OCCASIONAL PAPER NO 125

Records of the Zoological Survey of India

A pocket book of the Amphibians and Reptiles of the Chilka Lagoon, Orissa.

T. S. N. MURTHY

Zoological Survey of India

RECORDS
OF THE
ZOOLOGICAL SURVEY OF INDIA

OCCASIONAL PAPER NO. 125

A POCKET BOOK OF THE AMPHIBIANS AND REPTILES OF THE CHILKA LAGOON, ORISSA

By
T. S. N. MURTHY
Southern Regional Station,
Zoological Survey of India, Madras

Edited by the Director, Zoological Survey of India, Calcutta
1990

Published : March, 1990

Price : *Inland* : Rs.
Foreign : £ $

Production : Publication Unit, Zoological Survey of India, Calcutta

Printed in India by A. K. Chatterjee at Jnanodaya Press, 55B, Kabi Sukanta Sarani, Calcutta 700 085 and Published by the Director, Zoological Survey of India, Calcutta

RECORDS
OF THE
ZOOLOGICAL SURVEY OF INDIA

Occasional Paper

No. 125 **1990** **Pages 1-35**

CONTENTS

Dedicated to the memory of
Nelson Annandale
who pioneered the faunistic investigations
of the Chilka Lake

PREFACE

The interesting frogs and reptiles of the Chilka lagoon in the State of Orissa seem not to have been given the attention they deserve. This small booklet introduces the few amphibians and many reptiles found in the Chilka Lake, on its several islands and hills, and along the shoreline.

Literally, thousands of tourists visit the Chilka Lake round the year. Groups of school boys and girls come here regularly. It is necessary to tell them about the fauna of the lagoon and the ways of its wild denizens. Also, now is the time when the literature on reptiles is beginning to move from the specialist into the public arena and more and more people begin to see and want to know more about reptiles. This book is therefore in the right direction for it is primarily designed as a handy guide for easy identification of a reptile or a frog found in the Chilka lagoon from the description of the animal's appearance, colouration, size and its behaviour in the field written in simple language and by employing the minimum of scientific terminology. By referring to the text as well as the illustrations, the lay man should be able to identify the majority of the reptiles and amphibians that constitute an integral and conspicuous component of the ecosystem of the unique lake. Hopefully, there will be readers who wish to pursue the the subject further and they are referred to the selected bibliography given at the end.

Any additional information regarding distribution, status and habitat of other amphibians and reptiles encountered by the biologists / naturalists interested in the herpetofauna of the Chilka lagoon is welcome and can be forwarded to the author.

Lastly, it is hoped that users of the book like the students, science teachers, tourists, navy personnel, coast guards, naturalists, zoological collectors, and even the armchair enthusiasts will greatly benefit by a little study or even casual reading of the slender but authentic reference resource on the little known reptiles and amphibians of the Chilka lagoon.

ZOOLOGICAL SURVEY OF INDIA T. S. N. MURTHY
MADRAS 600 028

INTRODUCTION

Physiography of the Chilka Lake

The Chilka Lake is a well-known brackish water body located on the east coast of India, spreading over an area of 1165² km in the Puri and Ganjam Districts of the State of Orissa.

The pear-shaped lake is connected to the sea (Bay of Bengal) at its northeast and is subjected to tidal fluctuations. It receives water from the River Daya, one of the tributaries of the River Mahanadi and also from several small local streams. The south and west portions are bounded by the hills. There are a number of islands dotting the lake which include the Breakfast Island (formerly Barkuda), the Honeymoon Island, the Gopkuda, and the Samal. The vegetation of the islands and the hills is mostly composed of semi deciduous tropical plants and scattered spiny bushes. The depth of water ranges from 0·5 m to 3 m and the salinity also varies at different portions of the lake.

History of herpetology of the Chilka

Information concerning the herpetology of the Chilka lagoon is scanty probably because the herpetologists in India thus far paid little attention to the reptiles found in the seas and the estuaries. Annandale (1915, 1917, 1921) carried out the first zoological study of the lagoon and presented a preliminary account on the subject. Thereafter the published work on the herpetofauna has been far less compared with that of the work on invertebrates, fishes and birds. The recent study by Ganapati *et al* (1952, 1955) and Biswas (1980) is only concerned with the burrowing skink, *Barkudia insularis*.

Recently there has been an upsurage of interest in the faunal wealth of the Chilka Lake which is often referred to as the 'Biologist's Paradise' It is, therefore, appropriate that the Zoological Survey of India has taken up the multidisciplinary Chilka lagoon expedition during the years 1985-1987 As a principal herpetologist of the expedition, I had ample opportunities to study the amphibians and reptiles at close quarters and make detailed observations on them which formed the basis of this work. Probably the great majority of amphibians and reptiles found in the lagoon are included in this book.

PART I

AMPHIBIANS

FROGS AND TOADS

Frogs and toads are a familiar group of amphibians, with short, tailless bodies and with long and powerful hindlegs which are used for jumping and also for swimming. They are often so similar to one another that they cannot be clearly distinguished, though frogs live in or near the moist places and have a slimy or smooth skin. The thin sheet of skin called 'web', found between the fingers and the toes greatly facilitates the swimming powers of these animals. Toads have rougher and warty skins and are mostly land dwellers. Further, toads are stout bodied and less streamlined than frogs. Frogs and toads are the only amphibians that have developed a true voice and make characteristic sounds. Most males have vocal sacs-swellings on each side of the throat-which are inflated during croaking.

The Tree Frogs possess the characteristic discs on the tips of the toes and the fingers, with web between the toes. They are strictly arboreal, descending to the ground for egg-laying. They lay their eggs in the foam nests, something unusual for the frogs.

The Narrow—mouthed Frogs have small, wedge-shaped heads, short legs and lack the webbing between the toes. They are mostly nocturnal, and burrowers but some are tree dwellers. Some are prettily patterned.

There are about 140 species of amphibians in India. Of these, six species of frogs and one species of toad are known from the Chilka lagoon.

Descriptions of Species

True Frogs

Family : RANIDAE

1. Skipping Frog, *Rana cyanophlyctis*

This is a medium sized common frog of India. It is almost black in colour, with rounded dark spots on the back and the limbs, the spots running together to form irregular blotches. The underside is white with dark speckling and the vocal sacs are dusky. The maximum length recorded for males is 60 mm and the females range from 53 mm to 71 mm in length. This frog is a truly aquatic creature in the sense that

it spends most of its time, floating motionless with the eyes and a part of the snout exposed. When disturbed, it skips over the surface before it dives which is the source of the common name. It is the only Indian frog which tolerates salinity and hence its occurrence in or near the salt creeks, and lagoons. It feeds mostly on aquatic insects which are captured under water and on land it eats ground-dwelling insects. The sexes are distinct, males with a greyish external vocal sac on eaeh side of the lower margin of the mandible. The male is very vocal during the monsoon and the call is prolonged, sonorous, and sounds as "creek creek" The common frog is found at all the places where the margin is swampy and also in the stagnant pools on several islands.

2. Indian Bullfrog, *Rana tigerina*

This species is the giant among the Indian frogs. The adult grows to be about 147 mm long. It is usually yellowish, green or olive in colour, relieved by a series of blackish spots. There is a distinct narrow mid stripe on the back. The legs are heavily mottled with dark. The throat and the vocal sacs are dusky and the rest of the underside is immaculate white. The bullfrog is generally found in the weed-choked ditches and marshes and is rare in the rocky pools. It spends its time during the day hiding among thick vegetation near the slow-flowing waters. It is a powerful jumper and swimmer, too. It becomes active in the night. It eats almost anything that is alive or gets into its habitat. It usually feeds on insects, earth worms, spiders, and snails but occasionally gulps down the bigger prey which includes other frogs, lizards, baby turtles, snakes, mice, and birds. It is a shy creature, congregating only during the breeding season. The loud and resonant call of the male is described as "quonk, quonk" which is repeated three or four times in a few seconds. The bullfrog is found in the paddies and in the rocky crevices of the wells and ponds along the edge of the lake and seems to be introduced by human agency.

3. Paddy-field Frog, *Rana limnocharis*

This is a small frog of 35 mm long and is like the bullfrog but the dark dorsal spots are less distinct. The back has a dorsal stripe and the throat is stippled with black. Males have black patches on throat. This frog can jump to safety into water or nearby bush on slightest alarm. The breeding season commences with the onset of monsoon. The call of the breeding male is described as a series of loud staccto notes. As its common name implies, this frog is found in damp land and is particularly abundant in the rice fields and in the irrigation canals fringing the lake.

4. Indian Burrowing Frog, *Rana breviceps*

This is a rare, toad—like frog which grows to be 50 mm long. It is light olive in colour, with a cream coloured middorsal stripe. The limbs are barred with black and the underparts are creamy. It has the power of digging itself into a depth of nearly 30 cm below the surface by employing the enlarged shovel—like metatarsal tubercles on the hind feet. It is entirely nocturnal even during the monsoon which fact accounts for its rarity. It leads a solitary life, congregating only during the breeding season. It is not one of the concert—giving frogs and the call of the breeding male is a loud, nasal "quonk." As one might expect of its fossorial habits, this frog is encountered but seldom in sandy or semi-arid areas, and grass lands especially after heavy showers when these animals are flushed out of their hiding places. The single specimen known from the lagoon has been picked up from the wet paddy fields on the edge of the lake at Rambha.

Old World Tree Frogs

Family : RHACOPHORIDAE

5. Tree Frog, *Polypedates maculatus*

This is the common tree—frog of peninsular India that frequents the houses. It grows to be 75 mm long. It has adhesive discs on the tips of the toes and the fingers which are slightly webbed. The skin of the back is smooth and that of the belly is granular. The usual colouration is grey, with dark markings especially on the sides of the head. The thighs are spotted behind with yellow. The tree frog spends most of its time aloft, foraging and calling from among the shrubs and trees. It is usually seen on the ground when it is seeking a pond or pool for egg-laying. The spawn is deposited on leaves at some height above the water, into which it soon slips. A single specimen of the tree frog has been collected from the shrubs on the edge of the lake at Barkul.

Narrow—mouthed Frogs

Family : MICROHYLIDAE

6. Ornate Frog *Microhyla ornata*

This is a small frog of about 25 mm long, with a narrow-head and an egg-shaped boby. It is nocturnal in habits. The colouration is distinctive and pretty, with a median sepia marking on the back which begins at about the mid-level of the eyes, narrows slightly on the occiput, then widens a little finally spreading on to the sacral region. The

throat of the male is suffused with black. The narrow-mouthed frog's voice is very feeble. It is usually found among dried up grassy bushes, and under leaves, near the water edge. It often hides under logs and rocks. It principally feeds on white ants and breeds in shallow ponds or large rain water pools. Annandale recorded this species from the shore of the lake at Barkul.

True Toads

Family : BUFONIDAE

7. Common Indian Toad *Bufo melanostictus*

This toad is one of the commonest land animals in India. It is recognised by its stout body, the enlarged parotid glands, and the blunt head with ridges, which gives the animal a masked appearance. The skin is heavily tuberculated, with black-tipped spines all over the back with double rows of prickly warts in the middle. The colouration is uniform brown or black above and white below, with brassy yellow eyes. The common toad grows to more than 75 mm in length. It is a slow hopper, generally hiding in the day under logs, stones, or in holes in some cool places, emerging at dusk to prey upon the insects which constitute its main diet. Besides the insects, the toad's food includes bees, snails, and earthworms. It is generally nocturnal, but is seen in the day during or after the monsoon showers. It utters a rather feeble cry when handled for the first time. The milky noxious secretion exuding through the enlarged skin glands protects this animal from most enemies. The sexes are distinct, the breeding male with black excrescences on the inner fingers. The breeding season starts with the monsoon when the male makes a very characteristic call. The common toad is found on the islands, hills, and along the margin of the Chilka Lake.

PART II

REPTILES

Soft-shelled Turtles

Family : TRIONYCHIDAE

The soft-shells are thoroughly aquatic turtles that live in muddy waters, burying themselves in soft mud or sand with only the head, or a small portion of it, exposed. The shell (carapace) is disc-like and is

covered with soft skin, instead of with horny shields. The snout ends in a fleshy proboscis and the jaws are concealed under soft, fleshy lips. Tne ear is hidden and the eyes are lateral. The head and neck can be withdrawn into the shell and darted out with great rapidity. The feet are paddle-like, and broadly webbed, with three claws on cach foot. The soft-shells are very alert reptiles in the wild and so they can move rapidly both on land and in water. They feed mostly on all sorts of aquatic animals such as fish, frogs, and molluscs and also on water plants. They lay round, thick-shelled, but brittle eggs in holes above the water level.

Of the six species of soft-shells found in India, one species occues in the Chilka Lake.

Descriptions of Species

8. Peninsular Flap-shell Turtle *Lissemys punctata punctata*

This is the commonest mud turtle of India, occurring in a wide variety of habitats ranging from ponds to large rivers. The head is greenish, with three black streaks in the young and the carapace is uniform olive-brown, with pale marks in the young. The pattern may or may not persist in the adults. Usually the shell is about 230 mm long. The common name Flap-shell comes from the pair of cutaneous flaps on the plastron (the lower shell) under which the hind legs can be concealed. It is of a quiet, timid disposition. The female lays from 10 to 12 eggs which will be buried in the ground by it close to the water. This turtle is common in the shallow water of the Chilka lake as well as in the ponds, and the paddy fields on the margin.

Lizards

Lizards, classified os suborder Sauria, ares caled reptiles, with four well-developed limbs, movable eyelids, and an external ear-opening. The tongue is much variable in structure and shape. It is mainly employed as a sensory organ and also for lapping up the prey. Some limbless lizards which have elongated bodies are snake-like in appearance but they can be told apart by their distinctive ear-openings and movable eyelids which are quite foreign to the snakes. Certain lizards like the geckos, the skinks, and the lacertids have the ability to shed the tail and regenerate a new one in its place. Nearly all lizards are insectivorous. Most of them can change colour, depending on the light, the temperature, and the mood of the animal. Males are larger, quarrelsome, and

brilliantly coloured than females. A vast majority of the lizards reproduce by laying eggs and a few bear living young. Lizards are fast runners and are not easily caught. There are no venomous lizards in India.

Lizards are a conspicuous and an abundant component of the fauna of the Chilka lagoon. Of the nearly 155 species of lizards found in India, some ten species representing the geckos, the garden lizards, the skinks, and the monitor lizards are known from the lagoon.

Descriptions of Species

Geckos

Family : GEKKONIDAE

Geckos are small nocturnal lizards which live around houses or on trees. They are recognised by the soft bodies, the lidless eyes with a vertical pupil, and the short tails. The skin, covered with fine beaded tubercles or granules, is transparent. Geckos are found in the houses, on the ground, in the forests and on trees. The amazing running powers of these lizards on smooth, vertical surfaces are due to the clinging pads on the undersides of their feet. Geckos feed mostly on insects. They lay 2-3 white, oval hard-shelled eggs ; house-geckos deposit the clutch in such unusual places such as the Radio or TV sets, bookshelves, and wardrobes whereas the tree geckos glue their eggs to the underside of a leaf or bark of a tree. It takes about two months for the eggs to hatch into exact replicas of their parents. Geckos are the only reptiles to have developed a true voice. A gecko produces the unusual sound by clicking its broad tongue against the roof of the mouth and usually it is a soft chirruping or clucking sound. Geckos are docile and rarely bite.

Three species of geckos are foudn in the Chilka lagoon.

9. Spotted House-Gecko, *Hemidactylus brooki*

This is the most widelty destributed gecko in the Indan subcontinent and by far the commonest in India. It is usually light grey to dark brown in colour, with irregular dark spots, and a dark eye streak. The body is covered with granular scales and conical tubercles. It is a small lizard, adults never growing beyond 175 mm. Although it is characteristically a house-dweller, the spotted gecko is often found far away from the human settlements. It is strictly nocturnal in its habits and is vary inactive during the winter. Its call which is a loud "tik, tik, tik" commences soon after it is dark and continues till dawn. It fre-

quents the kitchens where it is assured of a plentiful supply of insects. This gecko is commonly seen on the walls of the tourist lodges, under stones and debris on the islands and along the shoreline of the lake.

10. Southern House-Gecko, *Hemidactylus frenatus*

As its name suggests, this is the commonest house-gecko of South India. The back is dark-brownish, with distinct darker markings often arranged as longitudinal stripes. The tail is sometimes coral-red during life. The pattern, however, fades with age. The length is a little over 125 mm. This gecko is often found in the bark of coconut trees or beneath debris on the outskirts of villages and cities. In the Chilka lagoon, this gecko occurs in the buildings above the water level and also on the shore. Some individuals were seen in the axils of palm fronds on the margin of the lake.

11. Bark Gecko, *Hemidactylus leschenaulti*

This is somewhat a larger and more stoutly built gecko than the preceding species and has taken to a life on the trees, preferring especially the giant Banyan and Tamirand trees the greyish-brown bark of which renders the reptile inconspicuous. It is usually grey, with dark markings on the back which vary much in shape ; they may be either wavy cross bars, longitudinal stripes, or a chain of rhomboidal spots down the spine. An additional characteristic of colouration is the dark streak which starts from behind the eye and extends on to the flanks. This is the largest of the common geckos, with a maximum length of nearly 180 mm. It spends most of the day lying concealed under the bark of huge trees which are often situated several metres above the ground and runs about on the tree trunks at night but seldom descends to the ground. Although it is mainly arboreal in habits, the bark gecko enters the houses and competes successfully with the other house geckos in search of the prey. It is common in most of India and is especially abundant both in the plains and hills of southern India. Several large specimens were found scampering across the branches of giant trees on the Gopkuda, Breakfast, and the Parikuda islands of the lagoon.

Garden Lizards

Family : AGAMIDAE

The agamids are a major assemblage of medium-sized ground, rock or tree-dwelling lizards with mobile heads, movable eyelids, five-toed feet, and slender, long tails. The body, covered with overlapping scales, is flat in the terrestrial species and laterally compressed in the

arboreal forms. The skin is either rough or spiny, with long, pointed scales on the neck and the back. The tongue is broad and flat. Males have throat-sacs and change colours during the breeding season. Many are good climbers. Some run on their hind legs. The majority are insectivorous and egg-layers.

Three species occur in the Chilka lagoon.

12. Fan-throated Lizard, *Sitana ponticeriana*

This is a diurnal, ground-dwelling lizard, remarkable for having only four toes on hind foot as against the normal five toes that are common to all other lizards of the family. This is a small lizard, rarely exceeding 205 mm in total length. The body is compressed and the slender tail is often twice the length of head and body. The males possesses a gular sac which extends on to the neck and the chest which is the source of the common names : Bearded/Fan-throated Lizard. The colouration is olive-brown above, with a series of dark-brown, black edged rhomboidal spots down the back and whitish below. The male's throat-fan in the breeding season is beautifully coloured with red, black, and blue. At the time of courtship the male distends and contracts its gaily coloured throat-fan rapidly like a flickering light, the female remaing concealed in the bush nearby. The fan-throated lizard is a very agile creature and can escape from danger at the slightest alarm by rushing into a near by hole or crack in the ground or in the bush. It can also run with great speed when its front feet often leave the ground. It feeds exclusively on surface-living ants and other insects. The female lays from six to eight eggs and buries them in the soil at the base of a bush and the eggs hatch in 7 to 8 weeks. This lizard is found throughout India in the wooded as well as the open country but is rare in the dense forests and the deserts. It is frequently found in the open sandy area on the edge of the Lake.

13. Indian Garden Lizard, *Calotes versicolor*

This lizard is so well-known and common throughout India that nobody should experience any difficulty in identifying it. It is a day-active reptile, frequently seen in the scrub, jungle, open woods, hedges and city gardens where it spends most of the day lying on boughs and twigs, making itself inconspicuous. It is an agile climber and a fast runner on the ground, too. It has an oval head, a laterally compressed body and an extremely long tail. The entire body and tail are covered with strongly keeled scales. The common lizard attains a maximum of 500 mm. 350 mm of which are taken up by the tail. It possesses no length gular sac, but has a prominent dorsal crest. The normal

colouration is dull brown or grey above, with dark wavy bars or spots, more pronounced in females and young, and white below. The males, with their swollen cheeks, are very pugnacious and can often be seen fighting and chasing each other. During the breeding season the male changes its usually brownish hue into pale yellow while the throat, sides of head, and neck assume a bright red tint which has probably earned the misappropriate name 'Blood-sucker' for the otherwise harmless lizard. The garden lizard feeds principally on insects, larvae, and spiders and occasionally eats small birds and frogs. The female lays from 10 to 30 eggs and buries them in holes in the ground. Usually the eggs hatch after 60 days. The common lizard is found plentifully on the islands as well as on the bushes along the edg of the lake.

