (1882); Boettg. *Ber. Offenb. Ver. Nat.* 1892, p. 141; Isenschmid, *Mitth. Nat. Ges. Bas.* 1903, p. 9; van Kampen, *Zool. Jahrb., Syst.* XXII, 1905, p. 704, in M. Weber, *Zool. Ergebn. Reis. Nied. O.-Ind.*, IV, p. 392 (1907), and *Nat. Tijdschr. Ned. Ind.* L. XIX, 1909, p. 37.

*Rana labialis*, Bouleng. *Ann. and Mag. N.H.* (5) XIX, 1887, p. 345, pl. x, fig. 1, and *Ann. Mus. Genova* (4) XIV, 1894, p. 617; S. Flower, *Proc. Zool. Soc.* 1896, p. 903, pl. xlv, fig. 3; Peracca, *Rev. Suisse Zool.* VII, 1899, p. 329; Laidlaw, *Proc. Zool. Soc.* 1900, p. 886; A. L. Butler, *Journ. N.H. Soc. Bomb.* XV, 1903, p. 199; Bouleng. *Faun. Mal. Pen.*, *Rept.* p. 242 (1913).

*Rana everetti*, part., Bouleng. *Proc. Zool. Soc.* 1897, p. 232; van Kampen, *op. cit.* p. 394.

*Rana mocquardii*, Werner, *Zool. Anz.* XXIV, 1901, p. 98.

*Rana erythræa* (non Schleg.), Isenschmid, *t. c.* p. 7.

*Rana tytléri*, part., Isenschmid, *t. c.* p. 11.

Vomerine teeth in short oblique series between the choanae or extending a little beyond the level of their posterior borders, equally distant from each other and from the choanae.

Head longer than broad, much depressed; snout rounded or more or less pointed, more or less projecting beyond the mouth, as long as or slightly longer than the eye, canthus rostralis strong; loreal region nearly vertical, deeply concave; nostril nearer the tip of the snout than the eye, distance between the nostrils equal to or a little greater than the interorbital width, which is equal to or a little greater or a little less than that of the upper eyelid; tympanum very distinct,  $\frac{2}{3}$  to  $\frac{5}{8}$  the diameter of the eye, close to it or at least 3 times as long as its distance from it.

Fingers rather long and slender, with slight dermal border, the tips dilated into large discs, those of the third and fourth measuring  $\frac{1}{2}$  to  $\frac{2}{3}$  the diameter of the tympanum, bearing a groove separating the upper from the lower surface; first finger as long as or slightly shorter than the second, subarticular tubercles large, very prominent.

Hind limb long and slender, the tibio-tarsal articulation reaching between the eye and the tip of the snout, the tip of the snout, or a little beyond, the heels strongly overlapping when the limbs are folded at right angles to the body; tibia 4 to 6 times as long as broad,  $1\frac{1}{2}$  to 2 times in length from snout to vent, a little shorter than the fore limb, longer than the foot. Toes with discs similar to but smaller than those of the fingers, webbed to the discs of the third and fifth, two phalanges of fourth usually free; outer metatarsals separated nearly to the base; subarticular tubercles rather small, prominent; inner metatarsal tubercle oval,  $\frac{1}{4}$  to  $\frac{1}{3}$  the length of the inner toe; a more or less distinct small round outer tubercle.

Skin smooth or granulate above, sometimes with small warts on the back; a more or less distinct, often rather broad, moder-

*Measurements, in millimetres.*

|                    |    | 1.  | 2.  | 3.  | 4.  | 5.  | 6. | 7.  | 8.  | 9.  | 10. | 11. | 12. | 13. | 14. | 15. | 16. | 17. | 18. | 19. | 20. | 21. | 22. | 23. | 24. | 25. | 26. | 27. |
|--------------------|----|-----|-----|-----|-----|-----|----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
|                    |    | ♂   | ♀   | ♂   | ♂   | ♂   | ♀  | ♀   | ♀   | ♀   | ♂   | ♂   | ♀   | ♀   | ♀   | ♂   | ♂   | ♂   | ♂   | ♀   | ♀   | ♂   | ♀   | ♂   | ♂   | ♂   | ♂   | ♀   |
| From snout to vent | .. | 33  | 53  | 36  | 35  | 34  | 49 | 45  | 42  | 36  | 47  | 53  | 58  | 52  | 51  | 41  | 40  | 43  | 42  | 60  | 57  | 43  | 64  | 44  | 44  | 45  | 42  | 66  |
| Head ..            | .. | 13  | 21  | 14  | 14  | 13  | 17 | 16  | 15  | 14  | 17  | 20  | 20  | 19  | 19  | 15  | 15  | 16  | 16  | 21  | 20  | 16  | 23  | 17  | 17  | 18  | 15  | 23  |
| Width of head ..   | .. | 9   | 17  | 10  | 10  | 10  | 14 | 13  | 12  | 11  | 14  | 17  | 16  | 15  | 16  | 13  | 12  | 13  | 13  | 18  | 18  | 15  | 21  | 13  | 14  | 15  | 12  | 20  |
| Snout ..           | .. | 4.5 | 8   | 6   | 5.5 | 4.5 | 7  | 7   | 6   | 6   | 6.5 | 8   | 8   | 7   | 7   | 6   | 5.5 | 6   | 6   | 8   | 8   | 6   | 9   | 6   | 6   | 7   | 5.5 | 9   |
| Eye ..             | .. | 3.5 | 7   | 5   | 5   | 4.5 | 6  | 6   | 5   | 5   | 6.5 | 8   | 7   | 7   | 7   | 6   | 5.5 | 6   | 6   | 7   | 7   | 6   | 8   | 6   | 6   | 6   | 5.5 | 8   |
| Interorbital width | .. | 3   | 4   | 3   | 3   | 3   | 4  | 4   | 3.5 | 4   | 4   | 3.5 | 5   | 5   | 4.5 | 3.5 | 3   | 3.5 | 3   | 5   | 4.5 | 3.5 | 4   | 4   | 3.5 | 3.5 | 4   | 5   |
| Tympanum ..        | .. | 3.5 | 5   | 3.5 | 3.5 | 3.5 | 4  | 4   | 3.5 | 3.5 | 5   | 5   | 5   | 5   | 4.5 | 4.5 | 4   | 4.5 | 4.5 | 5   | 4.5 | 4   | 5.5 | 5   | 3.5 | 3.5 | 4   | 5   |
| Fore limb ..       | .. | 20  | 39  | 22  | 22  | 22  | 31 | 28  | 24  | 22  | 31  | 35  | 39  | 34  | 35  | 26  | 25  | 27  | 28  | 40  | 36  | 28  | 46  | 30  | 32  | 30  | 29  | 47  |
| First finger ..    | .. | 4   | 7   | 4.5 | 4.5 | 4.5 | 6  | 5   | 5   | 5   | 6   | 7   | 7   | 6   | 7   | 4.5 | 4.5 | 4.5 | 4.5 | 8   | 7   | 5   | 9   | 5   | 6.5 | 5.5 | 5   | 9   |
| Second finger ..   | .. | 4   | 7.5 | 4.5 | 4.5 | 4.5 | 6  | 5.5 | 5   | 5   | 6.5 | 7   | 7.5 | 6.5 | 7   | 5   | 5   | 5   | 5   | 8   | 7   | 5.5 | 9   | 6   | 7   | 6   | 5   | 9   |
| Third finger ..    | .. | 6   | 12  | 7   | 7   | 7   | 9  | 9   | 8   | 7   | 11  | 11  | 12  | 11  | 12  | 8   | 8   | 8   | 8   | 13  | 11  | 9   | 15  | 9   | 11  | 9   | 8   | 15  |
| Fourth finger ..   | .. | 3.5 | 7.5 | 4   | 4   | 4   | 6  | 5   | 4.5 | 5   | 6   | 8   | 7   | 6   | 8   | 6   | 5.5 | 5.5 | 5.5 | 8   | 7   | 5.5 | 9   | 7   | 7   | 7   | 5   | 10  |
| Hind limb ..       | .. | 56  | 105 | 62  | 57  | 57  | 84 | 75  | 68  | 62  | 81  | 100 | 96  | 88  | 88  | 70  | 66  | 72  | 71  | 103 | 90  | 77  | 113 | 73  | 79  | 78  | 75  | 134 |
| Tibia ..           | .. | 19  | 35  | 21  | 19  | 19  | 29 | 26  | 23  | 21  | 27  | 32  | 32  | 30  | 30  | 24  | 22  | 24  | 24  | 33  | 29  | 25  | 36  | 25  | 26  | 25  | 24  | 41  |
| Foot ..            | .. | 16  | 30  | 17  | 17  | 17  | 23 | 22  | 19  | 18  | 24  | 30  | 28  | 25  | 27  | 20  | 19  | 21  | 22  | 31  | 27  | 22  | 35  | 20  | 22  | 23  | 21  | 35  |
| Third toe ..       | .. | 8   | 16  | 9   | 9   | 9   | 13 | 12  | 11  | 10  | 14  | 15  | 15  | 14  | 13  | 11  | 10  | 12  | 12  | 16  | 14  | 12  | 18  | 11  | 12  | 12  | 11  | 19  |
| Fourth toe ..      | .. | 13  | 25  | 15  | 14  | 14  | 19 | 18  | 17  | 15  | 21  | 24  | 24  | 20  | 22  | 16  | 16  | 17  | 18  | 27  | 23  | 19  | 30  | 17  | 18  | 19  | 17  | 30  |
| Fifth toe ..       | .. | 9   | 19  | 9   | 10  | 10  | 14 | 13  | 12  | 11  | 16  | 18  | 18  | 15  | 16  | 12  | 12  | 13  | 14  | 20  | 16  | 14  | 23  | 13  | 13  | 13  | 13  | 23  |

1-2. Kuala Lumpur, Selangor. 3-8. Malacca (types of *R. labialis*). 9. Singapore. 10. Sereinu, Mentawai. 11. Mt. Ophir, Padang Batu, Sumatra. 12-14. Matang, Sarawak. 15-16. Sarawak. 17-20. Pengalengan, Java. 21-22. Java. 23. Cape Engano, N. Luzon. 24. Masarang Chain, Celebes. 25. Bone Valley, Celebes. 26-27. Luhu, S. Celebes.

ately or feebly prominent glandular dorso-lateral fold from above the tympanum to the sacrum, or if to the hip, often broken up behind, its distance from its fellow, on the back, 5 to 6 times in length from snout to vent; a glandular fold from below the eye to the shoulder, followed by one or two glandules. Posterior half of thighs and usually of belly granulate.

