DECAPODA CRUSTACEA OF THE PATNA STATE, ORISSA.

By B. CHOPRA, *D.Sc., F.N.I., Offg. Director and* KRISHNA KANT TIWARI, *M.Sc., Research Scholar, Zoological Survey of India, Benares Cantt.*

The material dealt with in the present paper was mostly collected in March 1945, in various localities in the Patna State, Orissa. The physical features of the state, and a brief description of the localities in which collections were made, are given by Dr. B. S. Chauhan in another place of this publication. (p. 267)

The following species of Decapoda were collected in the State :—

Family Potamonidae

1. *Paratelphusa* (*Barytelphusa*) *jacquemontii* (Rathbun)
2. *Paratelphusa* (*Oziotelphusa*) *hydrodromus* (Herbst)

Family Palaemonidae

3. *Palaemon malcolmsonii* H.M.-Edw.
4. *Palaemon lamarrei* H.M.-Edw.
5. *Palaemon dayanus* Henderson

Family Atyidae

6. *Caridina nilotica* var. *chauhani*, nov.
7. *Caridina weberi* prox. var. *sumatrensis* deMan

Of the two crabs obtained, *P.* (*Barytelphusa*) *jacquemontii* appears to be a common species in the Patna State, while P. (*Oziotelphusa*) *hydrodromus* was obtained only at one locality, *viz.*, a tank at Patnagarh.

In the Palaemonidae, *Palaemon lamarrei* was collected in large numbers at all the stations visited. This species appears to form an important item of food of the local population. *Palaemon malcolmsonii* was obtained only twice, in the Ang River at Agalpur (one male specimen) and in the Tel River at Belgaon (four young male specimens). *Palaemon dayanus* was found in great abundance in, and below, a hillstream at Harishanker. Of the representatives of the family Atyidae, *Caridina nilotica* var. *chauhani* was obtained from nearly all stations along with *Palaemon lamarrei*, although not in large numbers. *Caridina weberi* prox. var. *sumatrensis* was found in abundance in the hillstream at Harishanker.

As *Palaemon dayanus* was found to exhibit a wide range of structural variations, opportunity has been taken to study two other collections of this species also. As a result of our study of these three fairly large series of specimens, we are able to give a fuller description of the species, than that originally given by Henderson. It is somewhat surprising that there are very few references in literature to this widely distributed species.

Family POTAMONIDAE

Sub-family *GECARCINUCINAE*.

Paratelphusa (Barytelphusa) jacquemontii (Rathbun).

1910. *Paratelphusa* (*Barytelphusa*) *jacquemontii*, Alcock, *Cat. Ind. Dec. Crust.*, Part 1, Brachyura, p. 79, pl. xii, fig. 55.

Ang River, Salebhata	..	Patna State Survey Party, March 1946.	1♂
Ang River, Agalpur	..	Do.	1 ♂, 1♀
Hill Stream, Harishanker	..	Do.	11 juvenile specimens, 12·8—34·0 mm. in maximum breadth.

Paratelphusa (Oziotelphusa) hydrodromus (Herbst).

1910. *Paratelphusa (Oziotelphusa) hydrodromus*, Alcock, *Cat. Ind. Dec. Crust.* Part 1, Brachyura, pp. 97-100, pl. xiii, fig. 60.

We have examined eight specimens of this species, four males and four females, collected in the Rani Sar, a tank at Patnagarh. The female specimens were sent to us by Mr. B. L. Choudhari, Agriculture Officer, Patna State. Although the Patna State examples are typical in nearly all respects, sometimes the post orbital crests are not trenchant, and are corroded on their inner aspect. The shape of the sixth abdominal segment of the males also does not agree exactly with Alcock's description. This segment, according to Alcock, is nearly as long as broad, but in the Patna State specimens the proximal breadth of the sixth abdominal segment is greater than its length. The sides of the segment are strongly biconcave. We have examined a large number of examples of this species from various localities, in the Collection of the Zoological Survey of India, and have found that the shape of the sixth abdominal segment of the male is, in most cases, as in the Patna State specimens.

Family Palaemonidae.

Sub-family *Palaemoninae*.

Palaemon malcolmsonii H. Milne-Edw.