14. Rock-Lizard, *Psammophilus blanfordanus*

As the common name suggests this lizard is a rock-dweller. It is the most familiar of hill lizards in South India. It is a medium-sized, diurnal lizard, distinguished by a depressed body, a fold in the skin of the throat, and a long, slender tail. There is neither the dorsal crest nor the gular sac. Adults reach up to a length of 315 mm; females are smaller. The colouration is variable; the young and females are olive-brown above, with a series of large, lozenge-shaped, dark-brown spots which hardly persist in the adult male; the adult male is pale brownish above and yellowish below, with an yellowish-brown stripe on the lips. At the time of courtship the male is an extremely beautiful object when its head and foreparts assume a brilliant crimson hue while the rest of the body becomes jet black in colour. The rock-lizard spends most of the day basking on bare rocks with which its colour harmonizes and where there is an abundance of sunshine and plenty of insects, the principal food of the reptile. It takes shelter at night in the crevices of stones. In spite of its heavy build, the rock lizard is extremely wary and darts into the crack of a rock at the least sign of danger. It is difficult to capture this agile lizard, especially if the day is warm and the reptile is alert. It seems either to be basking or moving out at full speed when it appears like a blurred streak. The female lays about eight eggs. The rock lizard has been recorded from the Bird Island and the Ghantasila in the Rambha Bay of the lagoon.

Skinks

Family : SCINCIDAE

Skinks are a vast assemblage of mostly small-sized lizards, which are recognised by their long and cylindrical bodies and short limbs.

They are found in the plains as well as the hills, the preferred habitat being sandy ground. Despite their abundance, skinks pass unnoticed because they are secretive lizards, usually found under stones or piles of debris and are seen only when they emerge on a sunny day, or when searching for food. The head is covered with enlarged shields and the body, with smooth or shiny scales which are nearly all the same size The tail is fragile and can be reproduced, if damaged. The tongue is thick and fleshy and is olfactory in function. Several sand-living and burrowing skinks have transparent disce in the lower eyelids so that they can see when the eyelids are closed, thus preventing the sand or other foreign particles from entering the eyes. In colour, skinks are mostly striped, crossbarred or spotted. They lack the ability to change colour, but at the time of courtship the males acquire a red or orange tint to their bodies. Skinks burrow with ease in sand. They feed on insects. Most skinks lay eggs and only a few produce their young alive.

Three species of skinks are known from the lagoon.

15. Common Skink, *Mabuya carinata*

This is the best known of Indian skinks. It is a heavily-built lizard, but with short limbs. It is shiny brown, olive or bronze with a distinct pale stripe on each sade from eye to tail and sometimes a second white band from upper lip to groin: There are dark spots on the sides. During the breeding season the flanks of the male turn scarlet. The average total length of an adult is only about 275 mm, although an occasional individual may reach 325 mm. This skink lives at ease both in the forests and near the human dwellings. It is a diurnal lizard, found throughout the year except during the cold months. This is probably the most urbane of our skinks ; it is not uncommon in the houses, City parks, and vacant plots. In addition to insects which constitute its exclusive food, the common skink is known to eat small vertebrates. The female lays from 8 to 11 eggs in a small hole she has dug, or in a rotting log or under a rock. Very little is known of the breeding behaviour of the common skink. It is seen several times on the islands and along the edge of the lake.

16. Sand Skink, *Mabuya bibroni*

This is the skink that frequents the sandy sea shore. It is olive-brown above with a black-edged light vertebral band, and a white bordered black lateral stripe and is white below. As in all the other sand skinks, the central part of the lower eyelid of this skink is transparent. Adults are usually 115 mm in total length. An adult of

this agile skink has been sighted when it is searching for food among the vegetation on the shore of Barkuda Island.

17. Barkudia Burrowing Skink, *Barkudia insularis*

This is the skink which made history when the first specimen of this rare species was dug up from loose earth on the Barkuda Island in the Chilka Lake in the early 1900s and described as new to science later. This skink, which has adapted to a mostly fossorial existence, is a highly specialized lizard for living in the subsurface substra. Its streamlined features include a wedge-shaped head, an elongated, slender body with a short tail, a partially countersunk lower jaw and the total lack of limbs. The eyes are small, though functional and the ear-opening is minute. The tongue is long, slender, and bifid and is shot out at frequent intervals. Adults are usually less then 175 mm long, of which the tail accounts for 60 mm. The limbless skink is glossy-brown above, with a black spot on each scale which fuse to form 8 to 14 longitudinal lines down the back and along the tail, and the belly is creamy white. It burrows with great rapidity to a depth of up to 25 cm in loose earth and feeds on a variety of small, mostly soil-living arthropods such as the termites and the beetle larvae. Apart from the megre knowledge that it is oviparous, very little is known of the breeding habits of this skink. Although the limbless skink has recently been reported from a few pockets outside the type-locality, it has, of course, become scarce on the island of its name sake in the Chilka Lake.

Monitor Lizards

Family : VARANIDAE

Monitors are rather unusual lizards with a distinctinctive appearance. The mobile head, the elongated neck, the flattened body with a laterally compressed tail, the snake-like forked tongue, and the heavily-built limbs with sharp claws are so characteristic that one hardly makes any mistake in telling them apart. The eyes are very prominent and the ear-opening is distinct. The head is covered with small scales and the body with minute juxtaposed scales and tubercles. Monitors are the world 's heaviest and largest lizards ; the Water Monitor, with a record length of 2.5 m, is the second largest living lizard, next to the Komodo dragon of Indonesia which grows to a length of over 3 m. Despite their heavy build, monitors are surprisingly agile and active ; they are good climbers, runners, and swimmers. They are all carnivorous, eating any animal they can overcome ; they eat fish, crabs, eggs, and

even rotting flesh and all are fond of eggs of birds and other animals. The female lays from 15 to 30 eggs and deposits them in termite mounds, holes in the ground, hollow logs or piles of brush. As might be expected of such large animals, monitor lizards are formidable reptiles as they can bite hard, lashing with the tail, and scratching furiously with their dagger-like claws.

Of the four species of monitors that inhabit India only one species occurs in the Chilka lagoon.

18. Common Indian Monitor, *Varanus bengalensis*

This is the best-known land monitor of India. In spite ot its widespread distribution, the common monitor seems to be scarce as it escapes easy detection by taking advantage of its colouration which harmonizes well with the surroundings. It is a diurnal lizard, found equally at home both in the forests as well as the outskirts of villages and cities, the preferred habitat being the open, dry forests. Adults are usually about 1.8 m in length. The adult is usually olive, yellowish or brownish above, with darker spots and yellowish below, uniform or spotted with dark, more prominent on the throat. The young, which are more brightly coloured, are dull orange to light brown above, with whitish ocelli and often alternating with blackish cross-bars and whitish below, with transversely arranged dark bars. The female lays about 30 oval, white, soft-shelled eggs, deposits them in a hole dug by it, or in ant hills and departs after closing up the hole with leaves. It takes about 8-9 months for the eggs to hatch. The common monitor has been frequently sighted in the neighbourhood of the dense vegetation along the margin of the lake as on several islands.

SNAKES

Snakes have elongated bodies, covered with overlapping scales which may be either smooth or keeled. The scales on the underside are enlarged and plate-like, with stiff ridges that press against the ground when the snake is crawling. Snakes lack movable eyes and functional legs. Snakes do not have external ear-openings and so they connot hear in the normal way. They can, of course, pick up the earth-borne sound vibrations through their sensitive bodies. The flicking forked tongue is harmless and it is mainly employed as a sensory organ. The

teeth are needle-like and pointed backward, which enable the snake to grab the slippery prey. Poisonous snakes have hypodermic needle-like fangs which are in fact the modified front teeth used for injecting the venom when the snake strikes. All snakes hunt and eat live animal prey. The two lower halves of a snake's lower jaw are connected only by an elastic ligament which enables the snake to swallow an object much larger than the snake's head. Most snakes lay elongate, leathery shelled eggs but some bring forth their young alive. The young are miniatures of the adults.

As is true of most aquatic zones, snakes are an important and conspicuous element of the herpetofauna of the Chilka Lake. Sixteen species of snakes are found in the Chilka lagoon. Of these, the venomous snakes belong to the families Elapidae, Hydrophiidae, and Viperidae and the remainder are harmless. The snakes of the lagoon can be broadly divided into the following groups, making their recognition somewhat easier : Blind snakes, Boas File Snakes, Colubrids, Cobras and Kratis, Sea Snakes, and Vipers. We will discuss them in that order.

Descriptions of Species

Blind Snakes

Family : TYPHLOPIDAE

These are small, burrowing, worm-like degenerate snakes, with stumpy tails which end in a spine. The scales on the belly are of the same size as those on the back. The eyes are tiny blackish dots, buried beneath the head-shields. The mouth is narrow, with a few teeth only in the upper jaw. Blind snakes are expert burrowers in soft soil in which they dig quickly and easily, making use of the blunt snout and the terminal spine of the tail. Because of their living underground or under dccaying logs, and leaf litter, the blind snakes are seen only when they wander on the surface at night or when flushed out of their burrows during rains. They feed on worms, ants and their eggs, and other soft-bodied arthropods. They are absolutely harmless. When handled, they exude a foul-smelling musky secretion, at the same time wriggling vigorously and poking with the spiny tail. Very little is known of the breeding habits of these small and secretive creatures ; some blind snakes lay eggs and others bear live young. All are of small size, few of them exceeding 500 mm in length.

Three species are recorded from the Chilka lagoon.

19. Common Blind Snake, *Ramphotyphlops braminus*

As the common name suggests, this blind snake is one of the commonest of our reptiles, although seldom seen on account of its burrowing habits. It is a remarkably wide ranging species, introduced into every nook and corner of the globe either by human agency or by accidental dispersal in drift-timber. It is dark brown or almost black, wtih the snout, the anal region, and the tail being whitish. Its favourite haunts are the nests of termites or unused rat holes, but it occasionally causes a surpise by getting into water-pipes where, no doubt, it is found because of the assured supply of termites, its favourite food in the muddy layers of pipes. It grows to 170 mm. The common blind snake is an all-female species, laying from 5 to 8 self-fertilised eggs.

20. Slender Blind Snake, *Typhlops porrectus*

This blind snake is very similar in colouration to the common blind snake, from which it differs in its slender body and length. It reaches length of 285 mm. It is known from the Breakfast Island.

21. Beaked Blind Snake, *Typhlops acutus*

This is the largest of the Oriental blind snakes, with a recorded length of 600 mm. The snout is very sharp and hooked, which is the source of the common name. It is light brown, with pale cross-streaks on each scale. The beaked blind snake has so far been taken on the Gopakuda and the Breakfast islands and from the Kalijugeswar Hill of the Chilka lagoon.

Boas

Family : BOIDAE

Boas are heavy bodied snakes, with short and blunt tails. They are rather primitive as is shown by their retention of vestigial hind limbs which are visible externally as horny claw-like spurs projecting from either side of the vent. These rudimentary "legs" seem functionless in females, but males use them to tap the female during courtship. The massive body is covered with small scales and the belly plates are distinctly narrower. The eye is small, with a vertical pupil. Boas are slow-moving snakes, generally most active at night. Though non venomous, their mobile jaws are heavily studded with long, backward pointing, curved needle-sharp teeth, which are used for gripping the prey firmly. They mostly feed on small birds and mammals which are killed by constriction -a method of coiling around the prey and squeezing it to death. They bring forth the young alive. When disturbed or alarmed in the wild, boas roll themselves up in a ball with the head

tucked in the centre. The Indian boas are seldom 1 m in length and are not as large as one expects them to be.

One species occurs in the Chilka lagoon.

22. Common Sand Boa, *Eryx conicus*

The common sand boa is mainly a snake of the plains, and is distinctly partial to sandy soil in which it can burrow easily and rapidly. It is grey above, tinged with yellow or brown and a series of large dark-brown blotches which tend to join to from a zigzag stripe and an additional lateral series of scattered spots of the same colour ; the underside is whitish. Adults grow to 90 cm. The common sand boa lies for most of the day in the dry and loose sand, with just a portion of the head exposed. It is active at night, when it hunts for its prey consisting mostly of mice, rats, and smaller birds. The female brings forth from 6 to 8 live young at a time. Though the sand boa is timid in disposition, its temper is, however, uncertain as it sometimes coils and flinches violently, delivering nasty bites, if molested. This snake is found on the Breakfast and the Honeymoon islands of the lagoon.

File Snakes

Family : ACROCHORDIDAE

These are obese, sluggish, inoffensive fish eating snakes, living both in fresh and salt waters of Southsest Asia and Papuasia. The body is covered with small scales, which are granular on the head and juxtaposed and tuberculated on the back. The blunt edges of scales roughen the skin and give a harsh file-like feel to the skin which is the source of the common name. There are no ventrals. The tail is short and rounded. The skin is loose and does not stretch as the skins of other snakes do. As with all thoroughly aquatic snakes, the nostrils can be closed with flaps and the body as well as the tail are flattened from side to side. The tiny eyes seem inadequate, but the snakes rely on their keen sense of smell to locate fish, their principal food. Although lacking the usual serpentine grace, these sluggish snakes are swift and graceful swimmers in water, their native element, but are helpless on land, where they can only twitch their bodies. They give birth to as many as eight young at a time. These snakes, which are also known as "wart Snakes" or "Rasp-skinned water Snakes", range from 1.3 m to 1. 8 m in length.

One species is found in the Chilka Lake.

23. Asiatic File Snake, *Chersydrus granulatus*

This is the snake which is exceedingly common in the Chilka Lake. The eyes and nostrils are directed more upwards than sideways

and the tail is short, compressed, and prehensile. The skin of the abdomen is raised like a low median fin which increases the lateral resistance and the swimming powers of the snake. In estuarine specimens, the ground colouration is dark grey or blackish, with white cross-bands, which hardly persist in the adult. The head is blackish with a few, whitish spots on the crown, and a larger spot of the same colour on the temporal region. The marine individuals are dirty whitish grey in colour, with a zigzag dorsal marking. Some exceptional specimens may reach 1.3 m. but most are about 0. 8 m long. The Asiatic file snake is mainly active at night, normally spending the day in shallow murky water, where it rests on the mud at the bottom. Its eyesight does not seem to be effective, thus rendering it easy to catch the snake.

It is so incredibly numerous in every portion of the lake that it can be expected with each haul of fishing nets.

Colubrid Snakes

Family : COLUBRIDAE

Most of the snakes in India are colubrids which exhibit a great diversity in structure and habits. They are met with in a wide range of habitats : some are terrestrial, some are arboreal, some are aquatic and yet some are estuarine. The scalation is typical : the head is covered with large and regularly arranged scales and the scales on the body are as wide as those on the belly. There is no trace of the hind limbs. Most of the colubrids have solid teeth on both the jaws and a few species, in which several of the teeth at the rear are grooved, are called back-fanged snakes. These snakes possesses some venom contained in the saliva which is used to paralyse the prey under seize. As one might expect, the colubrids vary much in colouration. Smaller species subsist on worms and insects and the larger ones feed on birds and mammals which are killed by rapid constriction. A vast majority lay eggs while a few are live bearers.

Six species occur in the Chilka lagoon.

24. Rat Snake, *Ptyas mucosus*

Thise is one of the commonest and most familiar of Indian snakes since it is never far from the vicinity of man and his surroundings. It prefers damp grasslands and cultivated areas, often straying into the adjacent hills and semi desert tracts. It has a long and robust body, with a long, slender, and prehensile tail. The head is thin and distinct from the neck. The eyes are large, with round pupils. The colouration is variable : it is usually dirty yellowish above, with black-tipped sides

and yellowish or whitish below ; the forebody of the young is marked with irregular but sharp cross-bars, which tend to fuse and form a reticulate pattern ; the lower lip is margined with black. Adults grow to 3.5 m or more in length. The rat snake is a good swimmer and climber. Despite the common name, it does not subsist on a meal of rats but is also found to eat frogs, lizards of all kinds, birds, and occasionally even snakes. Although harmless, the rat snake becomes aggressive if attacked. The male rat snakes perform a "Combat Dance." The female lays from 6 to 14 eggs in a clutch. Because of its fearsome length and aggressive disposition, the rat snake is very often mistaken for a cobra but the rat snake can easily be distinguished by its long and thin head and the large eyes. It has been reported from several islands in the lagoon.

25. Common Cat Snake, *Boiga trigonata*

This is a slender tree-dwelling snake, with a thin neck and large eyes. The long and prehensile tail is used for grasping the branches of a tree or twigs among the bushes. It is brownish above, with a series of Y-shaped black and white blotches which tend to form a zigzag on the back. The other name 'Gamma Snake' comes from the series of dark blotches on the back which somewhat resemble the Greek letter Gamma. It grows to 1 m and spends most of its time among the bushes and the trees, occasionally descending to the ground. It feeds on geckos, tree frogs and occasional birds and mice. The mild venom secreted by the snake is used only to benumb the prey and it is not dangerous to humans. However, the common cat snake is bold and fierce in disposition, biting readily when handled. The female lays from 3 to 11 eggs. The common cat snake has been recorded from the Breakfast Island in the Chilka Lake.

26. Common Bronzeback Tree Snake, *Dendrelaphis tristis*

This is another rear-fanged tree snake and is found throughout India. It is a slender and graceful snake, with a flat head and large eyes. It is bronze-brown or purplish-brown above, with a buff lateral stripe edged with black. The underside is whitish or light green. The bronzeback is diurnal in its habits and is active even during the hottest part of the day. It is an alert snake and can move with amazing speed in its favourite haunts such as the low bushes, thorny and palmyra trees near the cultivated areas. It has a peculiar habit of constantly swaying its narrow neck and the forebody in a wavering fashion. It chiefly feeds on frogs, lizards, and birds which it hunts by day but is also known to eat insects and toads. It normally is a shy and timid snake and does not bite freely if picked up. The female lays about 6 eggs in the hollow of a

tree or a disbanded bird's nest. This tree snake has been found to occur in good number on the Breakfast Island in the lagoon.

27. Checkered keelback water Snake, *Xenochrophis piscator*

This is the most common and abundant Water Snake of India, with a thick-set body, a pointed head distinct from neck, and a rather long tail. The name "Keelback" comes from the rough-edged scales on the snake's back which gives the snake a rough appearance. The Checkered Keelback is usually olive, yellow or brown with a distinct pattern consisting of numerous black and white spots arranged like a chessboard which is the source of the common name. An additional characterestic is the presence of two black streaks on the cheek. Adults grow to 1.5 m ; females are larger which reach a length of 2 m. The common water snake is mainly a snake of the plains but is also found in the hills up to 2100 m. It is diurnal in its habits and feeds principally on fishes and frogs. When excited, it rears up and assumes a cobra-like pose for which reason it is mistaken for a cobra and its bite is considered as fatal. Although it is non poisonous, the checkered keelback is decidedly a plucky and vicious snake, biting readily when stepped on or molested. It is a prolific breeder ; the female lays from 8 to 90 eggs in a clutch in holes near water. The common water snake frequents the edges of ponds and canals in the lagoon and is also found in the lake wherever the water is fresh.

28. Smooth water Snake, *Enhydris enhydris*

This is a mud-living snake, preferring the sluggish waters of the lakes, estuaries and the coasts. The body is stout and cylindrical and the tail is compressed. In accordance with the life in water, the nostrils are valvular and the scales on the belly are reduced in size. It is dark-olive or olive-brown above and lemon-yellow below. Adults are under 80 cm in length. In juveniles, there are three lines down the back but the vertebral line disappears with age. The mud snake feeds principally on fish, which are swallowed whole under water. It is quiet in disposition and does not bite when handled. The female brings forth from 6 to 18 live young at a time. Although the Smooth water Snake is reported as common on the east coast, it is somewhat rare in the Chilka ; only a solitary example was picked up from the muddy shore of the lake near Barkul.

29. Dog-faced water Snake, *Cerberus rhynchops*

This is a common estuarine snake of India, recognised easily by its thick and heavily scaled body and the checkered pattern on the underside. The common name comes from the fancied resemblance of the unusally prominent lower jaw of the snake to that of a bulldog's. It

is usually grey, with numerous black cross bars which are obscure on the forebody but are prominet posteriorly. The belly is pale yellowish, with conspicuous black blotches or cross-bars. Adults are from 60 cm to 1.25m long. The Dog-faced water Snake is a voracious feeder and its preferred food is fish. It generally is a mild and lethargic snake although it hisses loudly and bites viciously, if provoked. It gives birth to from 6 to 30 live young at a time. It is found in all portions of the Chilka Lake but is paticularly abundant in the areas rich in fish.