Bright green or bronze-brown above (brown or purple in spirit), sides dark green or dark brown, with rather indistinct darker spots; back sometimes with small dark spots; tympanum often reddish brown; a white or golden streak on the upper lip; limbs with more or less distinct dark cross-bands. Whitish beneath, throat and breast often spotted or marbled with brown.

Males with internal vocal sacs; fore limb strong.

Nasal bones moderately large, separated from each other and from the frontoparietals; ethmoid largely exposed above, pointed in front, extending to between the nasals.

Tadpole with the tail pointed, about twice as long as the body. Beak broadly edged with black; upper lip with 4 series of horny teeth, the outermost marginal and uninterrupted, the others interrupted; lower lip with 3 series of horny teeth, all or only the two outer uninterrupted.

Eggs measuring  $1\frac{1}{2}$  millim. in female 58 millim. long from snout to vent.<sup>1</sup>

*Habitat.* Malay Peninsula, Sumatra, Mantawei Islands, Borneo, Java, Celebes, Philippines.

I now regard *R. labialis*, from the Malay Peninsula, as a variety of the typical *R. chalconota* from Java, from which it differs in the usually shorter foot as compared with the tibia, the rather more slender hind limbs, and the smaller size; but intermediate specimens completely connect the two extreme forms.

### 110. *Rana macrops*.

*Rana macrops*, Bouleng. *Proc. Zool. Soc.* 1897, p. 233, pl. xvi, fig. 1.

Vomerine teeth in very small oblique groups between the choanae, or close together just behind them.

Head as long as broad, much depressed; snout rounded, projecting beyond the mouth, shorter than the eye, which is very large; canthus rostralis strong; loreal region nearly vertical, concave; nostril a little nearer the tip of the snout than the eye; distance between the nostrils equal to the interorbital space or the width of the upper eyelid; tympanum very distinct,  $\frac{1}{2}$  the diameter of the eye,  $1\frac{1}{2}$  to 2 times its distance from the latter.

Fingers long and slender, the tips dilated into rather large discs, with a groove separating the upper from the lower surface, and measuring  $\frac{2}{3}$  to  $\frac{3}{4}$  the diameter of the tympanum; first finger as long as the second, third much longer than the snout; subarticular tubercles moderately large, prominent.

<sup>1</sup> The Drs. Sarasin have observed this frog in Celebes to lay its eggs in a frothy mass out of the water, forming a sort of nest as in some *Rhacophorus*.

Hind limb long and rather slender, the tibio-tarsal articulation reaching the nostril or the tip of the snout, the heels overlapping when the limbs are folded at right angles to the body; tibia 5 times as long as broad,  $1\frac{2}{3}$  to  $1\frac{3}{4}$  times in length of head and body, shorter than the fore limb, a little longer than the foot. Toes with discs similar to but a little smaller than those of the fingers,  $\frac{2}{3}$  webbed; outer metatarsals separated nearly to the base; subarticular tubercles moderate, prominent; no tarsal fold; inner metatarsal tubercle elliptic or oval,  $\frac{1}{3}$  to  $\frac{2}{5}$  the length of the inner toe; no outer tubercle.

Skin smooth or finely granulate above, sometimes with a few small flat warts on the back; glandular dorso-lateral fold very feebly developed and distinct only anteriorly. Lower parts smooth.

Olive-green above; a blackish streak below the canthus rostralis; a blackish band on the temporal region and above the shoulder, broken up into spots posteriorly; sides greyish, marbled with dark brown; a whitish streak from below the eye to above the arm; limbs with more or less distinct dark cross-bands; hinder side of thighs marbled with dark brown. Brownish beneath, throat dark brown, with or without small white spots.

!! Male with internal vocal sacs and an oval flat gland at the base of the arm.

*Measurements in millimetres, of types, from Masarang.*

|                    |    |    |    | ♂   | ♀   |
|--------------------|----|----|----|-----|-----|
| From snout to vent | .. | .. | .. | 30  | 32  |
| Head               | .. | .. | .. | 12  | 12  |
| Width of head      | .. | .. | .. | 12  | 12  |
| Snout              | .. | .. | .. | 4   | 4   |
| Eye                | .. | .. | .. | 5   | 5   |
| Interorbital width | .. | .. | .. | 3   | 3   |
| Tympanum           | .. | .. | .. | 2.5 | 2.5 |
| Fore limb          | .. | .. | .. | 25  | 23  |
| First finger       | .. | .. | .. | 4.5 | 4   |
| Second finger      | .. | .. | .. | 4.5 | 4   |
| Third finger       | .. | .. | .. | 7   | 7   |
| Fourth finger      | .. | .. | .. | 5   | 4.5 |
| Hind limb          | .. | .. | .. | 58  | 56  |
| Tibia              | .. | .. | .. | 19  | 18  |
| Foot               | .. | .. | .. | 17  | 16  |
| Third toe          | .. | .. | .. | 8   | 8   |
| Fourth toe         | .. | .. | .. | 14  | 13  |
| Fifth toe          | .. | .. | .. | 10  | 9   |

*Habitat.*—Mountains of Celebes, between 3,000 and 3,300 feet.

### III. *Rana graminea*.

*Rana graminea*, Bouleng. *Proc. Zool. Soc.* 1899, p. 958, p. lxxvii, fig. 1.

Vomerine teeth in short oblique series between the choanae, nearer to each other than to the latter.

Head a little longer than broad, much depressed; snout rounded, scarcely projecting beyond the mouth, as long as or a little shorter than the eye; canthus rostralis strong, loreal region

feebly oblique or nearly vertical, concave ; nostril equally distant from the eye and from the end of the snout or a little nearer the latter ; distance between the nostrils greater than the interorbital width, which measures  $\frac{2}{3}$  to  $\frac{3}{4}$  that of the upper eyelid ; tympanum very distinct,  $\frac{2}{3}$  to  $\frac{3}{4}$  the diameter of the eye, 5 to 6 times its distance from the latter.

Fingers rather slender, with moderately large discs measuring  $\frac{1}{3}$  to  $\frac{1}{2}$  the diameter of the eye, bearing a groove separating the upper from the lower surface ; first and second fingers equal, third longer than the snout ; subarticular tubercles moderately large, prominent.

Hind limb long and slender, the tibio-tarsal articulation reaching far beyond the tip of the snout, the tibia reaching the axil, the heels strongly overlapping when the limbs are folded at right angles to the body ; tibia  $5\frac{1}{2}$  to 6 times as long as broad,  $1\frac{1}{2}$  to  $1\frac{2}{3}$  times in length from snout to vent, a little shorter than the fore limb, longer than the foot. Toes with the discs similar to but a little smaller than those of the fingers, entirely webbed ; outer metatarsals separated nearly to the base ; subarticular tubercles moderate ; no tarsal fold ; inner metatarsal tubercle elliptic,  $\frac{1}{3}$  to  $\frac{2}{3}$  the length of the inner toe ; no outer tubercle.

Skin smooth ; a moderately broad, feebly prominent glandular dorso-lateral fold from above the tympanum to the hip, its distance from its fellow, on the back, 5 times in length from snout to vent ; a glandular fold from below the eye to the shoulder, followed by a strong glandule.

Bright green above, brownish on the sides of the head and body, below the canthus rostralis and the dorso-lateral fold, and on the limbs ; upper lip white ; limbs with regular dark cross-bands ; hinder side of thighs marbled dark brown and yellow. Lower parts white.

Males with an external vocal sac in front of the arm ; fore limbs strong.

*Measurements, in millimetres.*

|                    |    |    | 1.<br>♂ | 2.<br>♂ | 3.<br>♂ |
|--------------------|----|----|---------|---------|---------|
| From snout to vent | .. | .. | 47      | 45      | 50      |
| Head               | .. | .. | 18      | 18      | 20      |
| Width of head      | .. | .. | .. 16   | 16      | 17      |
| Snout              | .. | .. | .. 6    | 6       | 7       |
| Eye                | .. | .. | .. 7    | 7       | 7       |
| Interorbital width | .. |    | .. 3.5  | 3.5     | 3.5     |
| Tympanum           |    |    | .. 5.5  | 5       | 4.5     |
| Fore limb          | .. | .. | .. 32   | 32      | 33      |
| First finger       | .. |    | .. 6    | 6       | 6       |
| Second finger      | .. | .  | .. 6    | 6       | 6       |
| Third finger       |    |    | .. 9    | 9       | 9       |
| Fourth finger      |    | .. | .. 6    | 6       | 6       |
| Hind limb          |    |    | .. 92   | 90      | 94      |
| Tibia              | .. | .. | .. 30   | 30      | 31      |
| Foot               |    |    | .. 27   | 26      | 29      |
| Third toe          |    |    | .. 15   | 15      | 16      |
| Fourth toe         | .. |    | .. 23   | 22      | 24      |
| Fifth toe          | .. |    | .. 17   | 17      | 19      |

1-2. Five-finger Mts., Hainan (types). 3. Man Son Mts., Tonkin.