1910. *Palaemon malcolmsonii*, Henderson and Matthai, *Rec. Ind. Mu* V, pp. 283-285, pl. xv, figs. 2 *a-f*.
1915. *Palaemon malcolmsonii*, Kemp, *Mem. Ind. Mus.* V, pp. 266-268.

Ang River, Agalpur	.. ..	Patna State Survey Party, March 1946.	1♂
Tel River, Belgaon	.. ..	Do. ..	.. 4 juvenile.

The Patna State specimens are typical in every respect. The specimens from the Tel River were caught during night fishing, which is briefly described by Dr. B. S. Chauhan in another paper.

Palaemon lamarrei H. Milne-Edw.

1908. *Palaemon (Eupalaemon) lamarrei*, de Man, *Rec. Ind. Mus.* II, pp. 222-226, pl. xix, fig. 4.
1915. *Palaemon lamarrei*, Kemp, *Mem. Ind. Mus.* V, pp. 265-266.

A large number of specimens of this species were collected from all the localities visited in the state, from young ones to fully grown males, and egg-bearing females. The rostrum is typical in all cases. De Man has given the ratio of chela to carpus in the first cheliped as 4 : 9, but in the specimens examined by us this ratio is as 4 : 11. According to de Man the carpus of the second cheliped is almost twice as long as the chela and three times as long as the palm ; in the Patna State specimens the proportions are practically the same. In examples from the Chilka lake, examined by Kemp, however, " the carpus, though still decidedly longer than the chela is proportionately shorter"

Palaemon lamarrei is widely distributed in many parts of India and shows considerable variation in the number of its rostral teeth and other characters.

The following table gives measurements (in millimeters) of five specimens from the Patna State.

No.	Sex.	Total legth of body.	I Cheliped.				II Cheliped.				
			Ischium	Merus	Carpus	Chela	Ischium	Merus	Carpus	Palm	Finger
1	♀ egg-bearing ..	68·5	3·8	5·4	7·1	2·1	6·5	6·3	9·3	2·8	2·5
2	♀ „ ..	57·3	3·0	4·2	5·4	1·9	5·0	5·0	7·7	2·3	1·9
3	♀ — ..	45·3	2·6	3·5	4·1	1·5	..	..	..	..	..
4	♀ egg-bearing ..	45·5	2·5	3·5	4·4	1·6	4·2	4·2	6·2	1·9	1·5
5	♀ „ ..	44·8	2·5	3·2	4·3	1·7	4·2	3·9	5·9	1· 4	1·7

Palaemon dayanus Henderson.

1893. *Palaemon Dayanus*, Henderson, *Trans. Linn. Soc. London* (2) V, pp. 443-444, pl. xl., figs. 7-13.

Henderson described *Palaemon dayanus* from a large series of specimens collected in various localities in Northern India. Though this species appears to have a wide range of distribution in India and Henderson's description is adequate enough for its identification, it is somewhat surprising that there are very few references to it in literature, and the only record of its occurence since Henderson's time, that we have come across, is by Nataraj[1] from Travancore.

We have before us three series of specimens from (1) the Patna State in Orissa, (ii) the Varuna River (a small tributary of the Ganges) at Benares, U. P., and (iii) Sonarpur, near Calcutta in Bengal. The specimens agree in nearly all characters with the description given by Henderson, and though they show a considerable range of variation in certain characters, they are undoubtedly referable to this species.

Males.—The shape of the rostrum is variable as illustrated by Hender son in his figs. 7-10 on plate xl. In most of our specimens the rostrum is straight, but in those from Sonarpur, it is distinctly upturned at its distal end. In length also the rostrum may fall short of the antennal scales by from one-fifth to one-fourth of its length. The antennal scale is rounded at its distal extremity.

The rostral teeth show considerable variation in their numbers. Henderson has given the rostral formula as $\frac{7-9}{5-6}$ though the range of variation may be from $\frac{5-10}{5-7}$. In the material that we have examined the number of teeth commonly found on the rostrum, as shown in the table below, may be represented by the formula $\frac{8-9}{5-6}$, and the range of variation as $\frac{7-11}{4-7}$. Though we have not seen any specimen with less than seven teeth on the upper border of the rostrum, taking Henderson's figures also, the range of variation in the number of teeth in the species appears to be $\frac{5-11}{4-7}$.