Cobras and Kraits

Family : ELAPIDAE

This family includes the highly venomous snakes like the Cobras, Kraits, and the Coral snakes. They all are terrestrial species, with grooved and fixed fangs in the front of the upper jaw, which cannot be folded back along the jaw, as can the fangs of vipers. The family is widespread in India, but only one species each of the krait and the cobra are found in the Chilka lagoon, with no representative of the coral snakes.

30. Common Krait, *Bungarus caeruleus*

This is the best-known of Indian kraits. The head is flat and is hardly distinct from the neck. The body is cylindrical, covered with highly polished scales, the central row being distinctly enlarged and hexagonal. The eye, which is bead like with a round pupil, is rather small and indistinguishable in life. The tail is short and rounded. Also called sometimes 'Blue Krait', the common krait is black or bluish above, with about 40 thin white cross-bars which may often be indistinct or absent anteriorly. The pattern is well-defined in the young which have cross-bars on the forebody ; in adults, however, the white bars may be found as a series of connected spots, with a prominent spot on the vertebral region. The upper lip and the lower parts are white. Adults grow to 1.8 m ; males are longer with proportionately longer tails. The krait is essentially a snake of the plains, and is distinctly partial to the open country, cultivated areas, and the scrub jungle at low altitudes. It seems particularly fond of the termite mounds, rat holes and burrows of other rodents, heaps of rubbish, manure, or brick in the open country as well as the gardens, ceilings of houses, abandoned buildings and such other forsaken places near the human dwellings. Male kraits seem to be very possessive snakes as is shown by their occasional performance of the vertical 'dance' which is merely enacted to guard their territory that is so often believed to be the mating of the snakes. Like the cobra, the

krait often enters the houses. It prowls at night and hunts for its food chiefly consisting of small rodents, lizards and snakes. It is a remarkably quiet snake, not anxious to bite except under provocation. When disturbed in the wild, the krait is apt to conceal its head in the coils of its body instead of attempting to bite. In spite of all this inoffensive nature, more deaths from snake-bite in India are due to this species, especially so because of its nocturnal habits and its highly powerful venom. The common krait has been recorded from the Barkuda Island.

31. Common Cobra *Naja naja naja*

The cobra is a particularly well-known venomous snake of India, which is recognised once it has erected its hood and displays the distinct "Spectacle mark"—a pair of ocelli connected by a U-shaped band on the back of its extended hood. When it is not displaying the hood which is formed by raising one-third of the body and spreading out some of the ribs in the neck region, the cobra looks like any other snake. The erected hood alarms the cobra's enemies and gives the snake a chance to strike and kill its prey. The common cobra is generally buff, brown or black in colour, with light or dark bands, cross-bars, variegations or reticulations which disappear with age. In addition, there is a black spot on either side of the underside of the hood and two or more black crossbands further below. The cobra is a remarkably adaptable snake and is found in all types of country : plains, jungles, open fields, and even in the regions heavily populated by man. It is extremely fond of water and this is probably the reason for its preponderence during the monsoon. Adults range from 1 m to 2 m in length. The cobra chiefly feeds on rats, mice, toads and frogs, but birds, eggs, and snakes also are eaten. Cobras exhibit strong parental instincts : the Indian cobra builds a nest and the female lies coiled around it to incubate the eggs, numbering 10 to 30 while the male guards the nest. The common cobra is not an aggressive snake and it actually tends to escape when encountered in the wild. It strikes only when it is accidentally stepped on or it is under extreme provocation. When cornered, it displays the hood, hisses, sways the body from side to side, and strikes repeatedly. The cobra's bite is said to be more effective at night than during the day as the snake sees better in the darkness and strikes with accuracy and determination. Its venom is neurotoxic in nature and affects the nervous system resulting in the respiratory paralysis and the cardiac failure of the bitten person. The common cobra has been recorded from several islans in the lagoon and the recent record is from the Gopakuda Island.

Sea Snakes

Family : HYDROPHIIDAE

Sea snakes, relatives of cobras and coral snakes, are easily recognised by their compressed bodies and paddle—shaped tails. The unusually flattened tail simulates the fin of an eel with which the sea snake is often confused. However, the dry, scaly skin of the sea snake clearly distinguishes it from the fish which has a smooth and slimy skin, and in addition, a gill pouch in the neck. The long, flexible, and laterally compressed body, the rudder—like tail, the nostrils, with their watertight valve—like flaps set on top of the snout are valuable adaptations for the life of these snakes at sea. In addition, they exhibit some special adaptations : all sea snakes have salt glands to rid the body of excess salt and the right lung is very extensile and is used for absorption of oxygen, and also as a hydrostatic organ. Sea snakes have to come often to the surface to breath, but they can also remain under water for a considerable time if occasion so demands. They swim gracefully and rapidly in water, their native element, but are helpless on land where they move slowly, with an awkward gait owing to the absence of the large plate—like belly scales found in other snakes. They average in length from 1 m to 2 m, though just a few grow to 3 m. Sea snakes do not show any scheme of colouration : they are usually coloured olive or grey, cross-barred with black. They principally feed upon fish and crustaceans, which are killed by their powerful venom and swallowed whole. Sea snakes have short, fixed fangs and their venom is more potent than that of the cobra. Although they are generally described as timid and easy going, biting people if only seriously injured or under extreme provocation, it might be as well to consider all sea snakes as potentially dangerous and avoid taking risks with any sea snake. Although most produce their young alive, just a few go ashore and lay eggs. Sea snakes, which are more numerous in number than all the snakes of the world put together and are the most venomous of the living vertebrates, are known by 55 kinds, chiefly found in the Indian and Pacific Oceans. Some twenty species inhabit the Indian seas, a majority of them being found in the Bay of Bengal.

Two species are recorded from the Chilka Lake.

32. Beaked Sea Snake, *Enhydrina schistosa*

This is one of the most widely distributed and abundant sea snakes, which is easily recognised by its snout which is hooked and looks like the beak of a bird. In addition, there is a deep groove under the chin. The young are olive grey, with dark bands that encircle the body;

these bands disappear with age, the adults then being of a uniform greyish in colour, with or without faint dark bars. The belly in both the young and the adult is whitish. The average total length of an adult is 1. 1 m, but some large individuals grow to 1.2 m. The beaked sea snake was considered the most dangehers as its venom is proved to be much more powerful than that of the cobra. Two juveniles, trapped in the fishing nets, were picked up at Rambha and Barkul in the lagoon.

33. Eccentric Sea Snake, *Hydrophis obscurus*

This sea snake is rather eccentric in appearance : the head is very small and the elongated body is slender anteriorly and much compressed posteriorly. The young are olive or dark green above, with yellowish crossbands. The adults are more or less uniform grey or blue above and yellowish below. There is a yellow spot on the snout, and a curved yellow mark on each side of the head. Adults grow to 1.3 m. Annandale's (1915) contention that this species is more an inhabitant of the brackish water than the sea seems to be correct because the snake can be expected with each haul of the fishing nets operated in the Chilka Lake.

Vipers

Family : VIPERIDAE

Vipers are venomous snakes which are easily recognised by their triangular heads covered with small scales, stout bodies, and the striking colours and patterns. The tail, which is rather short is about one eighth of the total length, which may range from 2m.to 2.20m. The eyes are set far forward and the pupil is elliptic. The colour pattern comprises of a series of blotches or wavy bands. They are mostly land-living snakes, found both in the plains and the hills, but are partial to the rocky areas. They are rather slow-moving anakes, generally most active in the evening and at night. They feed mostly on small mammals, alhough they take frogs and toads, lizards, birds and their eggs, and other snakes. The poison-conducting apparatus has reached its maximum development in vipers : the canal conducting the poison is completely closed, and the large fangs are tucked in a folding-away device when not in use and are swung forward when the snake strikes. The viper venom is mainly a blood poison. Vvipers produce, as a rule, living young.

One species accurs in the Chilka lagoon.

34. Russell's Viper, *Vipera russelli*

This viper is one of the best-known and most widely distributed

of our venomous snakes. It is light brown above, with three series of large, dark rounded or oval spots and the underside is yellowish-white, or marbled with brown. At the rear of the head there are two large black markings and two light streaks which unite at the tip of the snout to form a V Adults average from 1.8 m to 2 m. in total length. The Russell's viper prefers open country and is commonly found in the grasslands, farmlands, cultivated areas, and the rocky regions. Although decidedly nocturnal in its habits, this viper is sometimes seen abroad during the day. It does not move away quickly and tends to crawl when disturbed, but holds the ground and emits a loud warning-like hiss, which can be heard up to a considerabie distance. Although disinclined to strike readily, it is always alert and can bite with force and determination, if provoked or injured. It is a much feared snake in India and is said to cause more deaths than the cobra owing to its nocturnal habits and long fangs, with which it can inject a large quantity of venom. The female is a prolific breeder, producing from 20 to 63 live young at a time. The young, which are exact replicas of the parents, are more aggressive than the adults. This viper occurs on some of the islands in the lagoon.

HOW TO FIND AND OBSERVE AMPHIBIANS AND REPTILES IN THE CHILKA LAGOON

Finding reptiles and amphibians in the field is a stimulating experience if one knows where to look for them. Here, briefly, are some tips for finding and observing amphlbians and reptiles found in the Chilka lagoon.

Frogs and toads can easily be found at night when they are breeding or prowling for food. They can also be found in any pond, marsh, or other body of water fringing the lake. The suggested season for collecting and observing the amphibians and reptiles is during the monsoon when these creatures congregate in large number for breeding and the best time to collect them is about early morning, late evening, and at night. A flash-light will be useful in observing them at night. The debris, the vegetation, and the piles of rock near the edge of the lake shelter a variety of amphibians and reptiles which will be exposed after a thorough overhaul of the entire area. Inspection of small holes in the mud or sandy, loose soil under the shade of trees might reveal the

presence of some rare burrowing forms. Fishing nets operated in the lake may pick up snakes and turtles in each haul and it is recommended that the observer should be present when the catches are sorted out. Another profitable technique is to keep a watch on the entire surroundings of the camp and "turn" every stone, log, dead wood, cardboard or junk which often might conceal some rare species. No lizard in the lagoon is venomous. A couple of snakes found in the lake and some three species inhabiting the islands are highly venomous. Unless these can be recognised positively in advance, the tourist should treat all snakes with due caution and avoid them as far as possible.

CHECKLIST AND DISTRIBUTION OF THE AMPHIBIANS AND REPTILES OF THE CHILKA LAGOON

SCIENTIFIC NAME	ENGLISH NAME	ORIYA NAME	DISTRIBUTION
(1)	(2)	(3)	(4)
Amphibia			
Anura			
Ranidae			
Rana cyanophlyctis	Skipping Frog	Pani benga	Throughout India ; Southwest Asia ; Sri Lanka ; Thailand : Malay Peninsula.
Rana tigerina	Bullfrog	Brahmuny benga	Throughout India, and Sri Lanka ; southern China, Malay Peninsula, and Archipelago.
Rana limnocharis	Paddy-field frog		Eastern Asia from Japan and China to India (generally) ; Sri Lanka ; Malay Peninsula and Archipelago, eastward to the Philippines, Borneo, and Lombok.

(1)	(2)	(3)	(4)
Rana breviceps	Indian Burrowing Frog		India, Sri Lanka, and Upper Burma. Mostly found in the plains of southern India.
Microhylidae			
Microhyla ornata	Ornate Frog		India ; Sri Lanka ; Burma ; Malay Peninsula ; Thailand ; Tonkin and Hainan.
Bufonidae			
Bufo melanostictus	Common Indian Toad	Kuji benga ; Luni benga	India ; Sri Lanka ; Mauritius ; Malay-archipelago ; Indo-China ; South China ; Hainan ; Philippines.
Rhacophoridae			
Polypedates maculatus	Tree Frog	Katha benga	India ; Sri Lanka.
Reptilia			
Testudines			
Emydidae			
Lissemys punctata	Peninsular Soft-shell	panka kaichho	The Peninsula, south of the Ganges ; Sri Lanka.
Squamata			
Sauria			
Gekkonidae			
Hemidactylus frenatus	Southern House-Gecko	Jhitpiti	Throughout India ; Pakistan.
Hemidactylus brooki	Spotted House-Gecko	Do	Asia ; Africa ; introduced elsewhere.
Hemidactylus leschenaulti	Bark Gecka		India ; Sri Lanka ; Pakistan.
Agamidae			
Calotes versicolor	Indian Garden Lizard	Endua	Throughout the Indian subcontinent and most of Southeast Asia.
Sitana ponticeriana	Fan-throated Lizard		Throughout India, barring east of the Ganges.

(1)	(2)	(3)	(4)
Psammophilus blanfordanus	Rock Lizard		From Bihar in eastern India through Eastern Ghats to the southern tip of India (Kanyakumari)
Scincidae			
Mabuya bibroni	Sand Skink		East coast from Orissa to Kanyakumari, Tamil Nadu.
Mabuya carinata	Common Skink	Champei-neula	Throughout India excepting the northwest.
Barkudia insularis	Barkudia Limbless Skink	Deemundia	Bnrkuda Island. Chilka Lake ; Waltair ; Nandankanan Biological Park, Orissa.
Varanidae			
Varanus bengalensis	Common Indian Monitor	Godhi	Throughout the Indian subcontinent.
Serpentes			
Typhlopidae			
Ramphotyphlops braminus	Common Blind Snake	Telia sapa	A widespread species ; introduced in all parts of the giobe by human agency or acci-dent.
Typhlops porrectus	Slender Blind Snake		India ; Pakistan ; Lanka.
Typhlops acutus	Beaked Blind Snake		Peninsular India, south of the Gongetic plain ; rare south of latitude 16 on.
Boidae			
Eryx conicus	Common Sand Boa	Boda sapa	From the Himalayan foot-hills to Kanya-kumari Tamil Nadu and Pakistan to Bihar, Bengal, and Orissa in the east ; Noth Sri Lanka.

(1)	(2)	(3)	(4)
Acrochordidae			
Chersydrus granulatus	Asiatic File Snake		Coasts of Sri Lanka, India, and Iada-China ; Australia, Papua New Guinea, and the Solomon Islands.
Colubridae			
Ptyas mucosus	Rat Snake	Dhamana	Throughout the Indian subcontinent ; Sri Lanka ; Burma ; Afghaninistan ; Turkestan ; southern China.
Boiga trigonata	Common cat Snake	Dalua naga	Fairly common in India ; Sri Lanka ; Pakistan.
Dendrelaphis tristis	Common Bronzeback Thee Snake		Peninsular India ; Sri Lanka.
Xenochrophis piscator	Checkered Keelback Water Snake	Dhanda	Indian subcontinent ; Malaya ; Southern China ; Taiwan.
Enhydris enhydris	Smooth water Snake		From coastal Andhra Pradesh to eastern Uttar Pradesh ; southern China ; Indo-china ; Godavary.
Cerberus rhynchops	Dog-faced Water Snake		Goasts of India, Pakistan, Bangladesh and eastwards.
Elapidae			
Bungarus caeruleus	Common Krait	Kaudia chiti	From Pakistan to West Bengal and south to Kanya-kumari ; Sri Lanka.
Naja naja naja	Common Cobra	Naga ; Gokhara	From Transcaspia in the north, through Indian

(1)	(2)	(3)	(4)
			subcontinent to southern China and to the Philippines ; Sri Lanka.
Hydrophiidae			
Enhydrina schistosa	Beaked Sea Snake	Dushta sarpa	Bay of Bengal ; Indian ocean ; abundant on both coasts of India and in estuaries.
Hydrophis obscurus	Eccentric Sea Snake	Biddi mallia	Boy of Bengal ; Common in the Chilka Lake.
Viperidae			
Vipera russelli	Russell's viper	Chandra bora	The whole of the Indian subcontinent ; Thailand ; Indo-china ; Formosa ; Indo-Australian Archipelago ; Sri Lanka.

GLOSSARY

Adaptation : a morphological or physiological or behavioural feature of an animal that enables it to its way of life.

Adult : a fully grown and sexually mature individual.

Aestivation : a passive period of life during prolonged drought or excessive heat.

Amphibia : animals that are capable of living both in water and on land.

Anal : the single or double scale in front of the vent.

Anterior : towards the head end.

Arboreal : living in or among trees.

Aquatic : living in water.

Bask : lying with the body exposed to the sun.

Belly plates : enlarged scales on the lower surfaces of a snake.

Blotches : Large but irregular markings on the body.

Bifid : forked.

Bipedal : walking on two legs ; holding back the fore-limbs along the sides of the body when running.

Carapace : dorsal (top) part of the shell of a turtle/tortoise.

Carnivorous : flesh-eating.

Clutch : the eggs laid by a female at a time.

Consriction : a method of killing prey employed by some snakes, in which the snake's body is tightly coiled around the body, causing death of the victim by strangulation.

Cranial : pertaining to the skull.

Crrnial crest : knobby protuberances on the back of the head in toads.

{*Crossbands* / Cross-bars} : stripes running crosswise along the body of an amphibian/reptile.

Cryptic : hidden.

Diurnal : active by day.

Dorsal : pertaining to the upper surface.

Dorsum : upper surface (back).

{*Estuarine* / Brackish} : inhabiting in the lower part of a river where freshwater mixes with sea water.

Femoral pore : a pore situated on the thigh of a gecko or in other lizards.

Fossorial : adapted for a burrowing mode of existence.

Granules : Small, rounded scales.

Gular : of or pertaining to the throat.

Habitat : the type of an environment in which an animal occurs.

Habits : life-history and behaviour of an animal-its food and feeding habits and mode of reproduction.

Hatchling : the young one that has just hatched out.

Imbricate : seales on the body of a reptile that overlap like shingles of a roof.

Inguinal : of or pertaining to the groin.

Insectivorous : feeding on insects.

Juveniie : immature ; young.

Juxtaposed : placed in apposition to.

Keel : sharp edge of a scale.

Labial : pertaining to the lips.

Mandible : skeleton of the lower jaw.

Marine : inhabiting the sea.

Maxilla : skeleton of the upper jaw.

Mental groove : longitudinal furrow in the chin of a snake.

Metatarsal : a bone between the tarsus and toes of the foot of an animal.

Nape : back of the neck.

Nocturnal : active at night.

Ocellus : a coloured spot.
(Pleural, Ocelli)

Omnivorous : feeding both on plant and animal matter.

Oviparous : reproduction by laying eggs that hatch outside the female's body.

Paddle : oar-like.

Parotid glands : large mucous glands on the neck, shoulder, or behind the eye in toads.

Pentadactyle : having five digits.

Plastron : the lower portion of the shell of a turtle/tortoise.

Posterior : away from the head ; towards the tail end.

Prehensile : capable of grasping or clasping.

Primitive : having changed little since the early stages of evolution.

Tadpole : the larva of a frog or toad.

Terrestrial : surface-living.

Tuberculate : covered with small, rounded bumps.

Ventral : of or pertaining to the lower surface.

Vocal pouch : a sac of skin situated underneath or at the side of the throat in male frogs and toads.

Vestigial : rudimentary.

Viviparous : giving birth to living young which develop within and are nourished by the female.

Web : the thin sheet of skin between the fingers and toes of frogs.

SELECTED BIBLIOGRAPHY

ANNANDALE, N, 1915. Fauna of the Chilka Lake. Reptiles and Batrachia. *Mem. Indian. Mus.* Calcutta, 15 : 167-174.

ANNANDALE, N. 1917. A new genus of limbless skinks from an island in the Chilka Lake. *Rec. Indian. Mus.* 13 : 17-21.

BISWAS, S. 1980. A note on the distribution of *Barkudia insularis* Annandale, a rare limbless lizard from Orissa. *J. Bombay nat. Hist. Soc.* 76 (3) : 524-525.

GANAPATHI, P. N. and K. K. Nayar, 1952. Occurrence of the limbless lizard belonging to the genus *Barkudia* Annandale in the Andhra University Campus, Waltair. *Curr. Sci.* 21 : 105-106.

GANAPATHI, P. N. and K. Rajyalakshmi. 1955. Binomics and some anatomical peculiarities of the limbless lizard *Barkudia insularis* Annandale. *Rec. India Mus* . 52 (182) : 279-290.

DANIEL, J. C. 1984. *The Book of Indian Reptiles.* Bombay Natural History Society Publication.

MURTHY, T. S. N. 1985. A field guide to the lizards of Western Ghats. *Rec. Zool. Surv. India,* Occasional Paper No. 72.

MURTHY, T. S. N. 1986. Lizards. *In Encylopedia of Indian Natural History.* (Centenary 1883-1983) Publication of the Bombay Natural History Society.

SCHMIDT, Karl P. and Rober F. Inger. 1957 *Living Reptiles of the world.* New york : Doubleday & Co.