*Habitat*.—Mountains of Hainan and Tonkin near the Kwangsi frontier.

### 112. *Rana monticola*.

*Hylorana monticola*, Anders. *Journ. As. Soc. Beng.* XI., 1871, p. 25 ;

Stoliczka, *Proc. As. Soc. Beng.* 1872, p. 105.

? *Hylorana pipiens*, Stoliczka, *t. c.* p. 106.

*Rana monticola*, Bouleng. *Faun. Ind., Rept.* p. 461 (1890).

Vomerine teeth in oblique groups between the choanae, equally distant from each other and from the latter, or a little nearer to each other.

Head as long as broad or a little longer than broad, much depressed ; snout rounded or obtusely pointed, feebly projecting beyond the mouth, as long as the eye ; canthus rostralis distinct ; loreal region feebly oblique, concave ; nostril equally distant from the eye and from the tip of the snout ; distance between the nostrils equal to the interorbital width or to that of the upper eyelid ; tympanum distinct,  $\frac{1}{3}$  to  $\frac{1}{2}$  the diameter of the eye, and  $\frac{2}{3}$  to  $1\frac{1}{2}$  times its distance from the latter.

Fingers long and slender, terminating in rather large discs, equal to or a little smaller than the tympanum, as long as broad and bearing a groove separating the upper from the lower surface ; first and second fingers equal, third longer than the snout ; sub-articular tubercles moderately large, prominent.

Hind limb long and slender, the tibio-tarsal articulation reaching beyond the tip of the snout, the heels strongly overlapping when the limbs are folded at right angles to the body ; tibia  $5\frac{1}{2}$  times as long as broad,  $1\frac{1}{2}$  to  $1\frac{3}{5}$  times in length from snout to vent, a little shorter than the fore limb, longer than the foot. Toes ending in rather large discs, but a little smaller than those of the fingers, nearly entirely webbed ; outer metatarsals separated nearly to the base ; subarticular tubercles rather small, feebly prominent ; no tarsal fold ; inner metatarsal tubercle oval,  $\frac{1}{3}$  the length of the inner toe ; no outer tubercle.

Skin of upper parts smooth ; a narrow, feebly prominent, glandular dorso-lateral fold from above the tympanum to the hip, the distance between the two folds, on the back, 5 times in the length from snout to vent ; a glandular fold from below the eye to the shoulder, followed by one or two glandules. Lower parts smooth.

Grey or brown above, uniform or with darker spots, sides sometimes darker ; a dark brown canthal streak and a large temporal spot ; a light streak along the upper lip to the shoulder ; limbs with dark cross-bands. Yellowish white beneath.

Males with an external vocal sac on each side of the throat ; limbs. very strong ; a strong pad on the inner side of the first finger.

Nasal bones small, oblique, widely separated from each other and from the frontoparietals ; ethmoid exposed but not extending to between the nasals. Terminal phalanges T-shaped.

*Measurements, in millimetres.*

|                    |    |    |    | 1.<br>♂ | 2.<br>♀          |
|--------------------|----|----|----|---------|------------------|
| From snout to vent | .. | .. | .. | 41      | 65               |
| Head               | .. | .. | .. | 16      | 20               |
| Width of head      | .. |    | .. | 15      | 20               |
| Snout              | .. | .. | .. | 5       | 7                |
| Eye                |    |    |    | 5       | 7                |
| Interorbital width |    | .. | .. | 3       | 4.5              |
| Tympanum           |    |    |    | 2.5     | 2.3 <sup>1</sup> |
| Fore limb          | .. |    |    | 32      | 43               |
| First finger       |    |    |    | 5       | 7.5              |
| Second finger      |    |    |    | 5       | 7.5              |
| Third finger       |    |    |    | 7       | 13               |
| Fourth finger      |    |    | .. | 5       | 8                |
| Hind limb          |    |    | .. | 81      | 121              |
| Tibia              |    |    |    | 26      | 41               |
| Foot               |    |    |    | 24      | 36               |
| Third toe          |    | .. | .. | 15      | 21               |
| Fourth toe         | .. | .. | .. | 21      | 30               |
| Fifth toe          |    |    |    | 15      | 23               |

1. Darjiling. 2. Darjiling (type).

*Habitat.* Darjiling. The types are from an altitude of 3,500 feet.

**113. *Rana gerbillus*.**

*Rana gerbillus*, Annand. *Rec. Ind. Mus.* VIII, 1912, p. 10, pl. ii, fig. 1.

Vomerine teeth in two small roundish groups or oblique series between the choanae or on a level with their posterior borders.

Head as long as broad; snout rounded, feebly projecting beyond the mouth, as long as or a little longer than the eye; canthus rostralis distinct; loreal region feebly oblique, concave; nostril a little nearer the tip of the snout than the eye; interorbital space as broad as the upper eyelid; tympanum distinct,  $\frac{1}{3}$  to  $\frac{2}{5}$  the diameter of the eye, 1 to  $1\frac{1}{3}$  times its distance from the latter.

Fingers slender, with large discs, that of the third as large as or rather larger than the tympanum; first finger shorter than the second, third longer than the snout.

Hind limb very long and slender, the tibio-tarsal articulation reaching far beyond the tip of the snout; tibia 6 times as long as broad,  $1\frac{1}{2}$  to  $1\frac{3}{5}$  times in length from snout to vent, longer than the foot. Toes with the discs smaller than those of the fingers, nearly completely webbed; subarticular tubercles large but not prominent, oval; no tarsal fold; a flat, oval inner metatarsal tubercle; no outer tubercle.

Back smooth or obscurely granulate, sometimes with large compressed longitudinal tubercles scattered more especially on the sides; a distinct glandular dorso-lateral fold. Lower parts smooth.

The young type specimen is described as very dark grey above, obscurely mottled with a paler shade; lips with pale vertical bars, sides pale, spotted with dark grey; limbs with dark cross-bands.

<sup>1</sup> The size of the tympanum is very different on the two sides.

Dull greenish yellow beneath, with large round or oval brown spots on the throat and breast.

The adult female which I refer to this species and of which measurements are here given, is greyish brown above, unspotted, with a blackish streak from the tip of the snout, through the eye and above the tympanum, to the hip, bordering the dorso-lateral fold; a whitish streak on the upper lip; limbs with dark cross-bands. Lower parts unspotted.

Male unknown.

#### Measurements.

|                    |    |    |    | Millim. |
|--------------------|----|----|----|---------|
| From snout to vent | .. | .. | .. | 60      |
| Head               | .. | .. | .. | 18      |
| Width of head ..   | .. | .. | .. | 18      |
| Snout              | .. | .. | .. | 7       |
| Eye ..             | .. | .. | .. | 7       |
| Interorbital width | .. | .. | .. | 4.5     |
| Tympanum           | .. | .. | .. | 3       |
| Fore limb          | .. | .. | .. | 39      |
| First finger ..    | .. | .. | .. | 7       |
| Second finger ..   | .. | .. | .. | 8       |
| Third finger ..    | .. | .. | .. | 11      |
| Fourth finger ..   | .. | .. | .. | 8       |
| Hind limb          | .. | .. | .. | 112     |
| Tibia              | .. | .. | .. | 38      |
| Foot               | .. | .. | .. | 31      |
| Third toe ..       | .. | .. | .. | 19      |
| Fourth toe         | .. | .. | .. | 27      |
| Fifth toe ..       | .. | .. | .. | 19      |

*Habitat.* The type, a young specimen 33 millim. long from snout to vent, preserved in the Indian Museum, is from Yembung, Abor foot-hills (1,100 feet), Assam. I refer to the same species two specimens from Pashok (3,500 feet), Darjiling district (L. C. Hartless), also preserved in the Indian Museum.

#### 114. *Rana luzonensis*.

*Rana luzonensis*, Bouleng. *Ann. and Mag. N.H.* (6) XVII, 1896, p. 401.

Vomerine teeth in oblique groups on a level with the posterior borders of the choanae and extending beyond them, nearer to each other than to the choanae.

Head as long as broad or slightly longer than broad, much depressed; snout acutely pointed, strongly projecting beyond the mouth, longer than the eye; canthus rostralis strong; loreal region nearly vertical, concave; nostril nearer the end of the snout than the eye; distance between the nostrils equal to or a little greater than the interorbital width, which equals that of the upper eyelid; tympanum very distinct,  $\frac{3}{5}$  to  $\frac{2}{3}$  the diameter of the eye, 2 to 4 times as long as its distance from the latter.

Fingers long and slender, the tips dilated into large round discs, with a groove separating the upper from the lower surface, the largest measuring  $\frac{2}{3}$  to  $\frac{3}{4}$  the diameter of the tympanum; first finger a little shorter than the second; subarticular tubercles rather large, very prominent.