[1]Nataraj, S., *Current Science* XI, pp. 467, 468 (1942).

Rostral formula in *Palaemon dayanus* Hend.

Rostral formula.	Number of specimens.			Total.
	Patna State.	Varuna River.	Sonarpur.	
7/4	1	nil	nil	1
8/4	2	3	nil	6
8/5	6	13	1	20
8/6	2	5	4	11
8/7	nil	1	1	2
9/4	1	1	nil	2
9/5	6	24	4	34
9/6	1	8	12	21
9/7	nil	3	5	8
10/5	1	1	nil	2
10/6	nil	5	2	7
10/7	nil	nil	3	3
11/7	nil	nil	1	1
Total no. of specimens	21	64	33	118

It is thus seen that out of the 118 specimens examined, 39 have eight upper rostral teeth, 65 have nine, 12 have 10, while one example each has seven or 11 teeth. Similarly, in these 118 examples, there are nine with four lower teeth, 56 with five, 39 with six and 14 with seven teeth.

Henderson has stated that the number of teeth on the rostrum varies according to its length. A study of the above table seems to confirm this view. The Patna State specimens with a comparatively short rostrum show the lowest formula 7/4, while the long rostrum forms from Sonarpur show the other extreme, *viz.*, 11/7. The Varuna River specimens, which are intermediate with regard to the length of the rostrum, show the middle range.

The arrangement of the teeth on the rostrum agrees with the description of Henderson. There are two or three teeth on the carapace, and usually the third tooth is placed just above the orbital border.

The carapace is smooth, with the hepatic spine rather small and behind it there is a sulcus, as described by Henderson.

The first legs are equal, slender and exceed the antennal spine by the length of the fingers and half the length of the palm. They are less than one-third the length of the body.

The following are the measurements (in mm.) of the first chelipeds of three male examples of about the same size.

Locality.	Total length of body.	Ischium.	Merus.	Carpus.	Chela.	Total length of cheliped.
Patna ..	60·8	3·6	5·1	6·5	2·9	18·1
Varuna ..	59·7	3·5	5·4	6·2	2·9	18·0
Sonarpur	63·2	4·3	5·6	6·8	3·0	19·7

The Merus is cylindrical, of uniform thickness, measuring slightly more than a fourth of the cheliped. The carpus is the longest segment measuring one-third or more of the entire cheliped; it is thickened distally. The chela is very short, less than half the length of the carpus. The fingers are either equal to or slightly longer than the palm. The ischium and fingers are covered with tufts of setae, while on the rest of the cheliped the hairs are very sparsely distributed.

The second chelipeds are moderately stout, slightly scabrous, equal or subequal and about half the length of the body (including rostrum) in smaller examples. In large and mature males they are considerably longer, in some cases measuring about two-thirds of the body length. The ischium is cylindrical. The carpus, which is generally slightly longer than the merus, is thickened distally. The chela is distinctly longer than the carpus. Henderson has described the palm as equal to the carpus, but we find this to be the case in only three or four large male specimens from Sonarpur. In all the remaining specimens, more than hundred in number, the palm is slightly shorter than the carpus. The fingers are about two-thirds the length of the palm and densely pubescent. The palm is slightly compressed laterally.

The following are the measurements (in mm.) of the second cheliped in three male specimens, one from each of the three localities :

Locality.	Total length of body.	Ischium.	Merus.	Carpus.	Palm.	Finger.	Total length of cheliped.
Patna ..	60·8	7·1	7·4	8·4	7·6	6·2	36·7
Varuna	59·7	6·9	8·0	9·0	8·8	5·7	38·4
Sonarpur	65·0	6·7	7·3	8·0	7·1	5·0	34·1

The fingers (Text-fig. 1, *a*) on removal of hairs, are seen to be conspicuously ridged longitudinally on all sides, as stated by Henderson and Kemp[1]. The fixed finger has one conical tooth, followed proximally by three or four small tubercles. The mobile finger has two large conical teeth, so placed that the tooth on the fixed finger lies just in front of the proximal tooth on the mobile finger when the fingers are apposed. The rest of the cutting edge is sharp and smooth.

[1]Kemp, S., *Rec. Ind. Mus.* VIII, p. 304 (1913).