SMITH, M. A. 1935. *Fauna of British India. Reptilia and Amphibia*-II, Sauria. xiii + 440 pp., Maps plate and text-figs. (Reprinted 1961 and 1981)

SMITH, M. A. 1943. *Fauna of British India. Reptilia and Amphibia*-III, Serpentes. xii+583 pp. (Reprinted 1961 and 1981)

WHITAKER, R. 1978. *Common Indian Snakes-a field guide,* Madras, pp. 154.

INDEX

ABOUT THE BOOK

The Pocket Book is a comprehensive guide to the identification of every species of amphibian and reptile found in the Chilka lagoon, Orissa. Almost every species is illustrated to facilitate easy recognition. The bulk of the book is written for the visitors to the Chilka in the hope that they will be stimulated to learn more about the amphibians and reptiles of the Chilka, and appreciate the place of these creatures in the ecosystem of the lagoon.

ABOUT THE AUTHOR

T.S.N. Murthy, who serves the Zoological Survey of India as a herpetologist, has long studied the amphibians and reptiles of India. He has participated in the Chilka lagoon expedition and the present book is based on the results of his herpetofaunal study. T.S.N. Murthy's researches have been blended with his extensive observations in the field. He has published several technical and popular articles in all branches of herpetology.

ACKNOWLEDGEMENTS

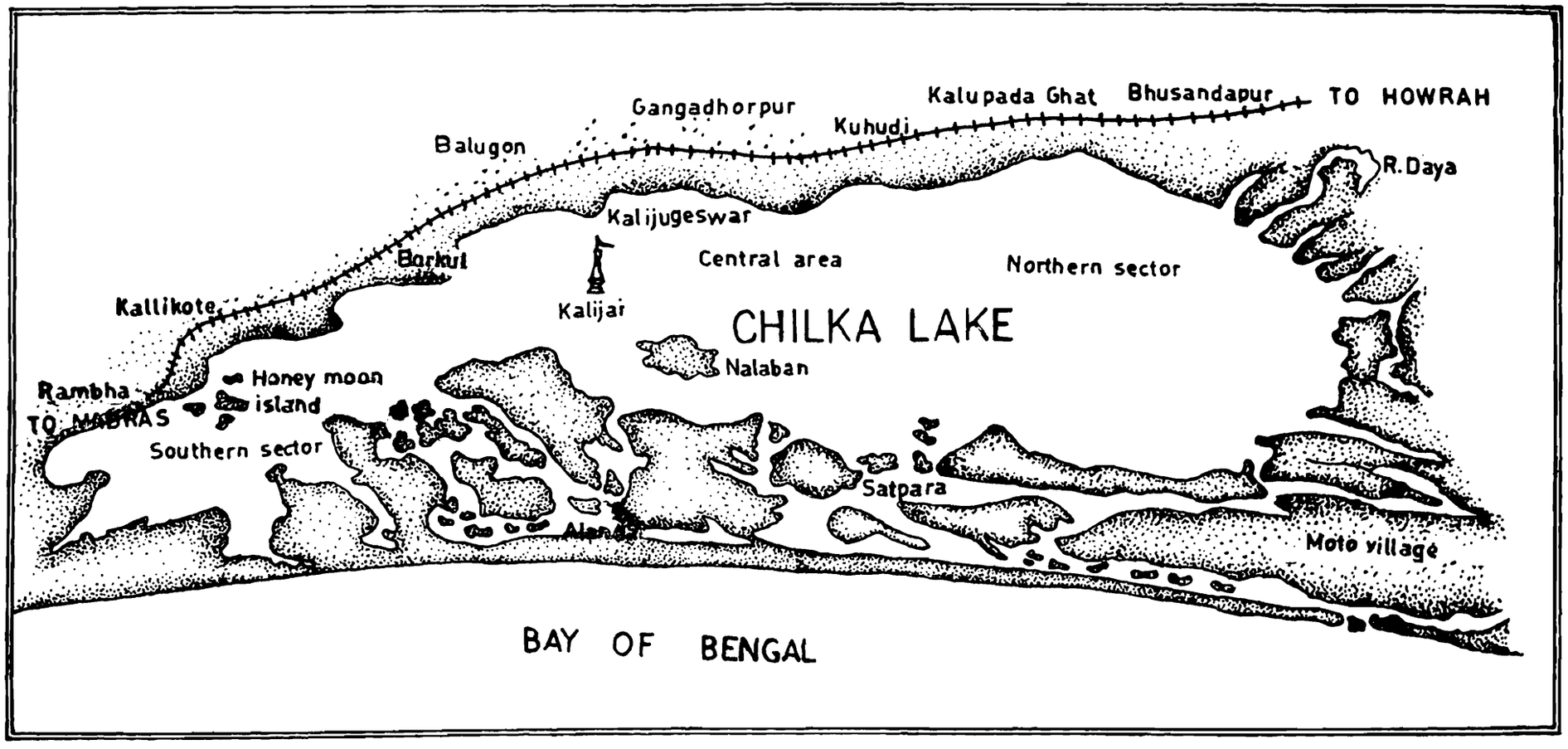
It is largely my association with the Zoological Survey of India (ZSI) and deep involvement in the Chilka lagoon expedition as a participant-in-charge of herpetology that has motivated me to attempt this book. I will, therefore, ever remain grateful to this pioneering research organisation and the Director, ZSI. I am most thankful to Dr. K.V. Rama Rao, Coordinator of the Chilka expedition, for without his help and encouragement the writing of this book would have been much more difficult. During many cruises of the Chilka Lake, I have profited on countless occasions by his abounding zeal and enthusiasm in exploring the herpetofaunal wealth of the Chilka lagoon. Special thanks are due to Sri P. Verma, Photographer of the Estuarine

Biological Station, ZSI, Berhampore who accompanied me and took photographs in the field under my supervision.

In the making of this book I have, of course, become indebted to several friends for providing me with some photographs of amphibians and reptiles of the Chilka.

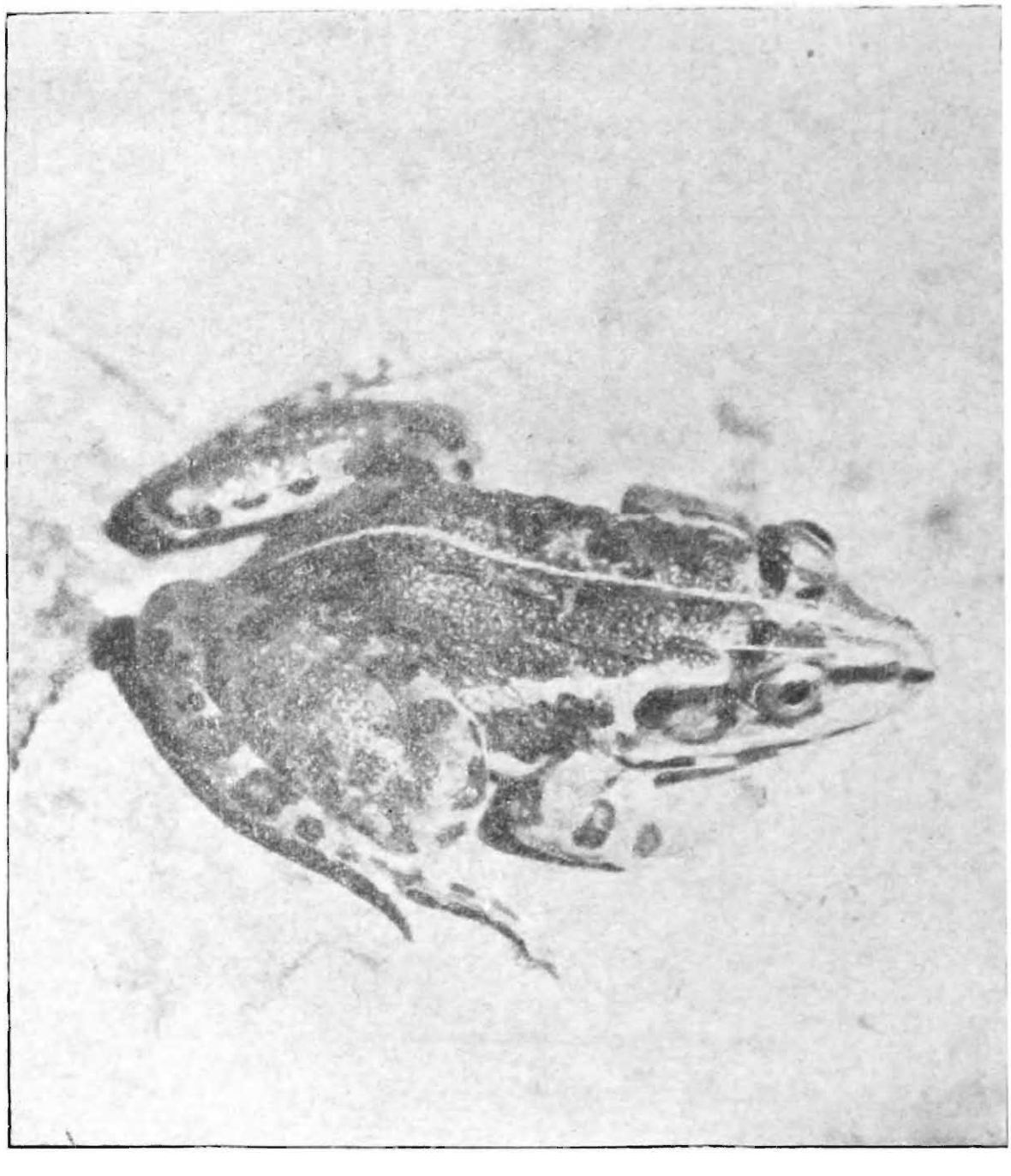
Finally, I must reserve my most special thanks to Dr. R.S. Pillai, Officer-in-Charge, Southern Regional Station, ZSI, Madras for his keen interest in my work.

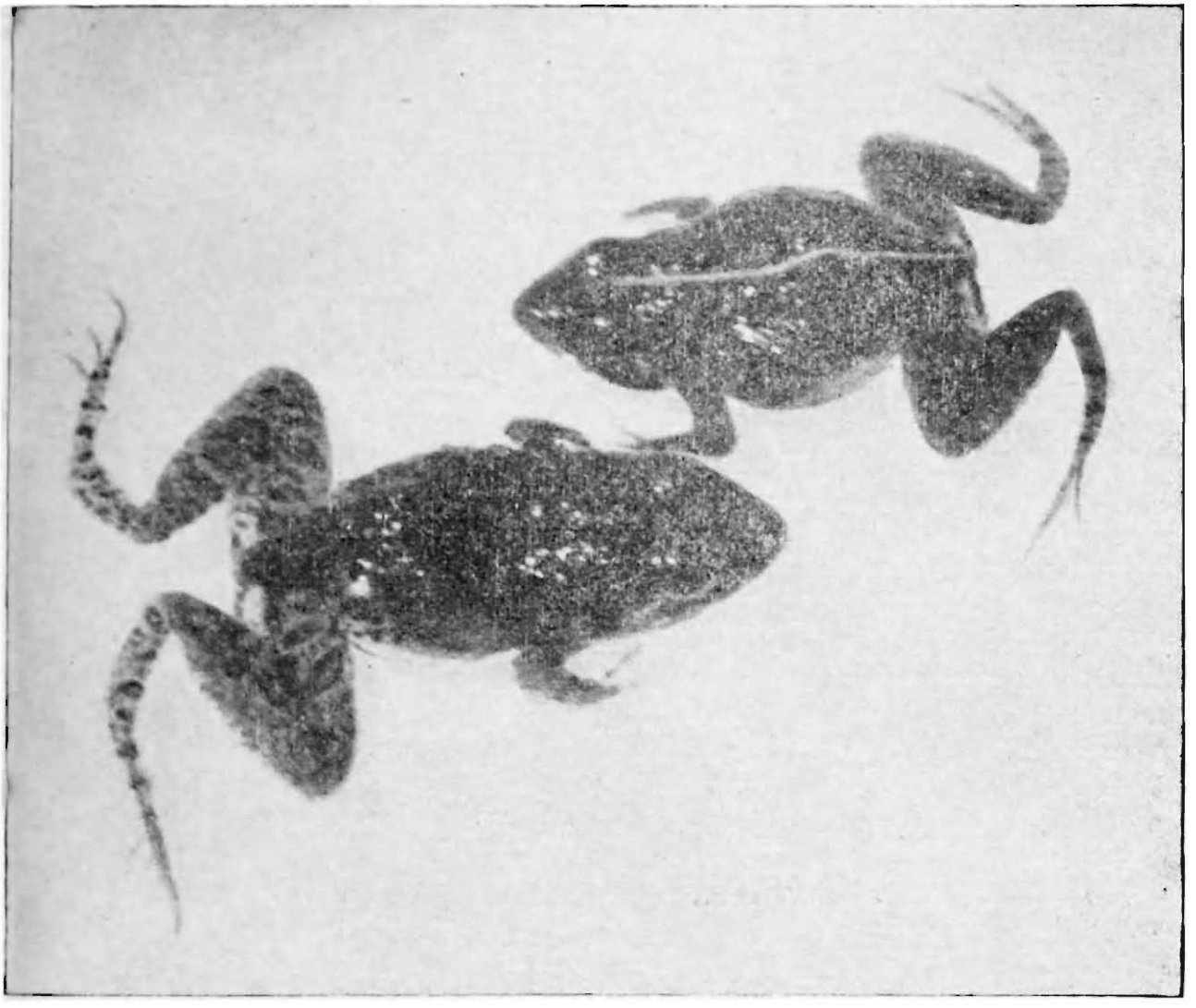
PLATES



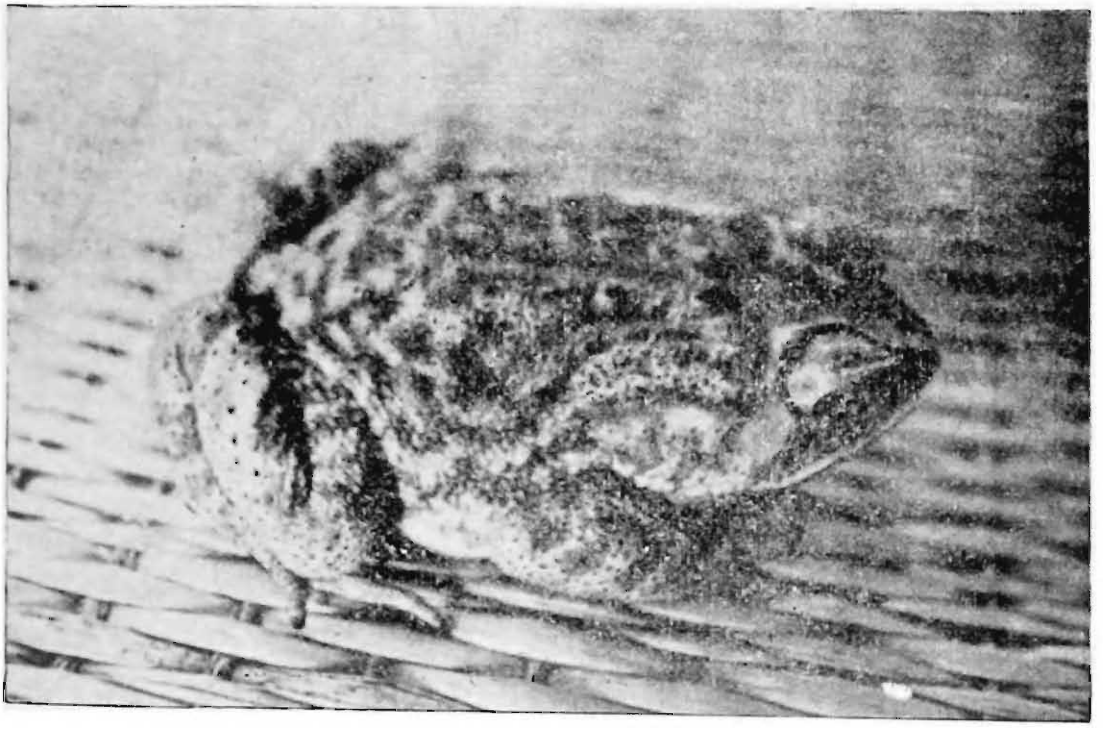
Map of Chilka Lake

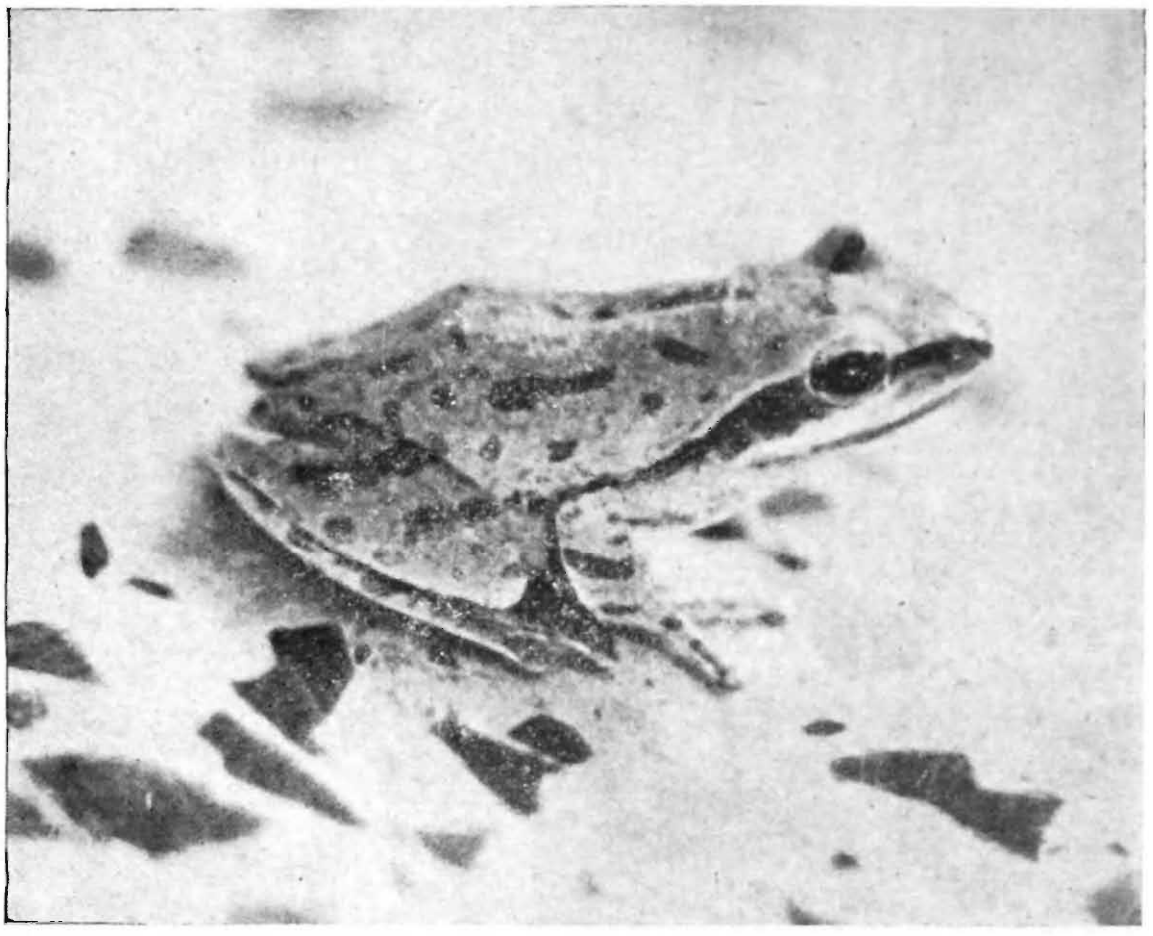
1. Skipping Frog, *Rana cyanophlyctis* Schneider