Hind limb long, the tibio-tarsal articulation reaching far beyond the tip of the snout, the heels strongly overlapping when the limbs are folded at right angles to the body ; tibia 6 to  $6\frac{1}{2}$  times as long as broad,  $1\frac{1}{2}$  to  $1\frac{3}{5}$  times in length from snout to vent, a little shorter than the fore limb, longer than the foot. Toes with discs similar to but smaller than those of the fingers, webbed to the discs of the third and fifth, two phalanges of fourth free ; outer metatarsals separated nearly to the base ; subarticular tubercles moderate ; no tarsal fold ; inner metatarsal tubercle oval, feebly prominent,  $\frac{1}{4}$  the length of the inner toe ; outer tubercle very small or absent.

Skin smooth ; a narrow glandular dorso-lateral fold, from above the tympanum to the hip, its distance from its fellow, on the back, 6 to 7 times in length from snout to vent.

Greyish or olive above, with or without a narrow light vertebral streak ; a blackish canthal streak and temporal spot ; tympanum reddish brown ; upper lip with a light dark-edged streak ; limbs with dark cross-bands. Whitish beneath, throat and breast sometimes brown.

Male unknown.

Nasal bones narrow, oblique, widely separated from each other and from the frontoparietals ; ethmoid exposed above, truncate in front, not extending to the nasals.

*Measurements of types, in millimetres.*

|                    |    |    |     |     |     |     |
|--------------------|----|----|-----|-----|-----|-----|
| From snout to vent | .. | .. | 58  | 43  | 38  | 37  |
| Head ..            | .. | .. | 20  | 15  | 14  | 14  |
| Width of head      |    |    | 20  | 15  | 14  | 13  |
| Snout              | .. | .. | 8   | 7   | 6   | 6   |
| Eye ..             | .. | .. | 6   | 5.5 | 5   | 5   |
| Interorbital width | .. | .. | 4   | 3.5 | 3   | 3   |
| Tympanum           | .. |    | 4   | 3   | 3   | 3   |
| Fore limb          | .. |    | 42  | 31  | 28  | 27  |
| First finger       | .. |    | 8   | 6   | 5   | 4.5 |
| Second finger      | .. | .. | 9   | 6.5 | 5.5 | 5   |
| Third finger       | .. | .. | 14  | 10  | 9   | 9   |
| Fourth finger      | .. | .. | 9   | 6.5 | 5.5 | 5.5 |
| Hind limb          | .. | .. | 115 | 86  | 75  | 73  |
| Tibia ..           |    |    | 37  | 29  | 26  | 25  |
| Foot ..            |    |    | 33  | 26  | 21  | 21  |
| Third toe          | .. | .. | 17  | 12  | 11  | 11  |
| Fourth toe         | .. | .. | 29  | 21  | 18  | 18  |
| Fifth toe          | .. | .. | 21  | 15  | 14  | 14  |

*Habitat.* This species is known from four specimens (female and half-grown) from the highlands of Lepauto, Luzon, Philippines.

### 115. *Rana mearnsii*.

*Rana mearnsi*, Stejneger. *Proc. U. S. Nat. Mus.* XXVIII, 1905, p. 343.

Vomerine teeth in oblique groups commencing on a line with the hinder edge of the choanae.

Head longer than broad ; snout rather pointed, considerably longer than the eye ; canthus rostralis well marked ; loreal region concave ; nostril nearer the tip of the snout than the eye ; inter-

orbital space broader than the upper eyelid; tympanum very distinct, about  $\frac{5}{8}$  the diameter of the eye.

Fingers very long, the third and fourth with very large discs, which are pointed anteriorly, first finger much shorter than the second.

Hind limb long, the tibio-tarsal articulation reaching considerably beyond the tip of the snout; tibia  $1\frac{3}{4}$  times the length of head and body. Toes with the tips dilated into small discs about the size of that of the first finger, nearly entirely webbed; a feeble inner metatarsal tubercle, about  $\frac{1}{4}$  the length of the inner toe.

Skin smooth above, with a distinct patch of minute pointed pustules on the posterior two-thirds of the upper eyelid, and a similar one, with the pustules somewhat wider apart, above the tympanum; a distinct but very narrow glandular dorso-lateral fold. Throat and breast smooth, belly and posterior lower surface of thigh coarsely granulate.

Olive-green above, the dorsal side of the head and back defined by a sharply marked yellow streak; sides of head purplish brown; edge of upper lip yellowish; indications of obscure dark cross-bars on the limbs; hinder side of thighs dark purplish grey, sending upward a triangular projection to include the vent; below the latter, in the dark area, two sharply defined round yellow spots. Uniform pale yellow beneath.

From snout to vent 62 millim.

*Habitat.* Mindanao, Philippine Islands. Type in U.S. National Museum.

#### 116. *Rana everetti*.

*Rana everetti*, Bouleng. Cat. Batr. Ecaud. p. 72, pl. vi (1882); Mocquard, *Nouv. Arch. Mus.* (3) II, 1890, p. 148.

Vomerine teeth in short oblique series on a level with and extending beyond the posterior borders of the choanae, to which they are nearer than to each other.

Head as long as broad, much depressed; snout rounded, scarcely projecting beyond the mouth, a little longer than the eye; canthus rostralis strong; loreal region very feebly oblique, concave; nostril nearer the tip of the snout than the eye; distance between the nostrils equal to the interorbital width or to that of the upper eyelid; tympanum very distinct,  $\frac{1}{2}$  the diameter of the eye, 4 times as long as its distance from the latter.

Fingers long and slender, the tips dilated into large discs with a groove separating the upper from the lower surface, those of the third and fourth  $\frac{2}{3}$  the diameter of the tympanum; first and second fingers equal, third longer than the snout; subarticular tubercles moderately large, very prominent.

Hind limb rather long and slender, the tibio-tarsal articulation reaching between the eye and the nostril, the heels strongly overlapping when the limbs are folded at right angles to the body; tibia 5 times as long as broad,  $1\frac{1}{2}$  times in length from snout to

vent, shorter than the fore limb, a little longer than the foot. Toes with discs similar to those of the fingers, but smaller, webbed to the discs; outer metatarsals separated nearly to the base; sub-articular tubercles rather small, very prominent; no tarsal fold; inner metatarsal tubercle oval, feebly prominent,  $\frac{1}{3}$  the length of the inner toe; a very indistinct outer tubercle.

Skin smooth above, with a rather indistinct glandular fold above the tympanum; a glandular fold from below the eye to the shoulder, followed by a glandule. Belly and posterior half of lower surface of thighs granulate.

Light greyish brown above, with round dark spots; a darker band on the side of the head and body; limbs with indistinct dark cross-bands. Lower parts white, hind limbs specked with greyish brown.

Male unknown.

*Measurements of type specimens (♀).*

|                    |    |    |    |            |
|--------------------|----|----|----|------------|
| From snout to vent | .. | .. | .. | 87 millim. |
| Head               | .  |    |    | 29         |
| Width of head      | .. |    |    | 29         |
| Snout              | .. |    |    | 12         |
| Eye                | .. |    | .. | 10         |
| Interorbital width |    |    | .. | 7          |
| Tympanum           |    |    |    | 8          |
| Fore limb          |    |    |    | 54         |
| First finger       | .  |    |    | 12         |
| Second finger      | .. | .. |    | 12         |
| Third finger       | .. | .. | .. | 19         |
| Fourth finger      |    |    | .. | 11         |
| Hind limb          |    |    |    | 146        |
| Tibia              | .. | .. | .. | 48         |
| Foot               | .. | .. | .. | 45         |
| Third toe          |    |    |    | 23         |
| Fourth toe         |    |    | .. | 38         |
| Fifth toe          |    |    |    | 28         |

*Habitat.* Luzon, Philippines. Recorded by Mocquard from Mt. Kina Baloo, North Borneo.

The type specimen, from Zamboanga, is the only one known to me, the specimens from Celebes, which I had referred to this species, being now regarded as inseparable from *R. chalconota*.

**117. *Rana ishikawæ*.**

*Buergeria ishikawæ*, Stejneger. *Proc. Biol. Soc. Washingt.* XIV, 1901, p. 190.

*Rana ishikawæ*, Stejneger. *Herp. Jap.* p. 132, fig. (1907).

Vomerine teeth in short series behind the level of the choanae.

Head as long as broad, much depressed; snout blunt, vertically truncate at the end, as long as the eye; canthus rostralis well marked; loreal region feebly oblique, concave; nostril nearer the tip of the snout than the eye; interorbital region slightly broader than the upper eyelid; tympanum very distinct,  $\frac{1}{2}$  the diameter of the eye and scarcely more than its distance from the latter.

Fingers moderately long, with rather large discs about  $\frac{2}{3}$  the diameter of the eye, first longer than the second.

Tibio-tarsal articulation reaching between eye and tip of snout; heels slightly overlapping; tibia  $2\frac{1}{2}$  times in length from snout to vent. Toes about  $\frac{2}{3}$  webbed, the discs a little smaller than those of the fingers; subarticular tubercles small, prominent; a tarsal fold; inner metatarsal tubercle flat, less than  $\frac{1}{2}$  the length of the inner toe; no outer tubercle.

Skin of upper surface exceedingly rough, even on the upper eyelids and on the sides of the head, the large tubercles wrinkled radially from a central prominence and surrounded concentrically by smaller tubercles. Lower surface finely granulate, except the posterior side of the thigh, which is coarsely so.

Brownish above, with a network of chocolate brown surrounding the large insular tubercles, which are ochraceous-buff, with the central prominence darker brown; lips pale, blotched with dark brown; limbs cross-barred with dark brown and drab. Pale russet beneath, with a network of obscure whitish mottlings.

From snout to vent 115 millim.

*Habitat.* Loo Choo Islands (Okinawa Shima).

The single specimen is preserved in the Imperial Museum, Tokyo.