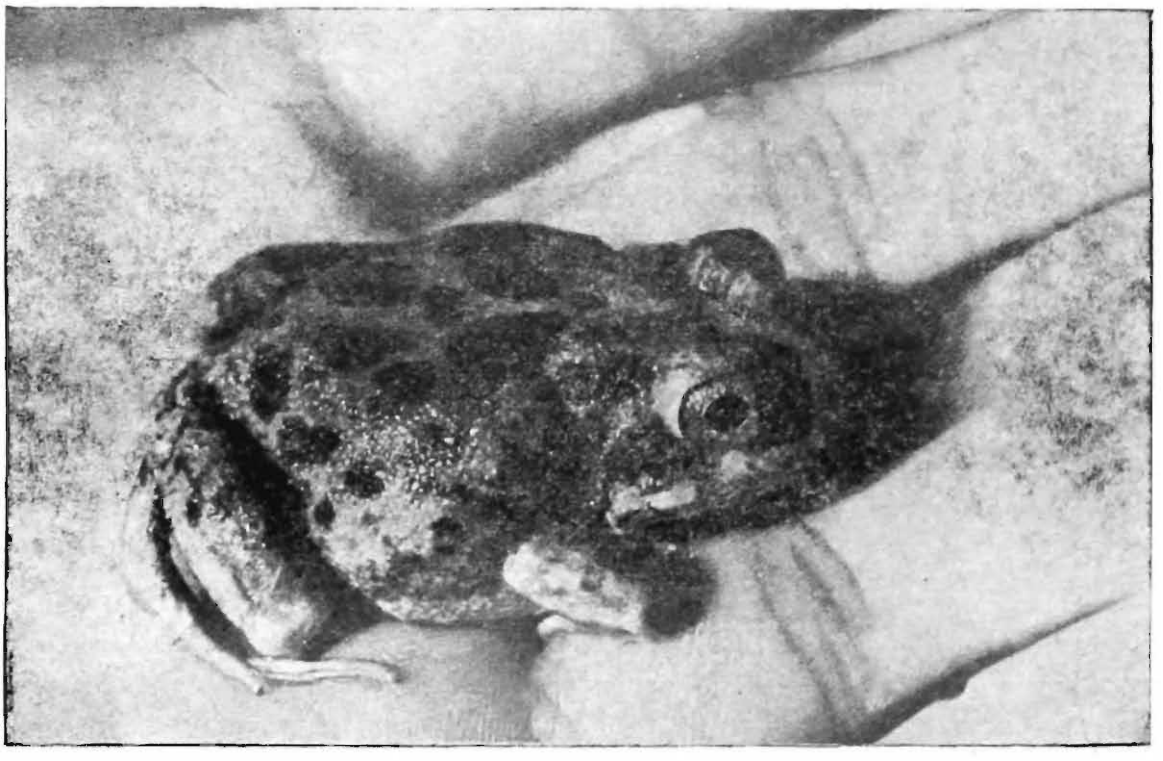


3. Paddy-field Frog, *Rana limnocharis* Weigmann

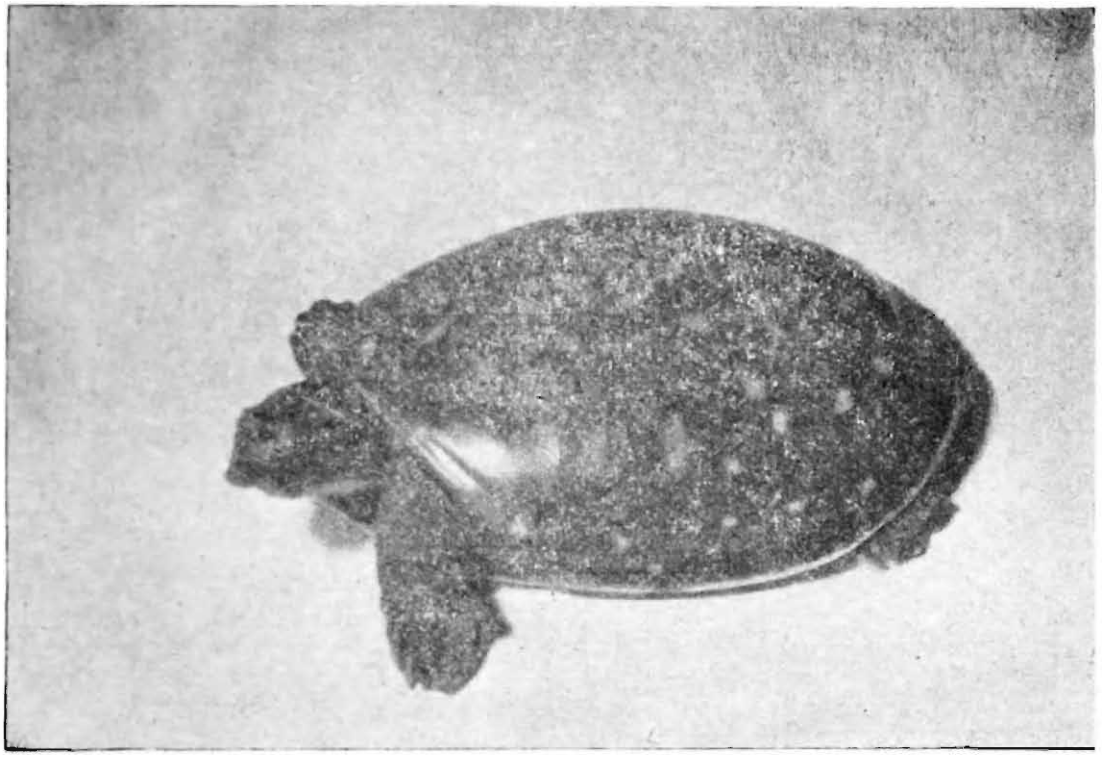




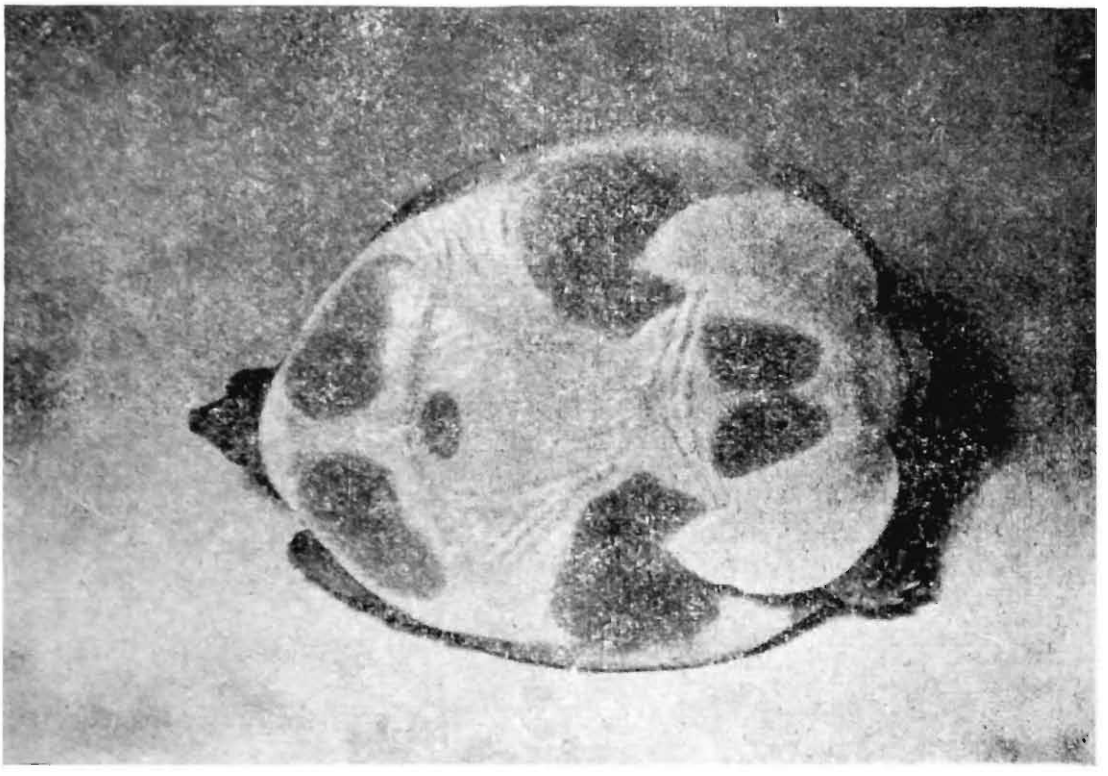
5. Tree Frog, *Rhacophorus maculatus* (Gray)



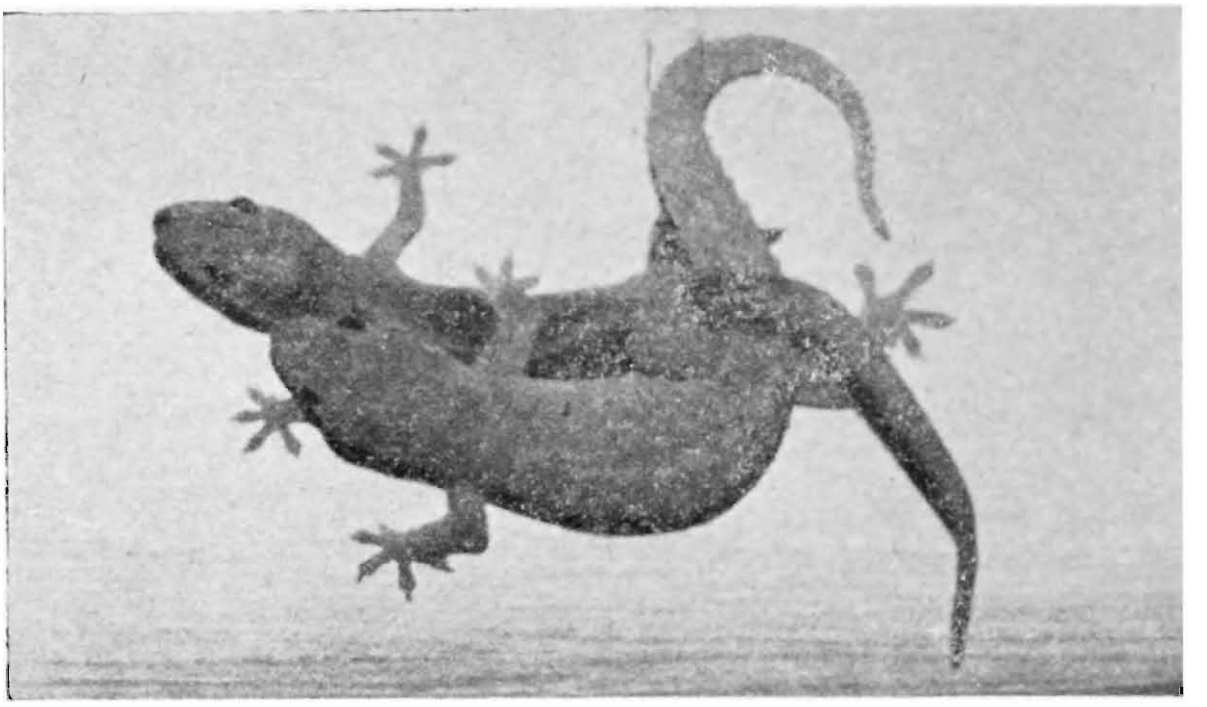
6. Common Indian Toad, *Bufo melanostictus* Schneider



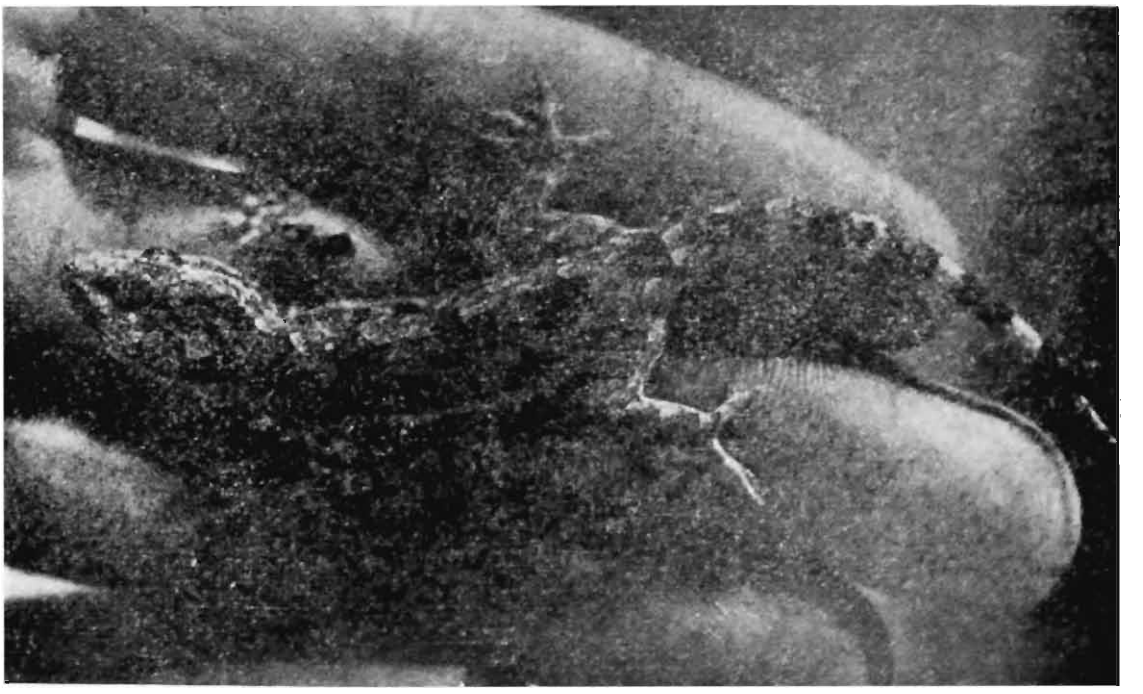
7. **Peninsular Soft-shell Turtle,** ***Lissemys punctata granosa*** **(Schoeptt)**



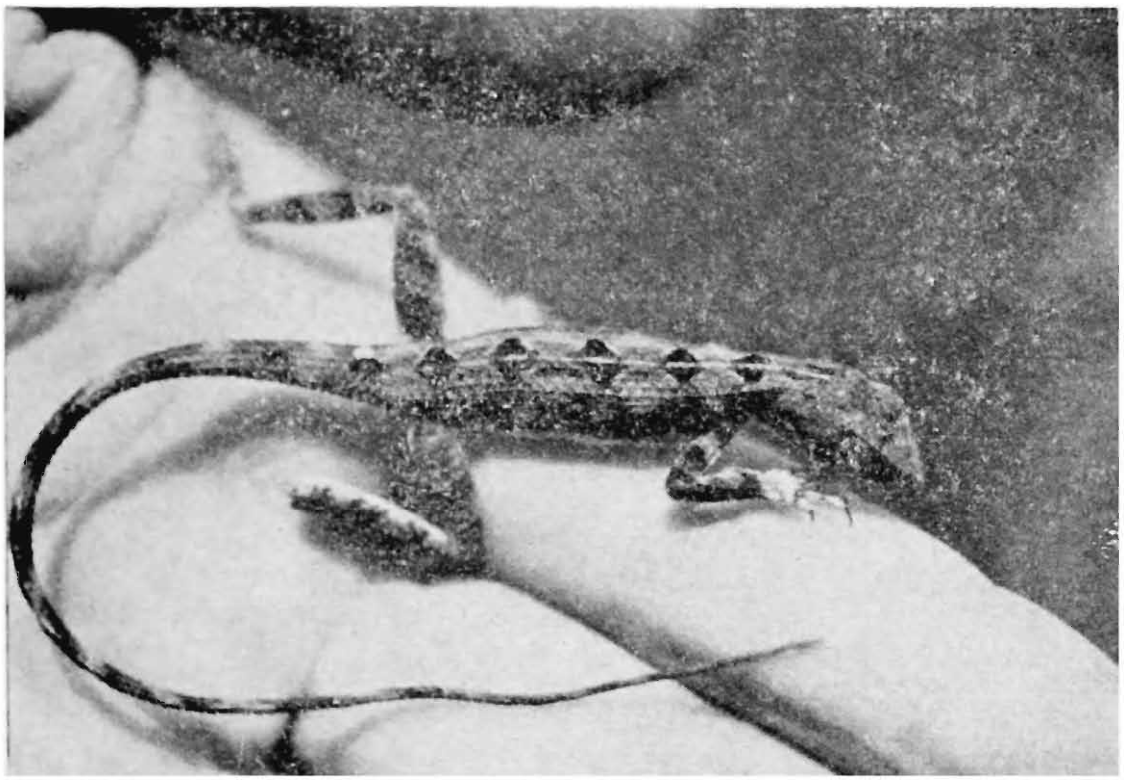
7A. Ventral aspect of the above



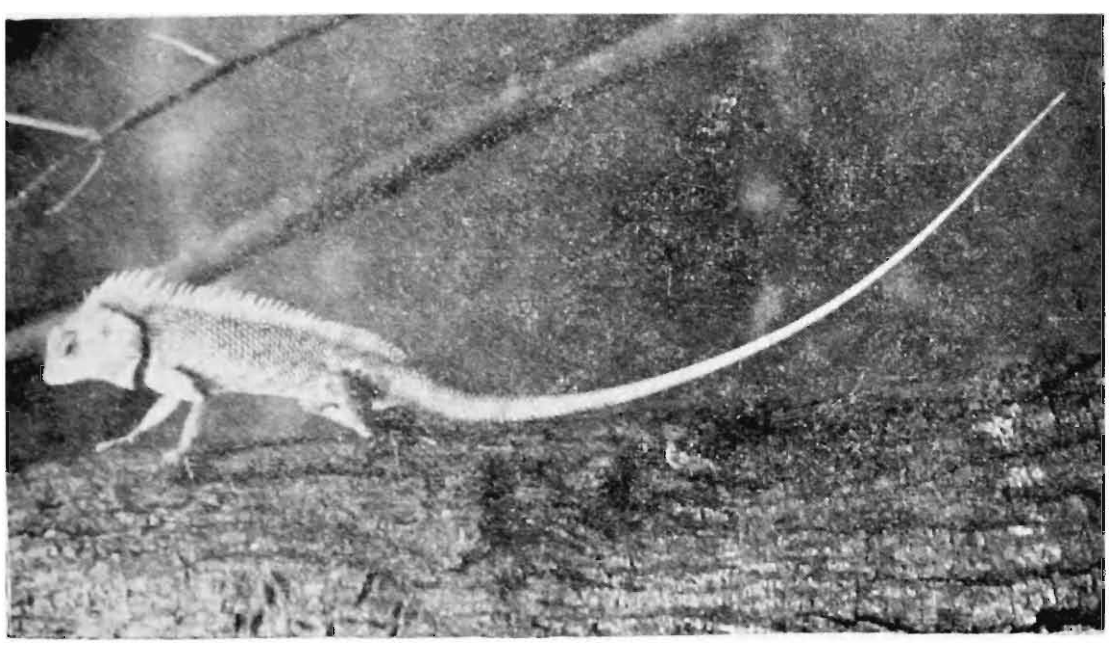
8. Southern House Gecko, *Hemidactylus frenatus* Schlegel—mating



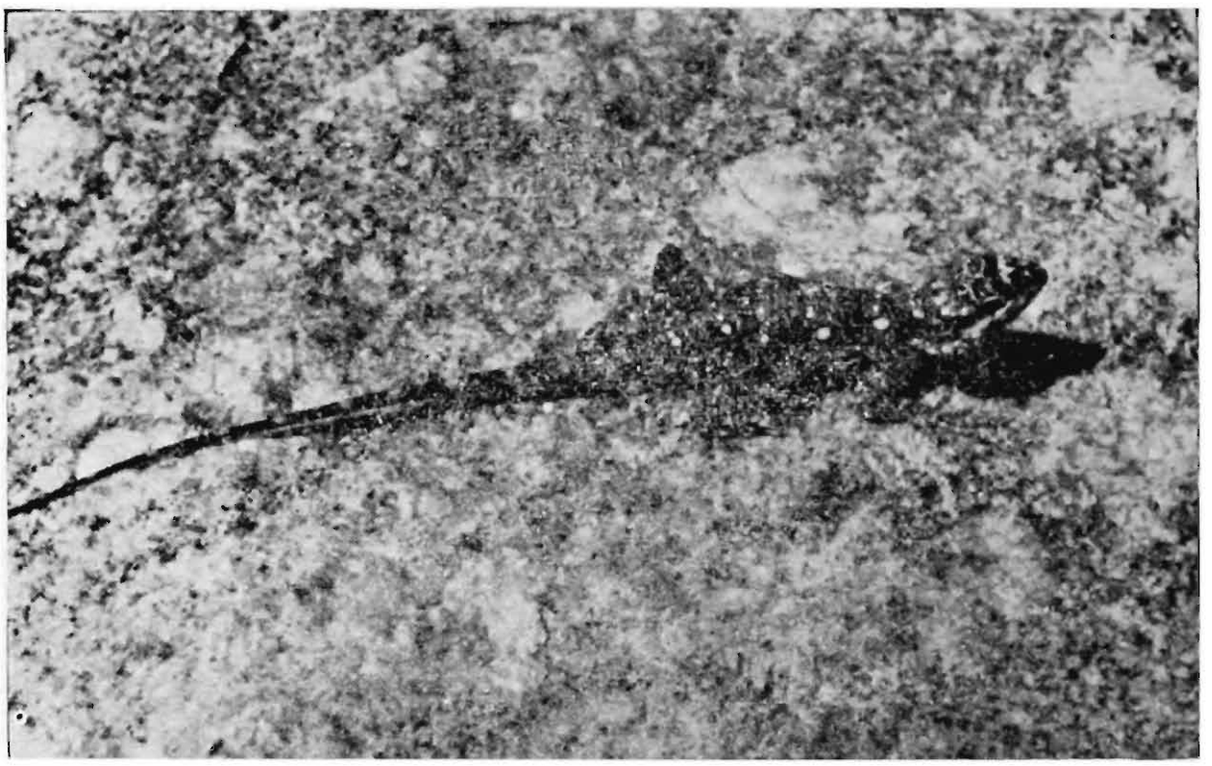
9 Bark Gecko, *Hemidactylus leschenaulti* Dumenil and Bibron



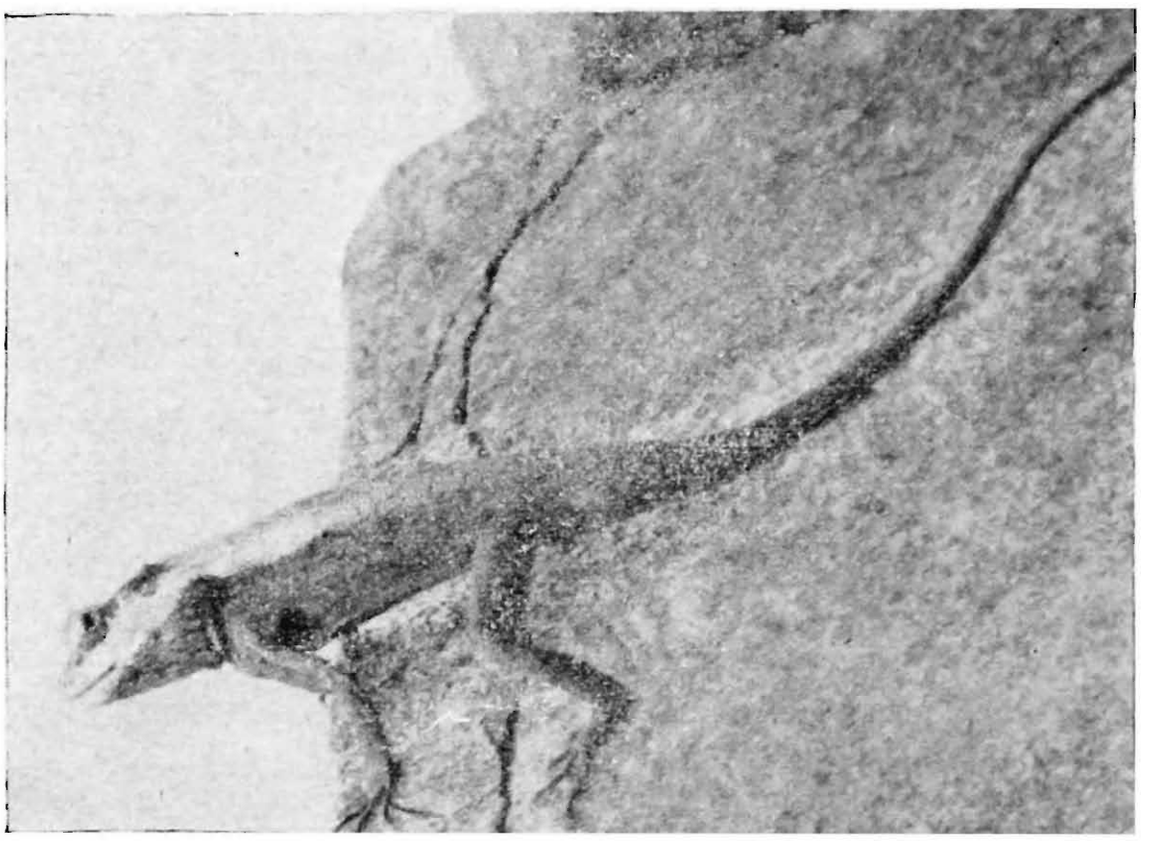
10. **Fan-throated Lizard, *Sitana ponticeriana* Cuvier**



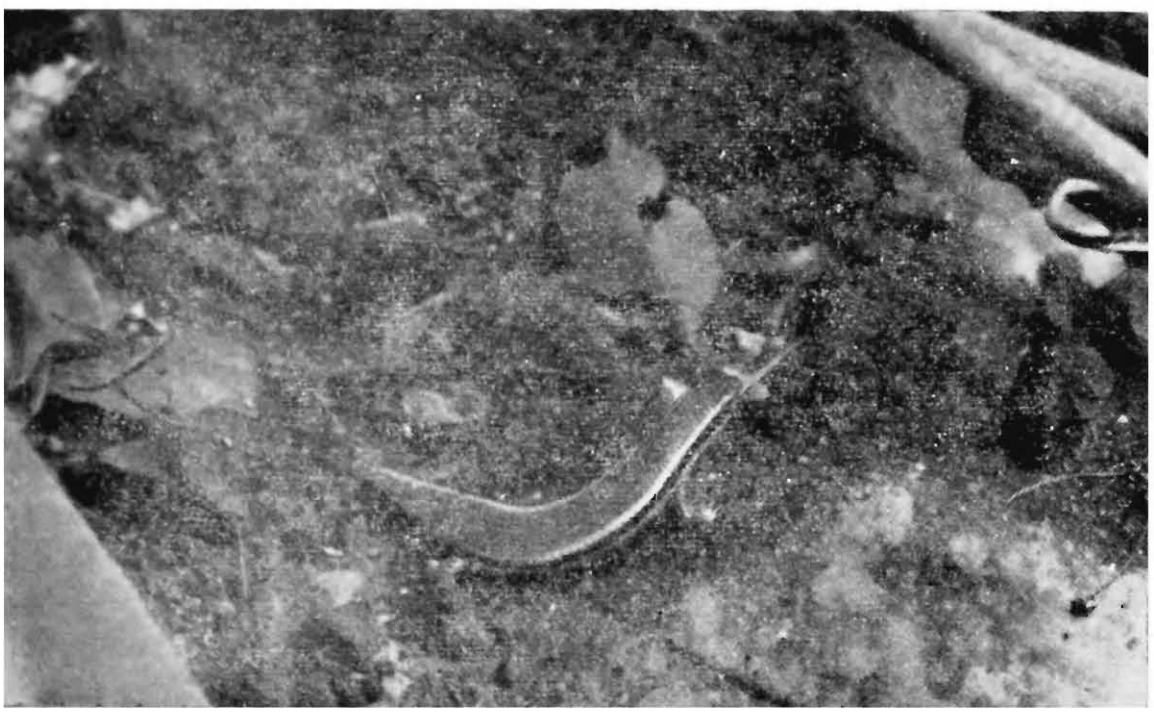
11. **Indian Garden Lizard, *Calotes versicolor* (Daudin)**



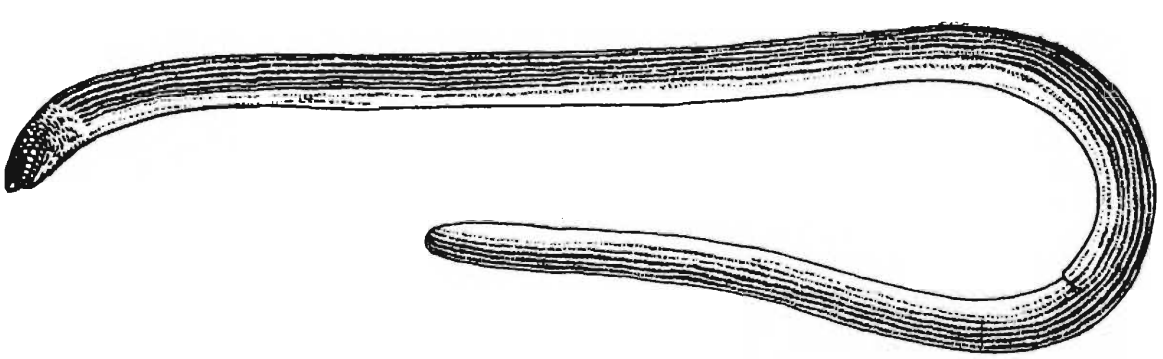
12. Rock Lizard, *Psammophilus blanfordanus* (Stoliczka)—Juvenile



12A. Rock Lizard—Adult



13. Common Skink, *Mabuya carinata* (Schneider)

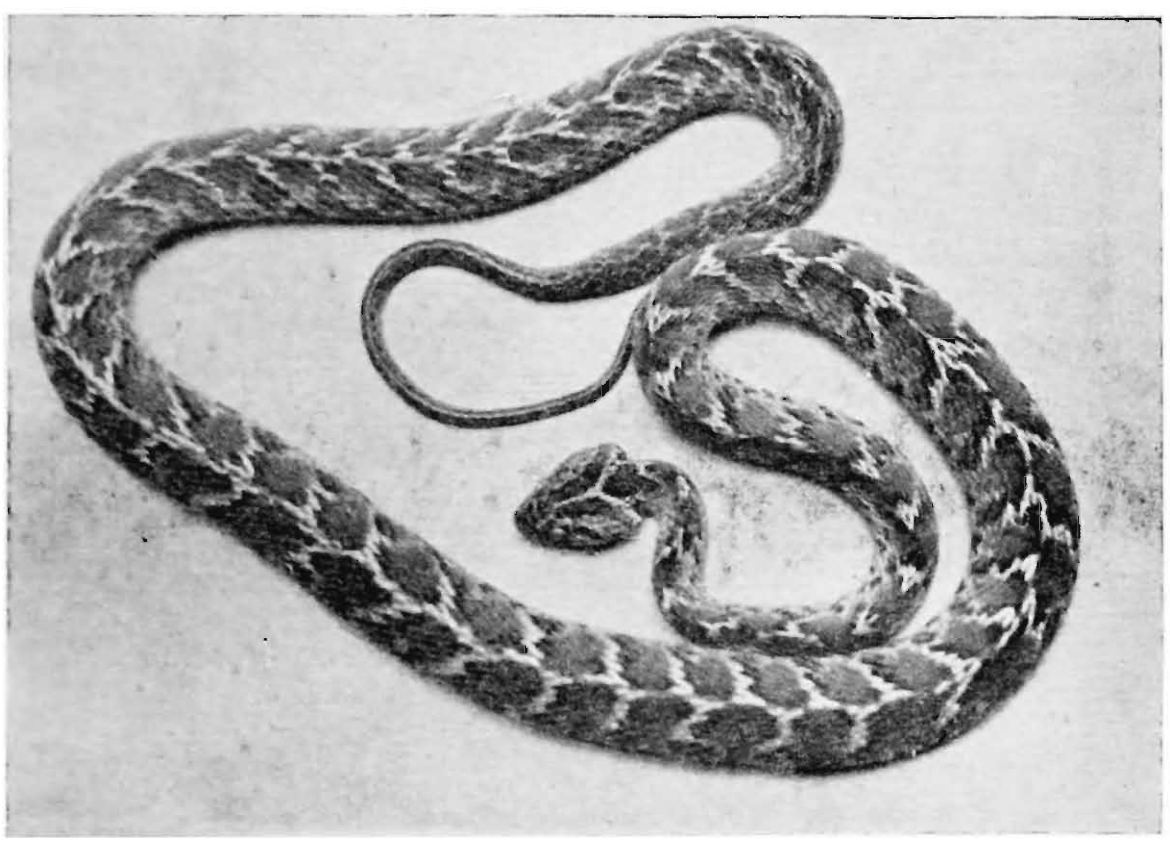


14. Barkudia Burrowing Skink, *Barkudia insularis* Annandale

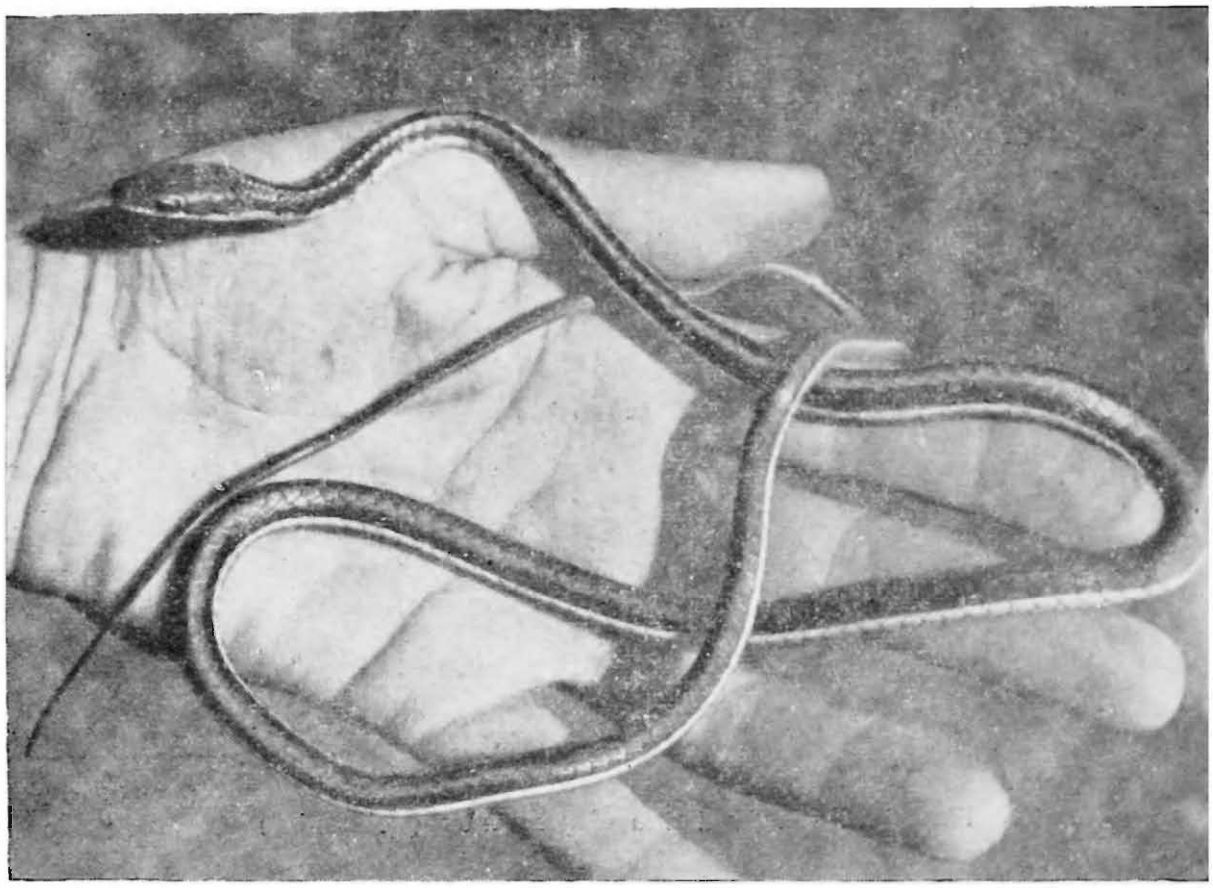
15. Common Indian Monitor, *Varanus bengalensis* (Daudin)

16. Beaked Blind Snake, *Typhlops acutus* (Dum. & Bib.)

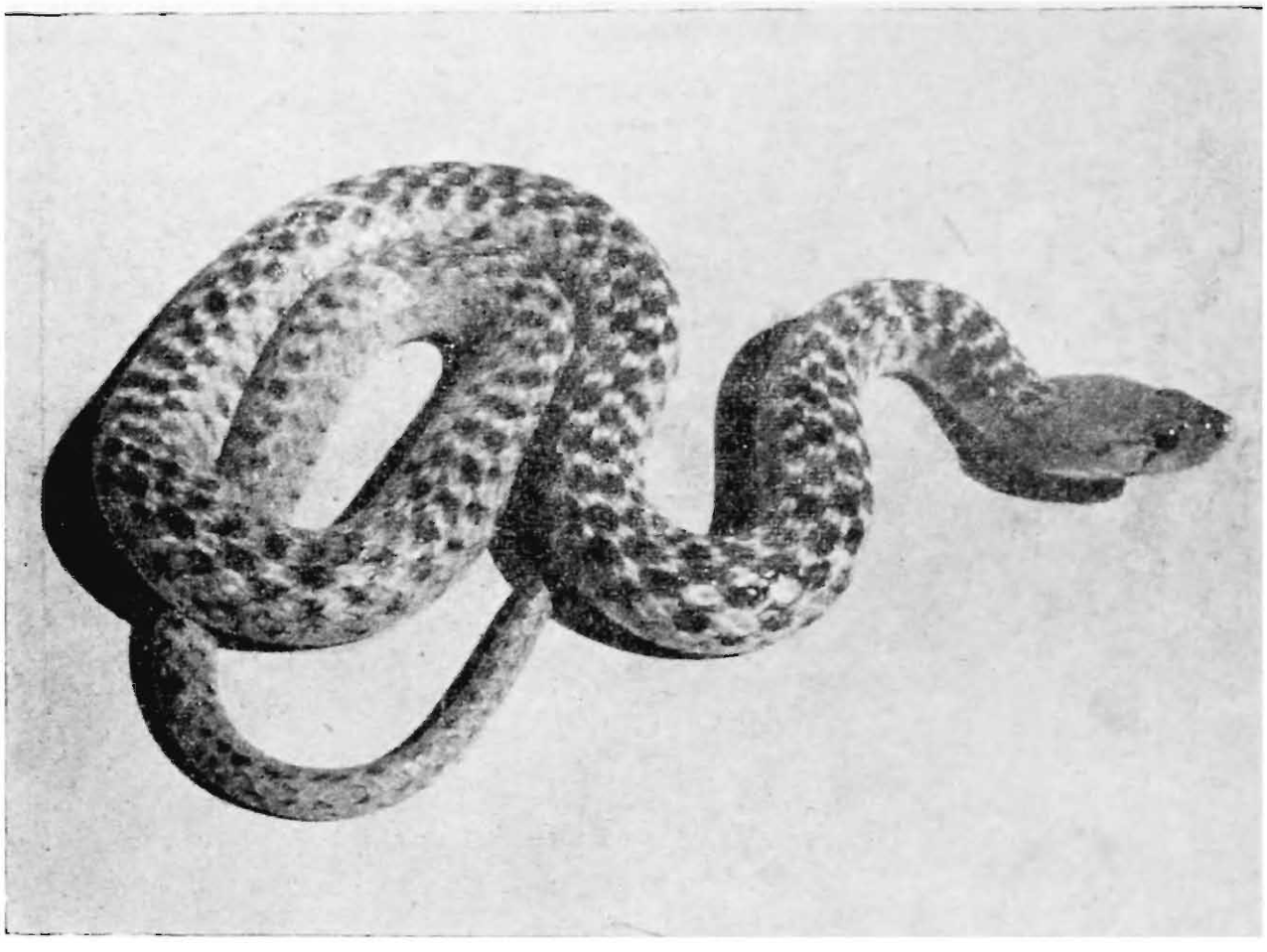
17. Common Sand Boa, *Eryx conicus* (Schneider)



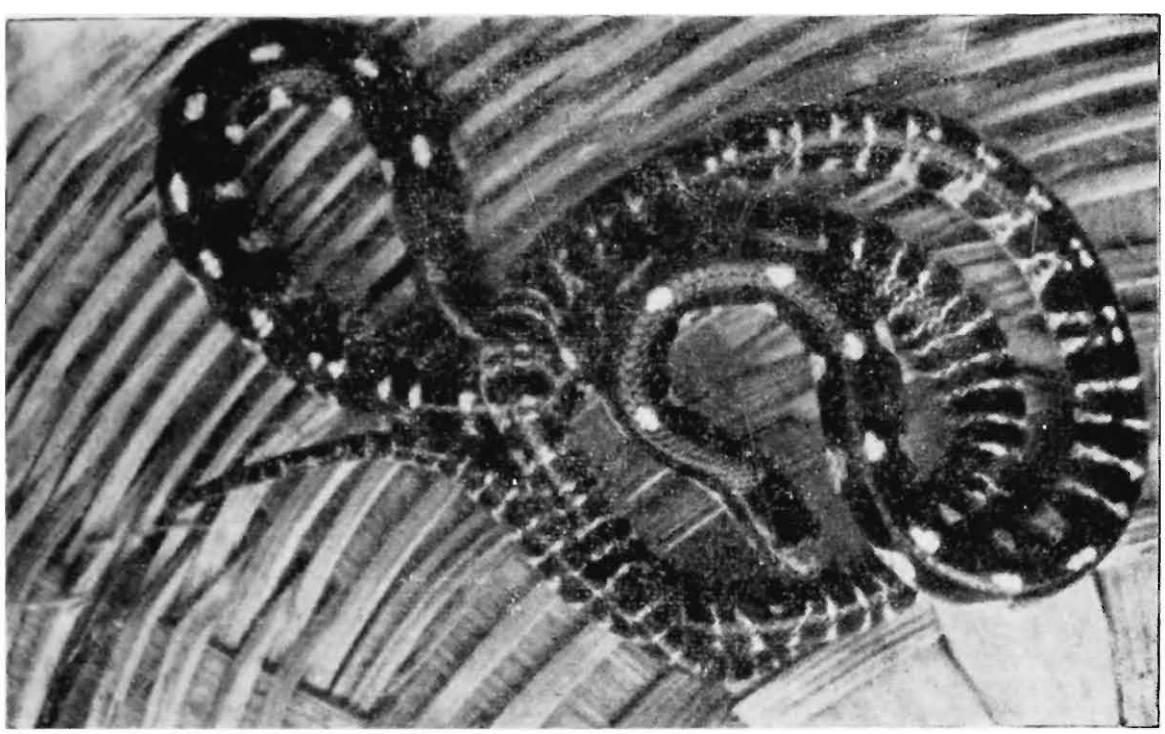
18. Common Cat Snake, *Boiga trigonata* (Schneider)