#### 118. *Rana crassiovis*, sp. n.

Vomerine teeth in short oblique series between the choanae, a little nearer to each other than to the latter.

Head as long as broad, much depressed; snout rounded, feebly projecting beyond the mouth, as long as or slightly longer than the eye; canthus rostralis distinct; loreal region feebly oblique, very concave; nostril a little nearer the tip of the snout than the eye; distance between the nostrils equal to the interorbital width or that of the upper eyelid; tympanum very distinct, about  $\frac{2}{3}$  the diameter of the eye,  $2\frac{1}{2}$  times its distance from the latter.

Fingers long and slender, with a slight dermal border, the tips dilated into moderately large discs with a groove separating the upper from the lower surface, as long as broad and measuring  $\frac{2}{3}$  the diameter of the tympanum; first finger as long as the second, third much longer than the snout; subarticular tubercles rather large, very prominent.

Hind limb long and slender, the tibio-tarsal articulation reaching far beyond the tip of the snout, the heels strongly overlapping when the limbs are folded at right angles to the body; tibia  $5\frac{1}{2}$  to 6 times as long as broad,  $1\frac{1}{2}$  to  $1\frac{2}{3}$  times in length from snout to vent, a little shorter than the fore limb, longer than the foot. Toes with discs similar to but smaller than those of the fingers, webbed to the discs of the third and fifth, two phalanges of fourth free; outer metatarsals separated nearly to the base; subarticular tubercles rather small, prominent; no tarsal fold; inner metatarsal tubercle oval, feebly prominent,  $\frac{1}{3}$  the length of the inner toe; no outer tubercle.

Skin smooth or finely granulate above, coarsely granulate on the sides, smooth beneath; a short glandular fold above the tympanum.

Dark purplish brown above, with large darker spots or marblings, yellowish on the sides, with round black spots; hind limb with numerous, very regular dark cross-bands; hinder side of thighs blackish brown, with white vertical bars, continuation of the interspaces between the dark cross-bands of the upper surface. White beneath, throat and breast speckled or spotted with brown.

Male unknown.

Eggs very large and unpigmented, 3 millim. in diameter.

*Measurements of the types (♀), in millimetres.*

|                    |    |     |     |
|--------------------|----|-----|-----|
| From snout to vent | .. | 63  | 62  |
| Head               | .. | 23  | 21  |
| Width of head      | .. | 23  | 21  |
| Snout              | .. | 8   | 8   |
| Eye                | .. | 8   | 7   |
| Interorbital width | .. | 5   | 5   |
| Tympanum           | .. | 5   | 4   |
| Fore limb          | .. | 44  | 46  |
| First finger       |    | 10  | 9   |
| Second finger      | .. | 10  | 9   |
| Third finger       | .. | 15  | 14  |
| Fourth finger      |    | 9   | 9   |
| Hind limb          | .. | 127 | 124 |
| Tibia              | .. | 42  | 40  |
| Foot               | .. | 37  | 33  |
| Third toe          | .. | 20  | 19  |
| Fourth toe         | .. | 31  | 28  |
| Fifth toe          | .. | 22  | 21  |

*Habitat.* Korinchi, Sumatra, 4,000 feet. The two specimens were obtained by the Robinson-Kloss Expedition<sup>1</sup> on the Batrachians of which I prepared a report 6 years ago still unpublished.

This species appears to be most nearly related to *R. pantherina*, van Kampen, likewise from Sumatra, which differs in having a larger tympanum, the interorbital space narrower than the upper eyelid, the first finger shorter than the second, and the belly granulate.

**119. *Rana kampeni*, n. n.**

*Rana pantherina* (non Fitz.), van Kampen, *Nat. Tijdschr. Nederl. Ind.* I.XIX, 1910, p. 22, pl. i, fig. 2.

Vomerine teeth in short oblique series extending somewhat beyond the level of the posterior borders of the choanae.

Head as long as broad; snout rounded, feebly projecting beyond the mouth, as long as the eye; canthus rostralis strong; loreal region feebly oblique, deeply concave; nostril equally distant from the eye and from the tip of the snout; interorbital

<sup>1</sup> [Since Dr. Boulenger returned the final proof of this memoir his paper on the Batrachia and Reptiles of the Robinson-Kloss Expedition has been published. The reference, which has priority over the description given here, is *Journ. Fed. Malay States Mus.* VIII (2), 292 (1920). N. A.]

space narrower than the upper eyelid ; tympanum very distinct, about  $\frac{2}{3}$  the size of the eye.

Fingers moderately long, the tips dilated into large discs, about as long as broad and  $\frac{2}{3}$  the diameter of the tympanum ; first finger shorter than the second, third longer than the snout.

Hind limb very long and slender, the tibio-tarsal articulation reaching far beyond the tip of the snout ; tibia 6 times as long as broad,  $1\frac{1}{2}$  times in length from snout to vent, much longer than the foot. Toes with well developed discs smaller than those of the fingers, nearly entirely webbed ; outer metatarsals separated nearly to the base ; inner metatarsal tubercle small ; no outer tubercle.

Skin smooth, belly granulate.

Bluish grey above, with large bluish black spots with light centres ; limbs with dark cross-bands ; white beneath.

From snout to vent 36 millim.

*Habitat.* Deli, Sumatra.

## 120. *Rana livida*.

? *Polypedates smaragdinus*, Blyth, *Journ. As. Soc. Beng.* XXI, 1852, p. 355.

*Polypedates lividus*, Blyth, *Journ. As. Soc. Beng.* XXIV, 1855, p. 718.

*Polypedates smaragdinus*, Jerd. *Proc. As. Soc. Beng.* 1870, p. 83.

*Polypedates chloronotus*, Günth. *Proc. Zool. Soc.* 1875, p. 569, pl. lxxv, fig. A.

*Rana chloronata*, Bouleng. *Cat. Batr. Ecaud.* p. 69 (1882).

*Rana livida*, Bouleng. *Ann. Mus. Genova* (2) V, 1887, p. 484, and *Faun. Brit. Ind., Rept.* p. 462 (1890) ; A. L. Butler, *Journ. N.H. Soc. Bomb.* XV, 1903, p. 201 ; Bouleng. *Faun. Mal. Pen., Rept.* p. 245 (1912).

Vomerine teeth in straight or oblique series between or extending a little beyond the choanae, equally distant from each other or nearer the latter.

Head as long as broad or slightly broader than long, much depressed ; snout rounded, feebly projecting beyond the mouth, as long as or slightly longer or slightly shorter than the eye ; canthus rostralis obtuse ; loreal region very feebly oblique or nearly vertical, deeply concave ; nostril a little nearer the tip of the snout than the eye ; distance between the nostrils equal to the width of the interorbital region or to that of the upper eyelid ; tympanum very distinct,  $\frac{1}{2}$  to  $\frac{2}{3}$  the diameter of the eye, 1 to 4 times its distance from the latter.

Fingers moderate, depressed, with more or less distinct dermal border, the tips dilated into very large discs, as long as broad, as large as or a little smaller than the tympanum, with a groove separating the upper from the lower surface ; first finger as long as or a little longer than the second, third longer than the snout ; subarticular tubercles large, very prominent.

Hind limb long, the tibio-tarsal articulation reaching beyond the tip of the snout, the heels strongly overlapping when the limbs are folded at right angles to the body ; tibia 4 to 5 times as long as broad,  $1\frac{3}{5}$  to  $1\frac{3}{4}$  times in length of head and body,

shorter than the fore limb, longer than the foot. Toes with discs similar to those of the fingers, but smaller, feebly webbed, the web feebly notched and involving the base of the discs ; outer metatarsals separated to the base ; subarticular tubercles moderate ; no tarsal fold ; inner metatarsal tubercle oval, flat,  $\frac{1}{3}$  to  $\frac{2}{5}$  the length of the inner toe , no outer tubercle.

Skin smooth, flanks and back of thighs granulate ; a glandular fold from below the eye to the shoulder, followed by a glandule.

Upper surface of head and body green, with or without a few black spots, sides of head and body dark brown ; a white streak along the upper lip ; limbs with blackish cross-bands , groin and back of thighs with yellow spots or marblings. Lower parts white or yellowish, throat and breast usually brown or speckled with brown.

Males with an external vocal sac on each side of the throat, in front of the arm ; fore limb strong ; a thick pad on the inner side of the first finger, covered during the breeding season, with a yellowish velvety horny layer.

Nasal bones small, widely separated from each other ; ethmoid exposed above and truncate or rounded in front. Terminal phalanges T-shaped.

Tadpoles from Tenasserim, referred with doubt to this species, and badly preserved as regards the labial teeth, are provided with a ventral sucking-disc, and are peculiar in having a round black spot on each side behind the eye and another on each side of the belly, near the base of the tail.

Eggs 2 millimetres in diameter, not pigmented.