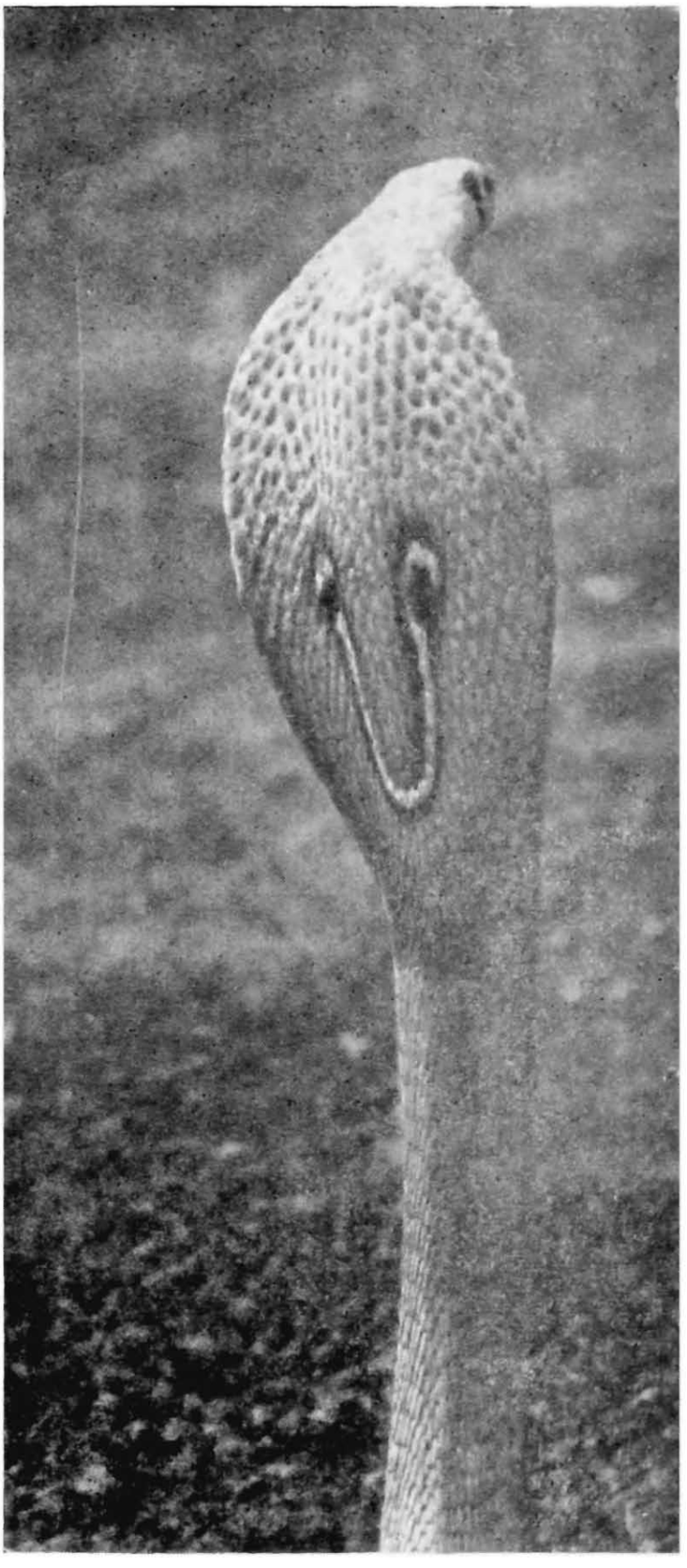
19. Common Bronzeback Tree Snake, *Dendrelaphis tristis* (Daudin)



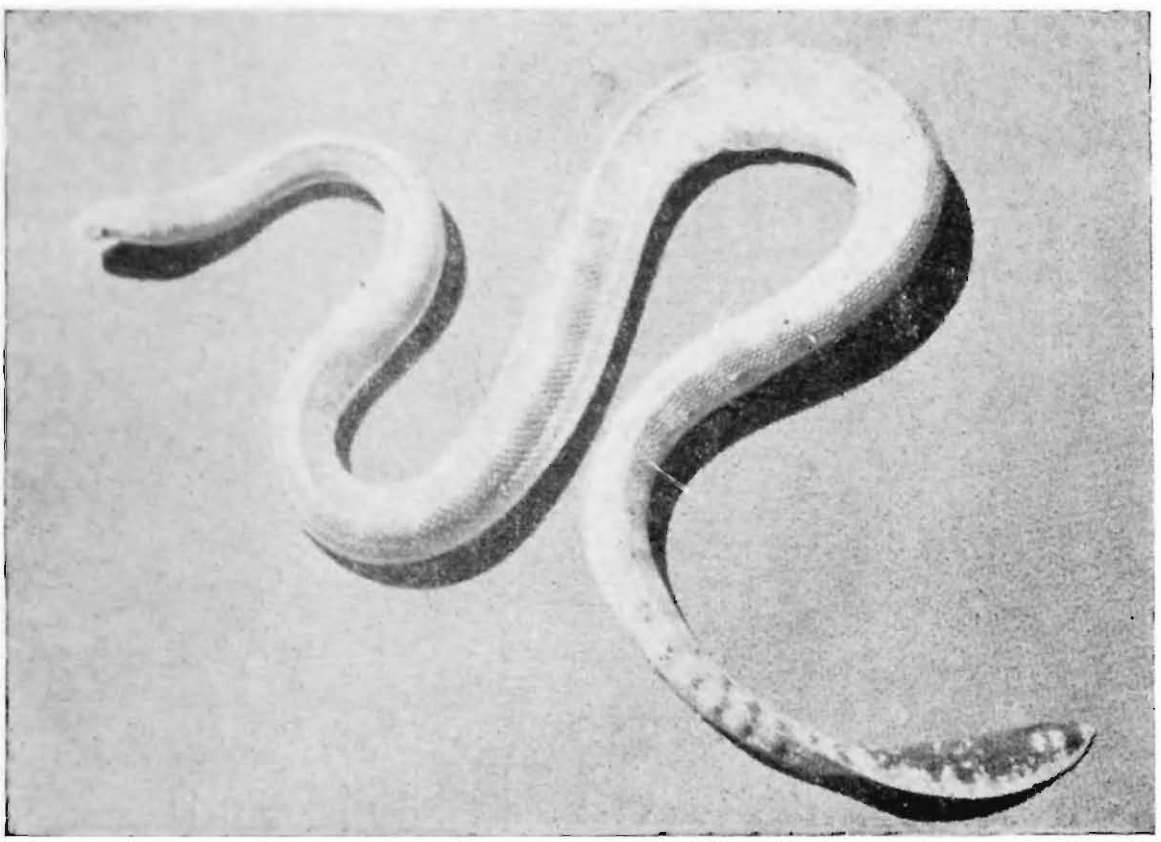
20. Checkered Keelback Water Snake, *Xenochrophis piscator* (Schneider)



21. Common Krait, *Bungarus caeruleus* (Schneider)



22. Common Cobra, *Naja naja naja* (Linn.)—With hood on display



23. Beaked Sea Snake, *Enhydrina schistosa* (Daudin)

24. Russell's Viper, *Vipera russelli* (Shaw)—baby

24A. Russell's Viper, *Vipera russelli*—adult

Fig. 1 SkippingFrog, *Rana cyanophlyctis* Schneider

Fig. 1A. The Common toad, Bufo melanostictus Schneider

Fig. 2. Paddy-Field Frog *Rana limnocharis* Weigmann

Fig. 2A. Paddy-Field Frog, *Rana limnocharis* Ventral aspect

Fig-2B The burrowing Frog, *Rana breviceps (Schneider)*

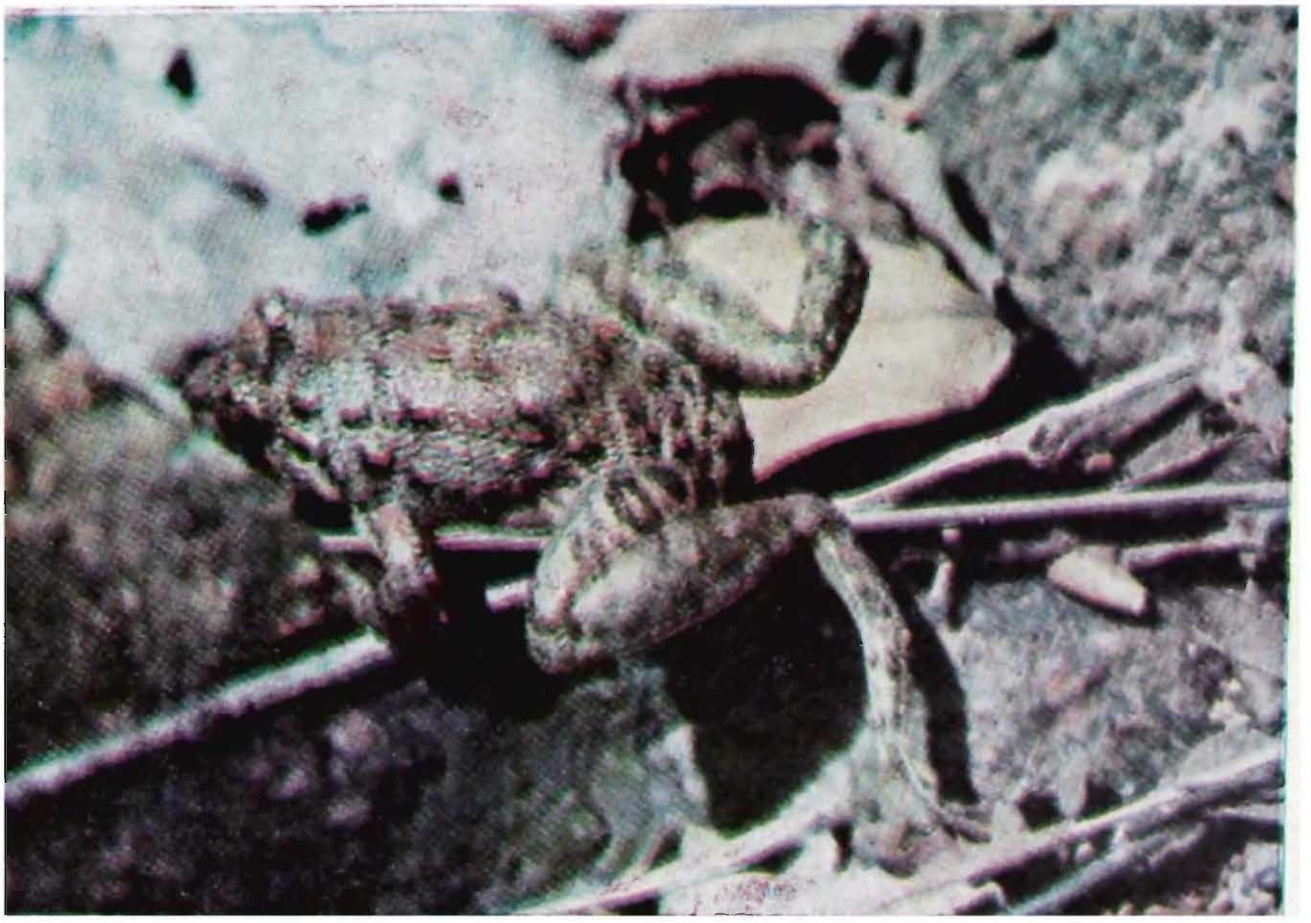


Fig. 2C. The Indian Bullfrog, *Rana tigerina* Daudern

Fig. 3. Peninsular Soft-shell Turtle *Lissemys punctata* granosa Schoeptt

Fig. 4. Indian Garden lizard, *Calotes versicolor* (Daudin)

Fig. 4A. Indian Garden lizard, *Calotes versicolor* (Daudin)
Breeding male

Fig. 5. Rock-lizard, *Psammophilus blanfordanus* (Stol.).. Adult

Fig 6. Sand Skink, *Mabuya bibroni* (Gray)

Fig. 7 Common blind snake *Ramphotyphlops braminus* (Daudin)

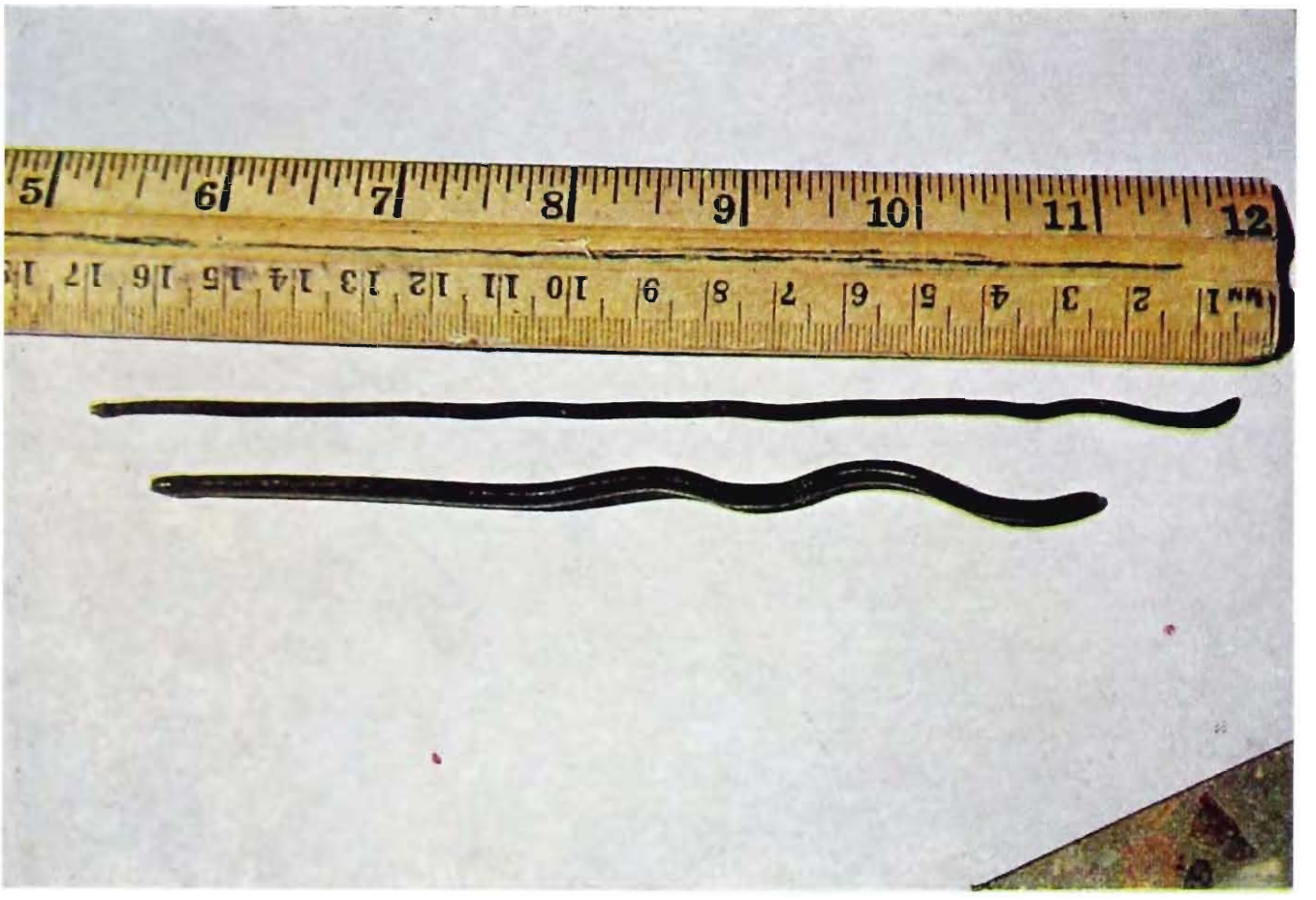


Fig 8. Slender blind snake, ***Typhlops porrectus*** (Stol) and common blind snake. ***Ramphotyphlops braminus***

Fig .8A.Rat Snake , *Ptyas mucosus* (Linn.)

Fig 9 .Asiatic File Snake , *Chersydrus granulatus* (Schneides)

Fig. 10. Common Sand Boa, *Eryx conicus* (Schneider)

Fig. 11 Common cat snake, *Boiga trigonata* (Schneider)

Fig. 12. Checkered Keelback water snake, *Xenochrophis piscator* (Schneider)

Fig. 13. Smooth water snake, *Enhydris enhydris* (Schneider)

Fig. 13A. Smooth water snake, *Enhydris enhydris*—Ventral view

Fig. 14. Dogfaced water snake, *Cerberus rhynchops* (Schneider)

Fig. 14A. Ventral aspect of the dog-faced water snake, showing the checkered pattern

Fig. 14B. Close up of the fore body of the dog faced water snake showing the cross bars