Measurements, in millimetres.

|                    | 1. | 2. | 3. | 4.  | 5.  | 6. | 7. | 8.  | 9.  | 10. | 11. | 12. |
|--------------------|----|----|----|-----|-----|----|----|-----|-----|-----|-----|-----|
|                    | ♂  | ♂  | ♂  | ♂   | ♂   | ♂  | ♀  | ♀   | ♀   | ♀   | ♀   | ♀   |
| From snout to vent | 51 | 51 | 50 | 50  | 49  | 45 | 95 | 93  | 90  | 84  | 100 | 90  |
| Head ..            | 18 | 18 | 18 | 18  | 17  | 16 | 29 | 28  | 29  | 28  | 32  | 31  |
| Width of head ..   | 18 | 18 | 18 | 18  | 17  | 16 | 29 | 30  | 29  | 29  | 33  | 31  |
| Snout ..           | 7  | 7  | 6  | 6   | 6   | 6  | 10 | 10  | 10  | 10  | 13  | 11  |
| Eye ..             | 7  | 7  | 7  | 7   | 7   | 6  | 10 | 10  | 10  | 10  | 11  | 10  |
| Interorbita lwidth | 3  | 3  | 3  | 3   | 3   | 3  | 6  | 6   | 6   | 6   | 7   | 6   |
| Tympanum ..        | 4  | 4  | 4  | 4   | 4.5 | 4  | 5  | 5   | 5   | 5   | 6   | 5   |
| Fore limb ..       | 35 | 35 | 35 | 34  | 33  | 32 | 60 | 63  | 58  | 58  | 65  | 60  |
| First finger ..    | 8  | 7  | 7  | 7   | 7   | 6  | 12 | 14  | 12  | 12  | 15  | 13  |
| Second finger ..   | 7  | 6  | 6  | 6.5 | 6.5 | 6  | 11 | 13  | 11  | 11  | 13  | 13  |
| Third finger ..    | 11 | 10 | 10 | 10  | 10  | 9  | 18 | 18  | 17  | 17  | 20  | 18  |
| Fourth finger ..   | .. | 7  | 7  | 7   | 7   | 6  | 12 | 13  | 11  | 12  | 14  | 12  |
| Hind limb ..       | .. | 95 | 93 | 90  | 90  | 88 | 87 | 170 | 170 | 164 | 160 | 174 |
| Tibia ..           | .. | 32 | 31 | 30  | 30  | 29 | 28 | 57  | 58  | 55  | 52  | 58  |
| Foot ..            | .. | 29 | 28 | 27  | 27  | 26 | 26 | 52  | 52  | 50  | 50  | 51  |
| Third toe ..       | .. | 15 | 15 | 14  | 15  | 14 | 14 | 26  | 28  | 28  | 27  | 30  |
| Fourth toe ..      | .. | 24 | 23 | 23  | 23  | 22 | 21 | 42  | 44  | 43  | 41  | 41  |
| Fifth toe ..       | .. | 20 | 18 | 17  | 17  | 17 | 17 | 34  | 34  | 33  | 34  | 33  |

1-10. Darjiling (types of *P. chloronotus*). 11-12. Thagata, Tenasserim.

*Habitat.* Eastern Himalayas, hills of Assam, Tenasserim, and Perak.

This handsome frog links the species grouped round *R. chalconota* with *R. latopalmata* and its allies, and speaks against Cope's

genus *Amolops*, which one might otherwise feel justified to accept, at least as a subgenus.

### 121. *Rana ricketti*.

*Rana ricketti*, Bouleng. *Proc. Zool. Soc.* 1899, p. 168, pl. xix, fig. 2.

Vomerine teeth in small groups close together behind the level of the choanae.

Head as long as broad or a little broader than long, very strongly depressed; snout rounded, projecting beyond the mouth, shorter than the eye; canthus rostralis distinct; loreal region nearly vertical, concave; nostril equally distant from the eye and from the end of the snout; distance between the nostrils greater than the interorbital width, which is equal to or a little less than that of the upper eyelid; tympanum more or less distinct,  $\frac{2}{7}$  to  $\frac{2}{3}$  the diameter of the eye,  $\frac{1}{2}$  to once its distance from the latter.

Fingers rather short, flattened, with distinct dermal border, ending in large round discs, at least as large as the tympanum, with a groove separating the upper from the lower surface and another above corresponding to the long transverse limb of the terminal phalanx; first finger shorter than the second, third much longer than the snout; subarticular tubercles rather small, feebly prominent.

Hind limb long, the tibio-tarsal articulation reaching the tip of the snout or not quite so far, the heels overlapping when the limbs are folded at right angles to the body; tibia  $3\frac{1}{2}$  to 4 times as long as broad,  $1\frac{4}{5}$  to 2 times in length from snout to vent, a little shorter than the fore limb, a little longer than the foot. Toes with large discs similar to those of the fingers but a little smaller, completely webbed, the web involving the base of the discs; outer metatarsals separated to the base; subarticular tubercles rather small, feebly prominent; no tarsal fold; inner metatarsal tubercle oval, flat,  $\frac{2}{3}$  the length of the inner toe; no outer tubercle.

Skin smooth above or finely shagreened and with scattered small flat warts; a glandular fold above the tympanum; belly more or less distinctly granulate.

Olive above, with large dark spots or marblings; a dark streak on each side of the head, passing through the eye; limbs with regular dark cross-bands. Whitish beneath, throat, or throat and breast, spotted or marbled with brown.

Males without vocal sacs; a large pad on the inner side of the first finger, covered with large round yellowish horny granules.

Nasals very small, widely separated from each other and from the ethmoid, which is exposed above and rounded in front. Terminal phalanges T-shaped, with very long transverse limb.

*Measurements, in millimetres.*

|                       | 1.  | 2.  | 3.  | 4.  | 5.  |
|-----------------------|-----|-----|-----|-----|-----|
|                       | ♀   | ♀   | ♂   | ♀   | ♀   |
| From snout to vent .. | 38  | 32  | 46  | 55  | 54  |
| Head ..               | 14  | 12  | 15  | 17  | 17  |
| Width of head         | 14  | 12  | 16  | 19  | 18  |
| Snout ..              | 4   | 3.5 | 5   | 5.5 | 5.5 |
| Eye ..                | 4.5 | 4   | 5.5 | 7   | 7   |
| Interorbital width .. | 3   | 2.5 | 4   | 4   | 3.5 |
| Tympanum              | 2   | 1.5 | 1.5 | 2   | 2   |
| Fore limb ..          | 22  | 18  | 28  | 32  | 30  |
| First finger          | 4.5 | 3.5 | 4.5 | 5.5 | 5.5 |
| Second finger         | 5   | 4   | 6   | 7   | 6.5 |
| Third finger          | 6.5 | 5.5 | 8.5 | 10  | 9   |
| Fourth finger         | 4.5 | 3.5 | 5.5 | 7   | 6   |
| Hind limb             | 61  | 50  | 76  | 88  | 86  |
| Tibia                 | 20  | 16  | 25  | 29  | 28  |
| Foot ..               | 17  | 14  | 23  | 26  | 24  |
| Third toe ..          | 10  | 8   | 12  | 16  | 15  |
| Fourth toe            | 14  | 12  | 19  | 22  | 20  |
| Fifth toe             | 12  | 9   | 15  | 18  | 16  |

1-2. Kuatun (types). 3-5. Man Son Mts.

*Habitat.* Kuatun Mountains in the N.-W of the Chinese Province of Fokien (3,000-4,000 feet), and Man Son Mountains, Tonkin (3,000-4,000 ft.), near the Chinese Province of Kwangsi.

**121. *Rana latopalmata*.**

*Polypedates? marmoratus*, Blyth, *Fourn. As. Soc. Beng.* XXIV, 1858, p. 188; Anders. *Proc. Zool. Soc.* 1871, p. 209; Stoliczka, *Proc. As. Soc. Beng.* 1872, p. 108; Anders. *Anat. Zool. Res. Yunn.* p. 842 (1879).

*Polypedates afghana*, Günth. *Cat. Batr. Sal.* p. 81 (1858), and *Rept. Brit. Ind.* p. 432 (1864).

*Amolops afghanus*, Cope, *Nat. Hist. Rev.* 1865, p. 117.

? *Ixalus kakhienensis*, Anders. *Anat. Zool. Res. Yunn.* p. 845, pl. lxxviii, fig. 6.

*Rana afghana*, Bouleng. *Cat. Batr. Ecaud.* p. 69 (1882), and *Ann. Mus. Genova*, (2) V, 1887, p. 420; Annand. *Rec. Ind. Mus.* VIII, 1912, p. 24, pl. iv, fig. 3.

*Rana latopalmata*, Bouleng. *Cat.* p. 464, *Faun. Ind., Rept.* p. 462 (1890), *Ann. Mus. Genova* (2) XIII, 1893, p. 337, and *Proc. Zool. Soc.* 1893, p. 526, pl. xliii, fig. 3.

*Ixalus argus*, Annand. *Rec. Ind. Mus.* VIII, 1912, p. 16, pl. iii, fig. 3.

Vomerine teeth in short transverse or feebly oblique series or small groups between the choanae or just behind the level of their posterior borders, nearer to each other than to the latter.

Head as long as broad or a little broader than long, much depressed; snout rounded or truncate, feebly projecting beyond the mouth, as long as the eye; canthus rostralis obtuse; loreal region feebly oblique, concave; nostril equally distant from the eye and from the tip of the snout, or a little nearer the latter; distance between the nostrils equal to or a little greater than the width of the interorbital space, which is equal to or a little less than that of the upper eyelid; tympanum more or less distinct, sometimes covered with granulations,  $\frac{2}{3}$  to  $\frac{3}{4}$  the diameter of the eye,  $\frac{1}{2}$  to  $1\frac{1}{2}$  times its distance from the latter.

Fingers moderately long, depressed, with distinct dermal border, with very large discs, broader than long and much larger than the tympanum, bearing a groove separating the upper from the lower surface and another above, corresponding to the long transverse limb of the terminal phalanx; first finger as long as or shorter than the second, third  $1\frac{1}{2}$  to  $1\frac{1}{3}$  times as long as the snout; subarticular tubercles moderately large, moderately prominent.

Hind limb long, the tibio-tarsal articulation reaching beyond the tip of the snout, the heels strongly overlapping when the limbs are folded at right angles to the body; tibia 4 to  $5\frac{1}{2}$  times as long as broad,  $1\frac{2}{3}$  to  $1\frac{1}{4}$  times in length from snout to vent, shorter than the fore limb, longer than the foot. Toes with large discs similar to those of the fingers but considerably smaller, completely webbed, the web feebly notched and involving the base of the discs; outer metatarsals separated to the base; subarticular tubercles moderately large or rather small, moderately prominent; no tarsal fold; inner metatarsal tubercle oval or elliptic, flat,  $\frac{1}{3}$  to  $\frac{1}{2}$  the length of the inner toe; no outer tubercle.

Skin smooth or finely granulate above, sides sometimes with rather large warts; a glandular fold above the tympanum. Belly and posterior half of lower surface of thighs more or less granulate.

Brown or dark olive above, spotted or marbled with blackish, or with greyish variegations; limbs with dark cross-bands. Yellowish beneath, uniform or marbled with brown.

Males with an external vocal sac on each side of the throat, in front of the arm; fore limb strong, with a large pad on the inner side of the first finger, covered during the breeding season with a velvety greyish horny layer.

Nasal bones small and widely separated from each other and from the ethmoid, which is truncate or rounded in front. Terminal phalanges T-shaped, the transverse limb longer than the longitudinal.

Tadpole with a large ventral sucking-disc, truncate in front, free on the sides and behind. Tail about  $1\frac{1}{2}$  times the length of the body, pointed, the dorsal crest commencing at a short distance from the body. Beak strong, black; lip much developed, not fringed, with 8 upper (3 uninterrupted) and 3 lower (2 uninterrupted) series of horny teeth.

Eggs  $1\frac{1}{2}$  to 2 millim. in diameter, not pigmented.

*Measurements, in millimetres.*

|                    | 1. | 2.  | 3. | 4. | 5.  | 6. | 7.  | 8. | 9.  | 10. | 11. | 12. | 13. | 14. | 15. | 16. |
|--------------------|----|-----|----|----|-----|----|-----|----|-----|-----|-----|-----|-----|-----|-----|-----|
|                    | ♂  | ♂   | ♂  | ♂  | ♀   | ♀  | ♀   | ♀  | ♀   | ♀   | ♀   | ♀   | ♀   | ♀   | ♀   | ♀   |
| From snout to vent | 90 | 77  | 60 | 46 | 100 | 91 | 90  | 90 | 84  | 83  | 80  | 75  | 82  | 54  | 52  | 82  |
| Head               | 31 | 27  | 22 | 18 | 32  | 29 | 30  | 30 | 28  | 29  | 27  | 26  | 27  | 18  | 18  | 27  |
| Width of head      | 33 | 27  | 22 | 18 | 35  | 33 | 32  | 33 | 30  | 32  | 29  | 28  | 30  | 18  | 18  | 29  |
| Snout              | 10 | 9   | 8  | 6  | 12  | 11 | 10  | 10 | 10  | 10  | 9   | 9   | 10  | 7   | 7   | 10  |
| Eye                | 10 | 9   | 8  | 6  | 12  | 10 | 10  | 10 | 10  | 10  | 9   | 9   | 10  | 7   | 7   | 10  |
| Interorbital width | 6  | 5.5 | 4  | 4  | 7   | 8  | 7   | 7  | 7   | 7   | 6   | 6   | 6   | 4   | 4   | 6   |
| Tympanum           | 3  | 3   | 3  | 2  | 4   | 4  | 3.5 | 3  | 3.5 | 3.5 | 3   | 3   | 3   | 3   | 3   | 3   |
| Fore limb          | 61 | 50  | 42 | 33 | 64  | 64 | 59  | 60 | 57  | 61  | 54  | 53  | 55  | 35  | 34  | 52  |
| First finger       | 11 | 10  | 7  | 7  | 13  | 13 | 12  | 12 | 11  | 14  | 11  | 12  | 12  | 7   | 6   | 9   |

|               | 1   | 2.  | 3.  | 4. | 5.  | 6.  | 7   | 8.  | 9.  | 10. | 11. | 12. | 13. | 14. | 15. | 16. |
|---------------|-----|-----|-----|----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
|               | ♂   | ♂   | ♂   | ♂  | ♀   | ♀   | ♀   | ♀   | ♀   | ♀   | ♀   | ♀   | ♀   | ♀   | ♀   | ♀   |
| Second finger | 13  | 10  | 8   | 7  | 14  | 13  | 13  | 13  | 12  | 14  | 12  | 12  | 13  | 8   | 7   | 10  |
| Third finger  | 16  | 13  | 12  | 10 | 19  | 19  | 18  | 18  | 17  | 18  | 16  | 17  | 17  | 11  | 10  | 15  |
| Fourth finger | 12  | 9   | 7   | 6  | 13  | 13  | 12  | 12  | 12  | 12  | 12  | 11  | 11  | 7   | 6   | 10  |
| Hind limb     | 162 | 135 | 108 | 89 | 170 | 168 | 163 | 160 | 154 | 158 | 146 | 145 | 144 | 90  | 94  | 143 |
| Tibia         | 55  | 47  | 36  | 29 | 58  | 57  | 55  | 53  | 51  | 53  | 50  | 50  | 49  | 30  | 33  | 48  |
| Foot          | 49  | 39  | 30  | 25 | 52  | 50  | 49  | 49  | 43  | 48  | 40  | 40  | 41  | 26  | 27  | 41  |
| Third toe     | 27  | 24  | 16  | 14 | 28  | 29  | 26  | 27  | 25  | 28  | 25  | 23  | 24  | 16  | 16  | 24  |
| Fourth toe    | 41  | 33  | 25  | 22 | 43  | 42  | 41  | 40  | 38  | 40  | 36  | 35  | 35  | 22  | 23  | 35  |
| Fifth toe ..  | 33  | 28  | 19  | 17 | 35  | 32  | 33  | 32  | 30  | 32  | 28  | 28  | 28  | 18  | 18  | 29  |

1-10. Darjiling. 11-12. Putao plain, N. Burma. 13-14. Thayetmyo. 15. Tenasserim (type). 16. —? (type of *Polypedates afghana*).

*Habitat*. Eastern Himalayas, between 1,000 and 6,000 feet, Khasi hills, Southern Yunnan and hills of Burma as far south as Tenasserim.

### 123. *Rana himalayana*.

*Rana himalayana*, Bouleng. *Ann. and Mag. N.H.* (6) 11, 1888, p. 507, and *Faun. Ind., Rept.* p. 463 (1890).

Vomerine teeth in short oblique groups between or just behind the choanae, which are unusually small, nearer to each other than to the latter.

Head a little broader than long, much depressed; snout rounded, feebly projecting beyond the mouth, as long as the eye; canthus rostralis obtuse; loreal region feebly oblique, concave; nostril a little nearer the eye than the end of the snout, distance between the nostrils a little greater than the width of the inter-orbital space, which equals that of the upper eyelid; tympanum very indistinct,  $\frac{1}{4}$  to  $\frac{1}{3}$  the diameter of the eye,  $\frac{2}{3}$  to once its distance from the latter.

Fingers very long, with very large discs, broader than long, bearing a groove separating the upper from the lower surface and another above, corresponding to the long transverse limb of the terminal phalanx; first finger shorter than the second, the tip merely swollen, third  $2\frac{1}{3}$  to  $2\frac{1}{2}$  times as long as the snout; sub-articular tubercles moderate.

Hind limb long, the tibio-tarsal articulation reaching beyond the tip of the snout, the heels strongly overlapping when the limbs are folded at right angles to the body; tibia 4 to  $4\frac{1}{2}$  times as long as broad,  $1\frac{1}{2}$  to  $1\frac{2}{3}$  times in length from snout to vent, shorter than the fore limb, longer than the foot. Toes with large discs similar to those of the fingers but considerably smaller, completely webbed, the web feebly notched and involving the base of the discs; outer metatarsals separated to the base; subarticular tubercles moderate; no tarsal fold; inner metatarsal tubercle oval or elliptic, flat,  $\frac{1}{3}$  to  $\frac{2}{3}$  the length of the inner toe; no outer tubercle.

Skin smooth above, with small granules on the sides and temples; a more or less distinct glandular fold above the tympanum. Belly and posterior half of lower surface of thighs granulate.

Olive or greyish above, with rather indistinct large, round, darker spots on the body and cross-bands on the limbs; hinder

side of thighs purplish brown. Lower parts brownish or pale olive.

Males with internal vocal sacs; fore limb strong; a thick pad on the inner side of the first finger.

Nasal bones extremely narrow, oblique, widely separated from each other and from the ethmoid, which is exposed above, rounded in front, and produced between them. Terminal phalanges as in *R. latopalmata*.

The tadpole from Darjiling described by Annandale (*Journ. As. Soc. Beng.* (2) II, 1906, p. 290) as differing from that of *R.*

*latopalmata* in the fringed lower lip, the dental formula  $\begin{matrix} 3 \\ 4-4 \\ 1-1 \end{matrix}$  and the uniform coloration, perhaps belongs to this species.