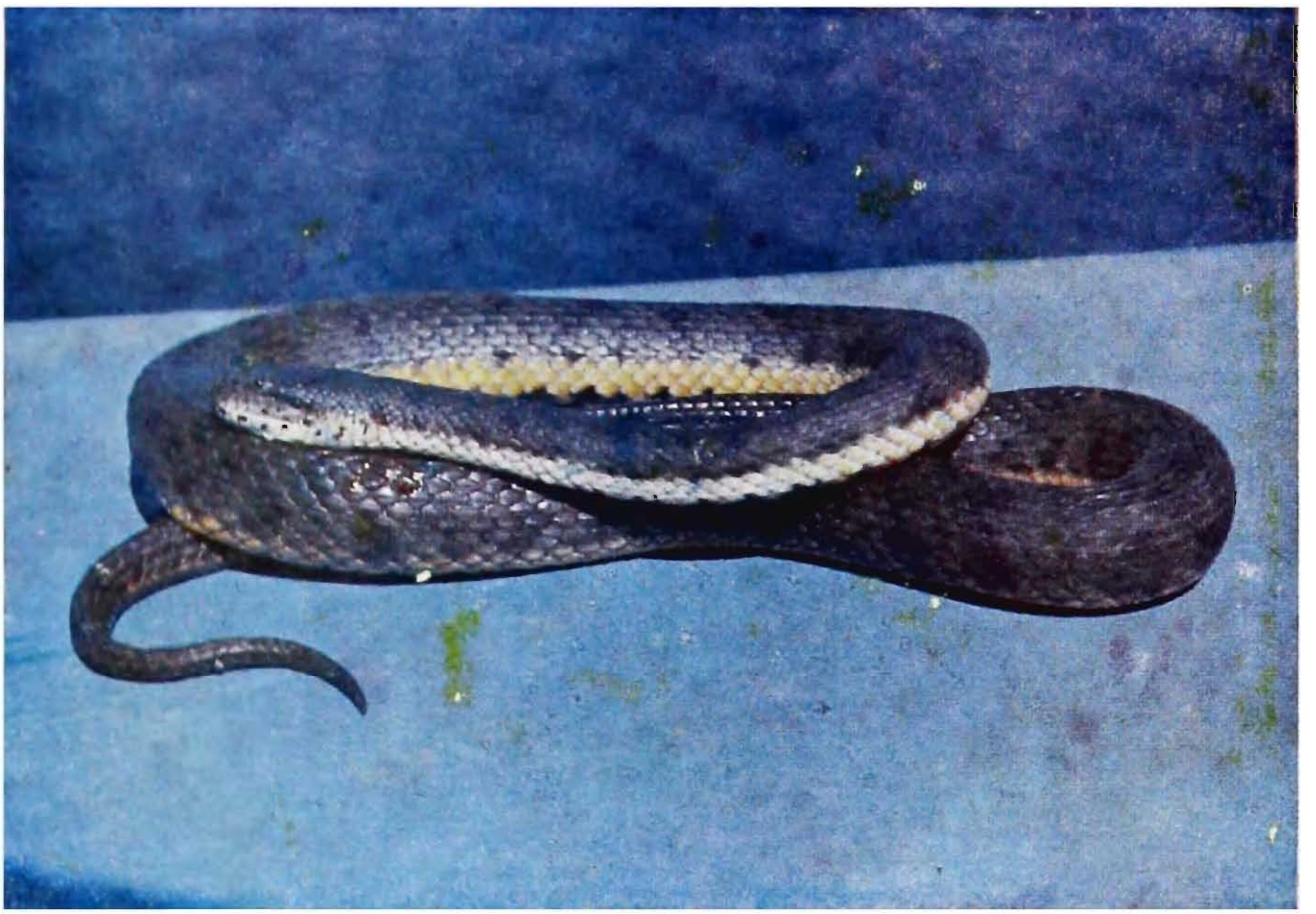


Fig. 15. A colour form of the dog-faced water snake, *Cerberus rhynchops*

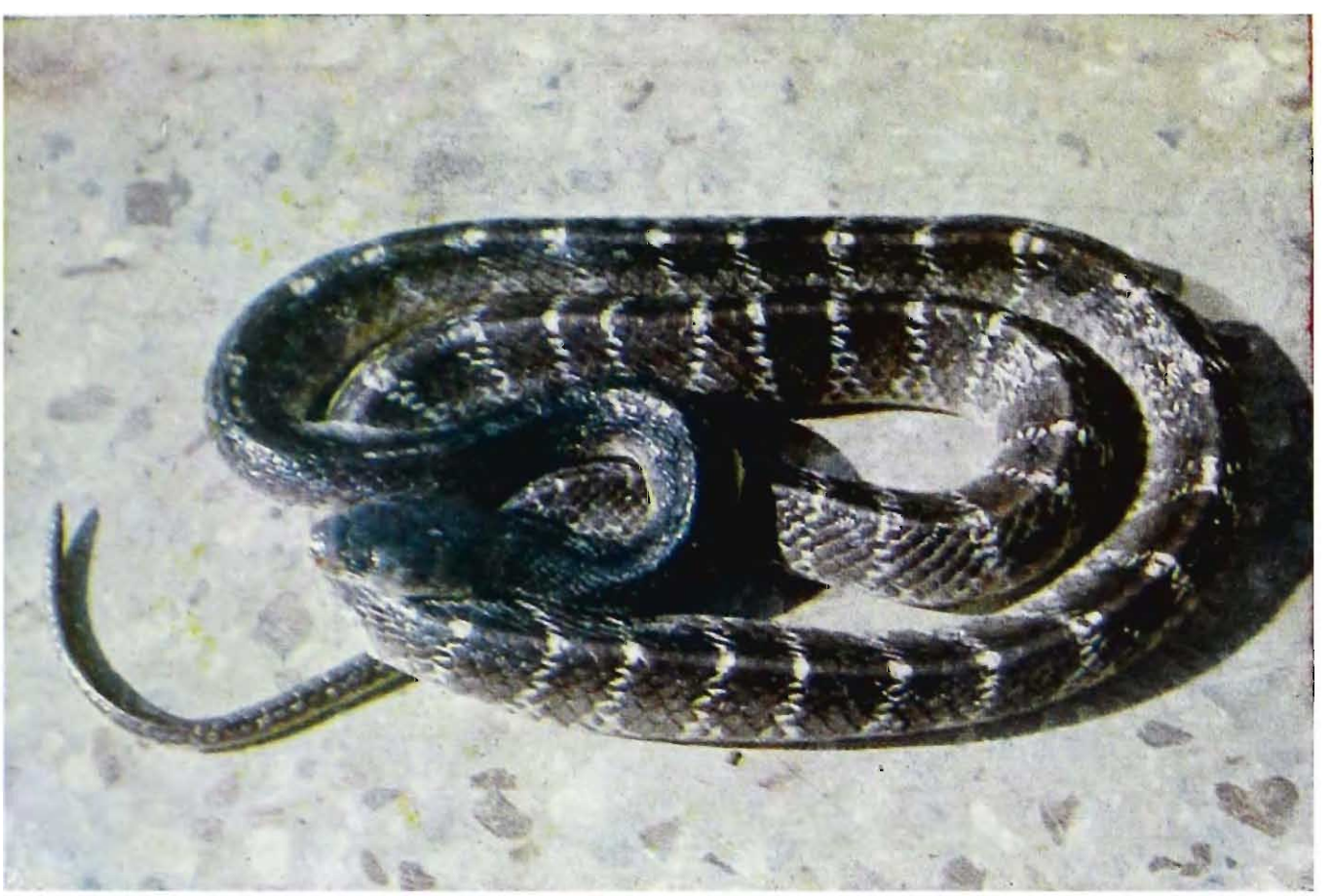


Fig. 16. Common Krait, *Bungarus cacruleus* (Schneider)

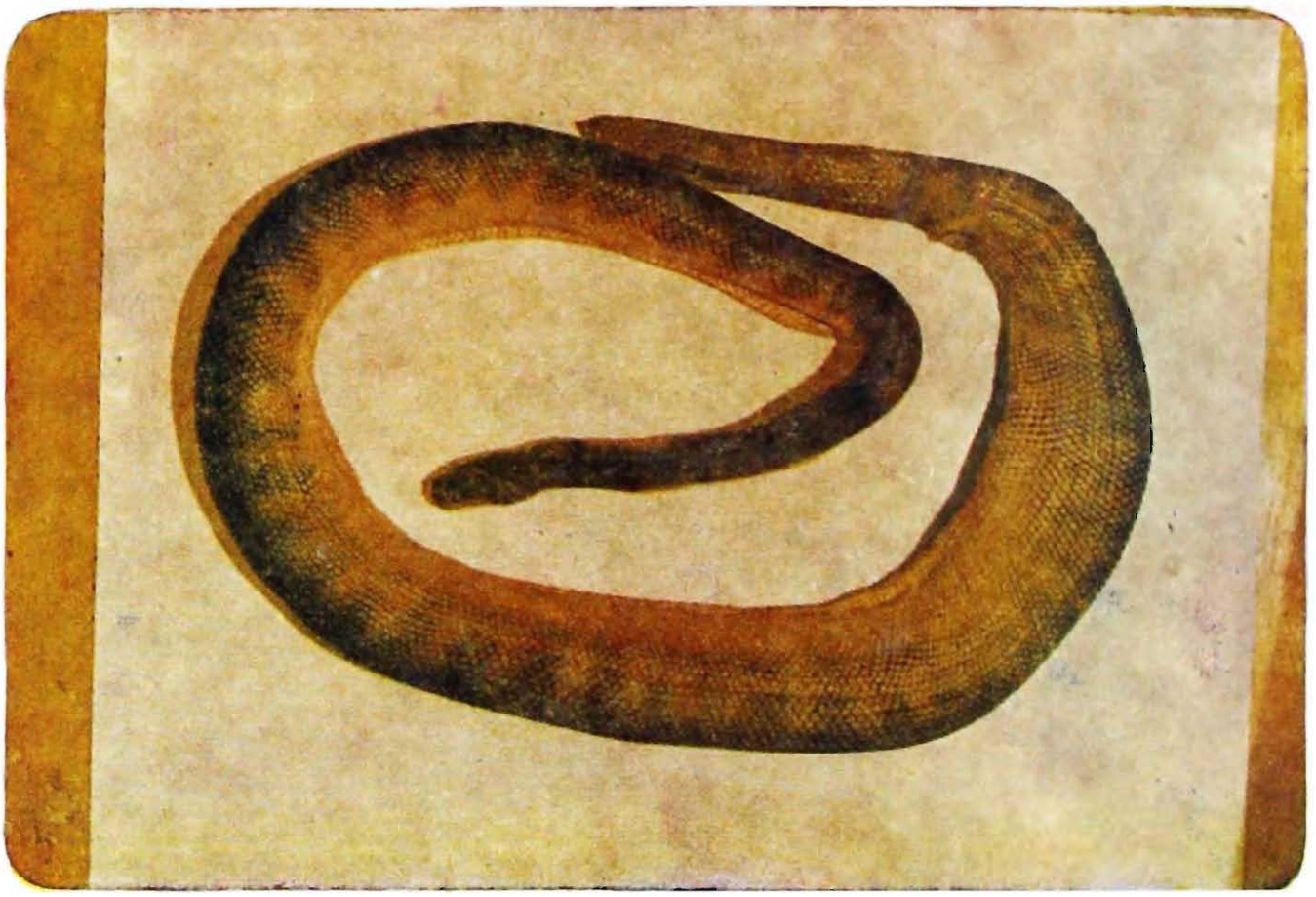


Fig. 17. Beaked Sea snake, *Enhydrina schistosa* (Daudin)

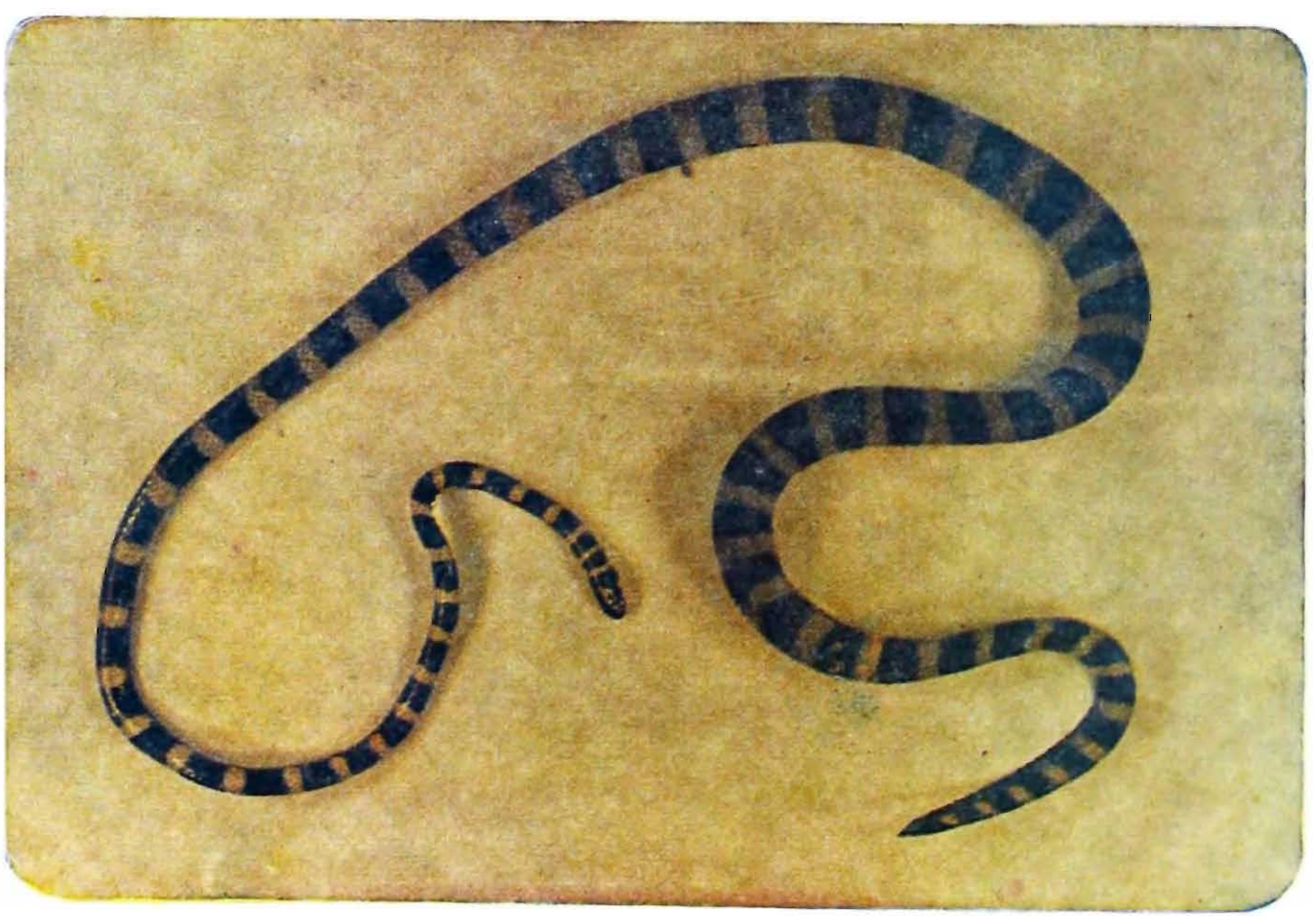


Fig.18. Eccentric Sea snake, *Hydrophis obscurus* (Daudin)

Fig. 19. Russell's viper, *Vipera russelli* (Shaw)

Fig.20. Breakfast (Barkuda) Island-Habitat of the rarelimbless Skink

Fig 21 A View of the rocky bird Island—Habitat of the Rock lizard.

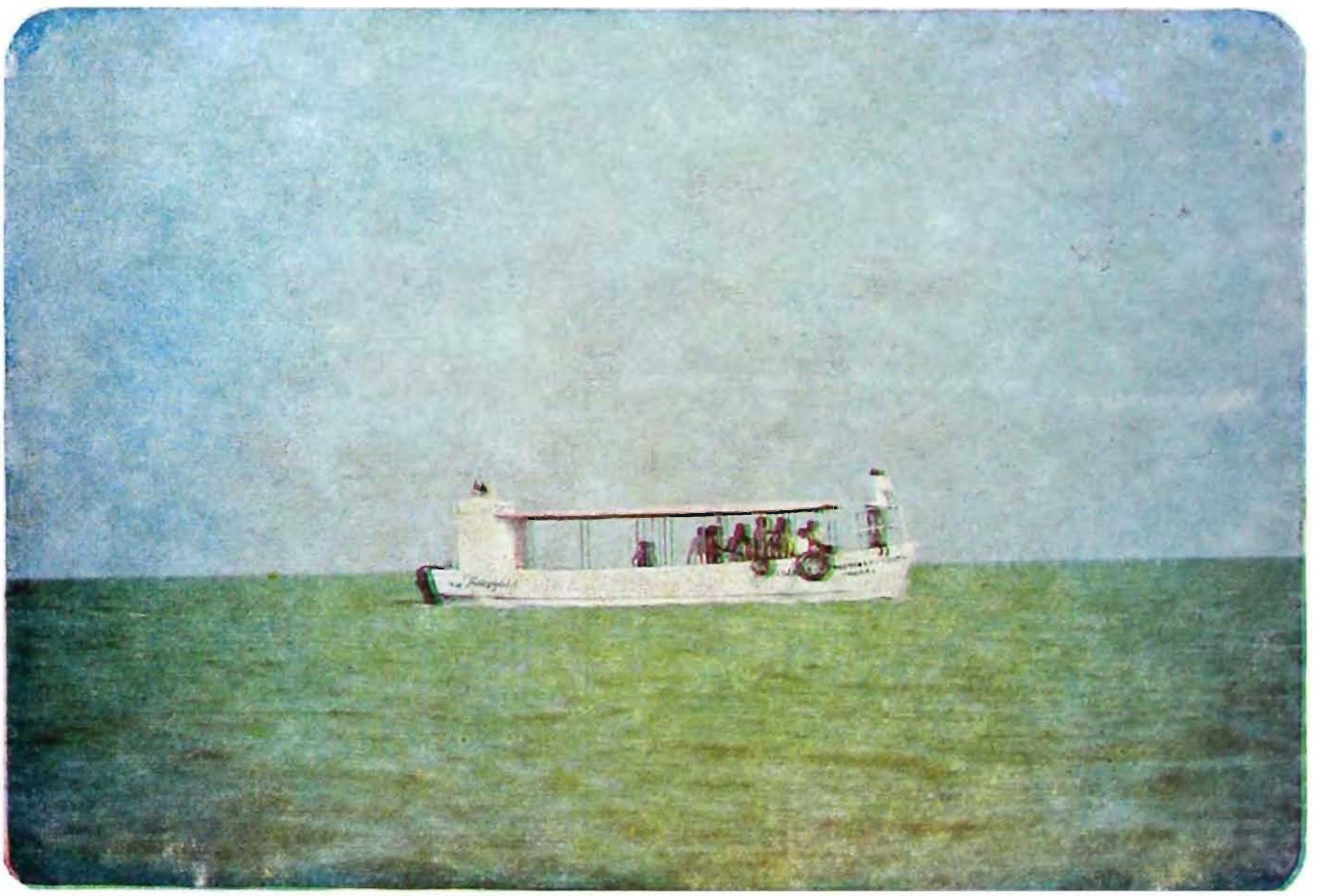


Fig. 22. A View of the deepest portion of the Chilka Lake

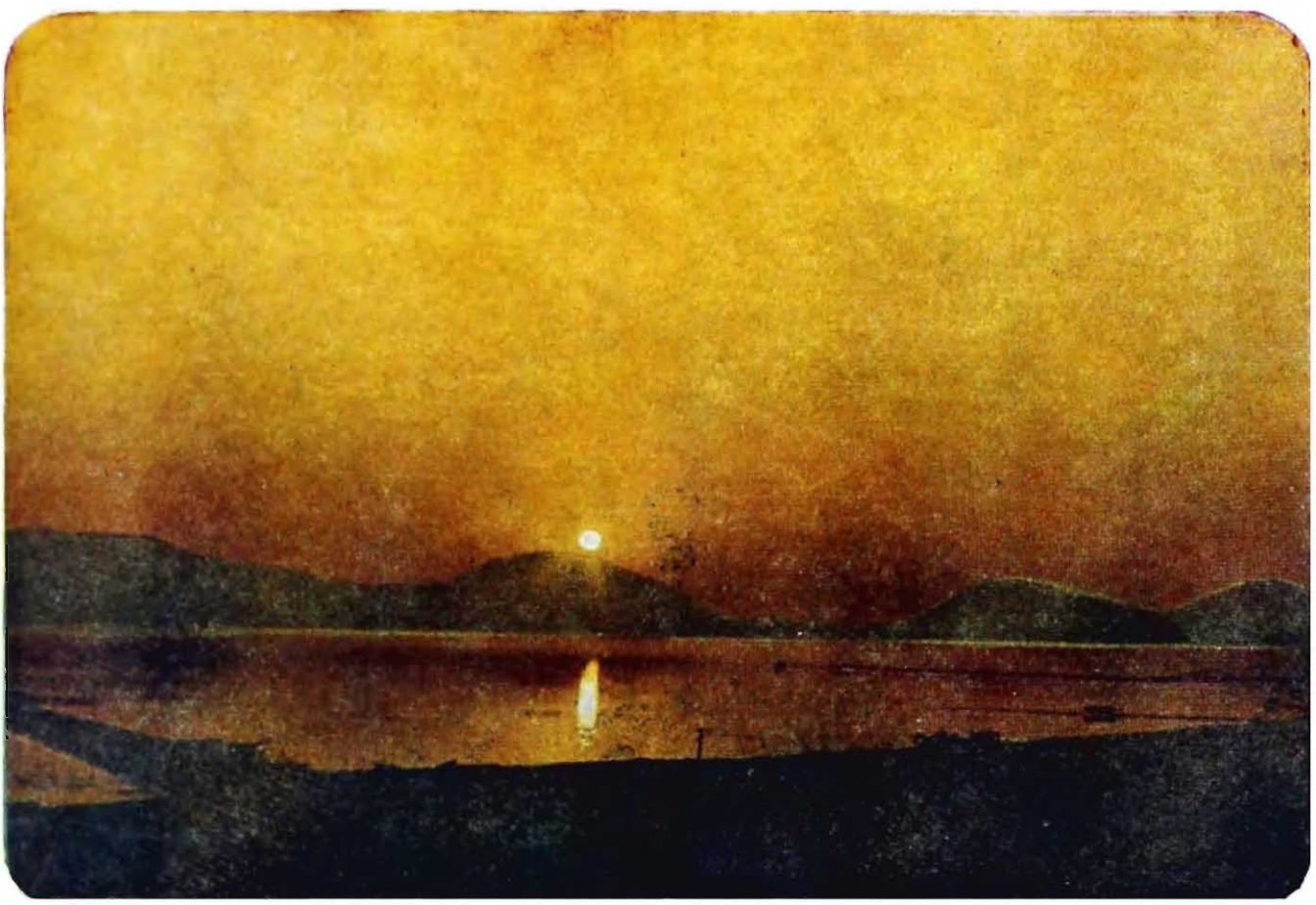


Fig. 23. Sun setting over the Chilka Lake at Rambha