*Measurements, in millimetres (types).*

|                    |    | ♂      | ♂   | ♀   | ♀   |
|--------------------|----|--------|-----|-----|-----|
| From snout to vent | .. | 75     | 74  | 83  | 80  |
| Head ..            | .. | 24     | 24  | 27  | 27  |
| Width of head      | .. | .. 25  | 27  | 28  | 29  |
| Snout ..           | .. | .. 8   | 8   | 9   | 9   |
| Eye ..             | .. | .. 8   | 8   | 9   | 9   |
| Interorbital width | .. | .. 6   | 6   | 7   | 6   |
| Tympanum           | .. | .. 2   | 2   | 3   | 3   |
| Fore limb          | .. | .. 63  | 61  | 67  | 65  |
| First finger       | .. | .. 10  | 10  | 11  | 11  |
| Second finger      | .. | .. 12  | 12  | 15  | 15  |
| Third finger       | .. | .. 21  | 21  | 23  | 22  |
| Fourth finger      | .. | .. 14  | 14  | 17  | 17  |
| Hind limb          | .. | .. 148 | 143 | 150 | 162 |
| Tibia              | .. | .. 49  | 47  | 50  | 52  |
| Foot               | .. | .. 46  | 45  | 47  | 49  |
| Third toe          | .. | .. 23  | 25  | 26  | 28  |
| Fourth toe         | .. | .. 37  | 37  | 39  | 42  |
| Fifth toe          | .. | .. 29  | 30  | 30  | 31  |

*Habitat.* Darjiling, Eastern Himalayas.

124. *Rana formosa*.

*Rhacophorus formosus*, Günth, *Proc. Zool. Soc.* 1875, p. 573, pl. lxx, fig. B.  
*Rana formosa*, Bouleng. *Cat. Batr. Ecaud.* p. 70 (1882), and *Faun. Ind.*  
*Rept.* p. 463 (1890).

Vomerine teeth in oblique groups just behind the level of the choanae, nearer to each other than to the latter.

Head as long as broad or slightly broader than long, much depressed; snout rounded, feebly projecting beyond the mouth, as long as or a little shorter than the eye; canthus rostralis obtuse; loreal region feebly oblique, concave; nostril equally distant from the eye and from the tip of the snout or a little nearer the former; distance between the nostrils a little greater than the width of the interorbital space, which equals that of the upper eyelid; tympanum more or less distinct, or very indistinct,  $\frac{1}{3}$  to  $\frac{2}{5}$  the diameter of the eye,  $\frac{2}{3}$  to  $1\frac{1}{2}$  times its distance from the latter.

Fingers very long, with very large discs, broader than long, bearing a groove separating the upper from the lower surface and

another above, corresponding to the long transverse limb of the terminal phalanx; first finger shorter than the second, the tip merely swollen, third  $2\frac{1}{4}$  to 3 times as long as the snout; sub-articular tubercles moderate.

Hind limb long, the tibio-tarsal articulation reaching the nostril or the tip of the snout, the heels strongly overlapping when the limbs are folded at right angles to the body; tibia  $4\frac{1}{2}$  to  $5\frac{1}{2}$  times as long as broad,  $1\frac{2}{3}$  to  $1\frac{5}{8}$  times in length from snout to vent, shorter than the fore limb, as long as or slightly longer than the foot. Toes with large discs similar to those of the fingers but considerably smaller, completely webbed, the web rather deeply notched but involving the base of the discs; outer metatarsals separated to the base; subarticular tubercles moderate; no tarsal fold; inner metatarsal tubercle oval, flat,  $\frac{1}{3}$  to  $\frac{2}{5}$  the length of the inner toe; no outer tubercle.

Skin smooth above; a glandular fold above the tympanum. Belly granulate.

Bright green above, with sharply defined black or blackish spots on the head and body; the ground colour may be reduced to a network between the spots; spots on the back and cross-bands on the limbs; hinder side of thighs marbled with black. Lower parts and web between the toes brown or marbled brown and whitish.

Males with internal vocal sacs; fore limb strong; a thick pad on the inner side of the first finger, covered, during the breeding season, with a velvety yellowish horny layer.

Nasal bones extremely narrow, oblique, widely separated from each other and from the ethmoid, which is largely exposed above, obtusely pointed in front, and produced between them. Terminal phalanges as in the preceding.

*Measurements, in millimetres.*

|                       | 1.<br>♀ | 2.<br>♂ | 3.<br>♀ | 4.<br>♀ | 5.<br>♀ | 6.<br>♀ | 7.<br>♀ |
|-----------------------|---------|---------|---------|---------|---------|---------|---------|
| From snout to vent..  | 64      | 53      | 67      | 67      | 75      | 57      | 53      |
| Head ..               | 21      | 18      | 22      | 22      | 23      | 19      | 19      |
| Width of head ..      | 21      | 18      | 23      | 23      | 24      | 20      | 20      |
| Snout ..              | 6       | 5       | 6       | 6       | 8       | 6       | 6       |
| Eye ..                | 7       | 6       | 7       | 7       | 8       | 6       | 6       |
| Interorbital width .. | 4       | 4       | 4       | 4       | 6       | 5       | 4       |
| Tympanum              | 3       | 2       | 2       | 2.5     | 3       | 2       | 2       |
| Fore limb ..          | 50      | 39      | 50      | 52      | 56      | 41      | 41      |
| First finger ..       | 9       | 6       | 9       | 9       | 10      | 7       | 7       |
| Second finger ..      | 12      | 7       | 11      | 12      | 12      | 10      | 9       |
| Third finger ..       | 17      | 12      | 18      | 17      | 18      | 15      | 15      |
| Fourth finger ..      | 11      | 7       | 12      | 12      | 12      | 11      | 10      |
| Hind limb ..          | 115     | 97      | 120     | 120     | 125     | 102     | 96      |
| Tibia ..              | 37      | 32      | 38      | 38      | 41      | 34      | 32      |
| Foot ..               | 37      | 31      | 38      | 38      | 40      | 33      | 31      |
| Third toe ..          | 20      | 18      | 22      | 22      | 22      | 17      | 17      |
| Fourth toe ..         | 32      | 25      | 32      | 32      | 34      | 25      | 23      |
| Fifth toe..           | 23      | 20      | 24      | 23      | 26      | 19      | 18      |

1. Khasi Hills (type). 2. Soondrijal, Nepal. 3-4. Darjiling. 5-7. Mussoorie, Himalayas.

*Habitat.* Khasi hills and Himalayas.

125. *Rana hainanensis*.

*Staurois hainanensis*, Bouleng. *Proc. Zool. Soc.* 1899, p. 958. pl. lxvii, fig. 2; T. Vogt, *Sitzb. Ges. Nat. Fr. Berl.* 1913, p. 225.

Vomerine teeth absent. A feeble tooth-like bony process in front of the lower jaw.

Head a little broader than long, much depressed; snout rounded, scarcely projecting beyond the mouth, shorter than the eye; canthus rostralis distinct; loreal region feebly oblique, deeply concave; nostril equally distant from the eye and from the end of the snout; distance between the nostrils greater than the interorbital width, which equals that of the upper eyelid; tympanum distinct,  $\frac{1}{2}$  to  $\frac{2}{3}$  the diameter of the eye,  $\frac{2}{3}$  to once its distance from the latter.

Fingers rather slender, with a distinct dermal border, the tips dilated into very large discs which are a little broader than long, much larger than the tympanum, with a groove separating the upper from the lower surface and another above, corresponding to the long transverse limb of the terminal phalanx; first finger shorter than the second, third twice as long as the snout; subarticular tubercles rather small, feebly prominent.

Hind limb long, tibio-tarsal articulation reaching the tip of the snout or slightly beyond, the heels overlapping when the limbs are folded at right angles to the body; tibia 4 times as long as broad,  $1\frac{2}{3}$  to  $1\frac{5}{6}$  times in length from snout to vent, shorter than the fore limb, longer than the foot. Toes with large discs similar to those of the fingers but smaller, completely webbed, the web involving the base of the discs; outer metatarsals separated to the base; subarticular tubercles rather small, feebly prominent; no tarsal fold; inner metatarsal tubercle flat, scarcely distinct, about  $\frac{1}{3}$  the length of the inner toe; no outer tubercle.

Skin smooth above in the adult, warty in the young; a glandular fold above the tympanum; lower parts smooth.

Olive above, spotted with black, or black with pale olive markings; limbs with dark cross-bands; hinder side of thighs with a black reticulation. Lower parts white.

Male unknown.

Tadpole with a large ventral adhesive disc, free on the borders, truncate in front. Tail pointed, twice as long as the body, the dorsal crest not extending to the base of the muscular part. Beak black, with feebly denticulate edge; lip large, with 3 uninterrupted upper and 2 pairs of lower series of horny teeth in front and 2 uninterrupted and 1 narrowly interrupted series behind.

*Measurements, in millimetres.*

|                       |            |
|-----------------------|------------|
| From snout to vent    | 58 millim. |
| Head ..               | 19         |
| Width of head ..      | 21         |
| Snout .. ..           | 6          |
| Eye .. ..             | 7          |
| Interorbital width .. | 5          |
| Tympanum .. ..        | 2.5        |

|               |    |    |            |
|---------------|----|----|------------|
| Fore limb     | .. | .. | 37 millim. |
| First finger  |    |    | 7          |
| Second finger |    |    | 9          |
| Third finger  |    | .. | 13         |
| Fourth finger |    | .. | 8          |
| Hind limb     | .. |    | 94         |
| Tibia .. ..   |    |    | 32         |
| Foot .. ..    | .. | .. | 27         |
| Third toe..   |    | .. | 15         |
| Fourth toe    |    | .  | 22         |
| Fifth toe ..  |    | .. | 17         |

*Habitat.* Hainan.

Although deprived of vomerine teeth, this frog is too closely related to *R. latopalmata* to be generically separated from it, but it connects *Rana* with *Staurois*, to which genus it was originally referred.

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