The telson (Text-fig. 1, *b*) is as described by Henderson. The outer sub-terminal spinules are very small, being much less than half the length

Text-fig. 1.—*Palaemon dayanus* Henderson. *a*. Chela, after removal of hairs (x 3½); *b*. Telson, dorsal view (x 4⅔).

of the inner spinules. The inner terminal spines are long, and have a tuft of setae between them. There are two pairs of dorsal spinules situated on the posterior half of the telson; these are not shown in Henderson's illustration.

Females.—Many egg-bearing females are present in the collection. The second chelipeds, as is usually the case, are shorter, less-stout and less scabrous than those of males. The eggs are large, measuring between 1·7 to 1·9 mm.

Size.—The specimens in the series that we have examined show considerable variation in size, the smallest egg-bearing female being 43·8 mm. long (including rostrum) while the largest male measures 75·0 mm.

Coloration.—In living specimens the chelipeds were prominently banded with stripes of dark brown pigment, and the carapace was densely mottled with the same colour. The antennular and antennal flagella were also banded. On the rest of the body the pigment was irregularly and sparsely distributed.

Hill Stream at Harishanker, Patna State, Orissa.	Patna State Survey Party, March 1946.	Large number of males (37·4—60·8 mm.) and females (39·3—52·6 mm.).
The Varuna River at Benares, U. P.	Zoological Collector (P. N. Mitter), July, 1946.	Males (35·2—70 mm.) and females (51·0—62·00 mm.).
Sonarpur, near Calcutta, Bengal.	?	Males (32·2—75·0 mm.) and female with maximum body length 59·2 mm.

Distribution.—Palaemon dayanus was recorded by Henderson from a large number of localities in Northern India—Orissa, Jubbulpur, Calcutta, Beerbhoom, Debroo (probably river Dibru in Assam), Delhi, Roorki, Hardwar, Loodhiana, River Jumna and Lahore. Our records of the species are from within the range given by Henderson. Nataraj (*op. cit.*) has, however, recorded the occurence of *P. dayanus* in Travancore in South India also.

It is interesting to note that *Palaemon dayanus* was collected only in one hill-stream in the Patna State, and attempts to obtain it from the rivers and the large number of tanks that were visited in the State proved unsuccessful. Similarly it is remarkable that whereas the species appears to be fairly common in the Varuna river, we have so far been unable to get any specimen from the Ganges river close by.

Like most other species of *Palaemon*, *P. dayanus* also shows considerable variations in several characters. This is clearly seen in the series of specimens examined by us. The Patna State specimens are small in size, the largest male being only 60·8 mm. in total length ; the rostrum is short, not reaching the antennal scale, is straight and not particularly deep ; the rostral formula is $\frac{7\text{-}10}{4\text{-}6}$, and the second chelipeds are comparatively slender. The Varuna River examples are larger in size than those from the Patna State, the largest male being 70·0 mm. in total length ; the rostrum reaches the tip of the antennal scales and is distally upturned ; the rostral formula is $\frac{8\text{-}10}{4\text{-}7}$; and the chelipeds are shorter. The Sonarpur specimens are the largest, the longest male example in the collection being 75·0 mm. ; the rostrum is also the longest exceeding the antennal scales by one-fifth to one-fourth of its length; is noticeably deep and considerably upturned distally ; the rostral formula is $\frac{8\text{-}11}{5\text{-}7}$, and the second chelipeds are also long and comparatively. stout. The amount of pubescence on the fingers is also variable. As suggested by Henderson, the variation in the number of teeth on the rostrum appears to be correlated with its length.

Family ATYIDAE.

Caridina nilotica (Roux).

1908. *Caridina nilotica* (typical form) de Man, *Rec. Ind. Mus.* II, pp. 259-62, pl. xx, figs. 1, 1*a*, 1*b*.

var. **chauhani** nov.[1]

A large number of specimens collected from various localities in the Patna State, appear to represent a new variety of *Caridina nilotica*. This variety bears a somewhat close resemblance to *Caridina nilotica* var. *brachydactyla* form *peninsularis*,[2] described by Kemp[3] from Patani in Siamese Malay States and Penang, but it differs from it, as also from other varieties of *Caridina nilotica* in certain well-defined characters.

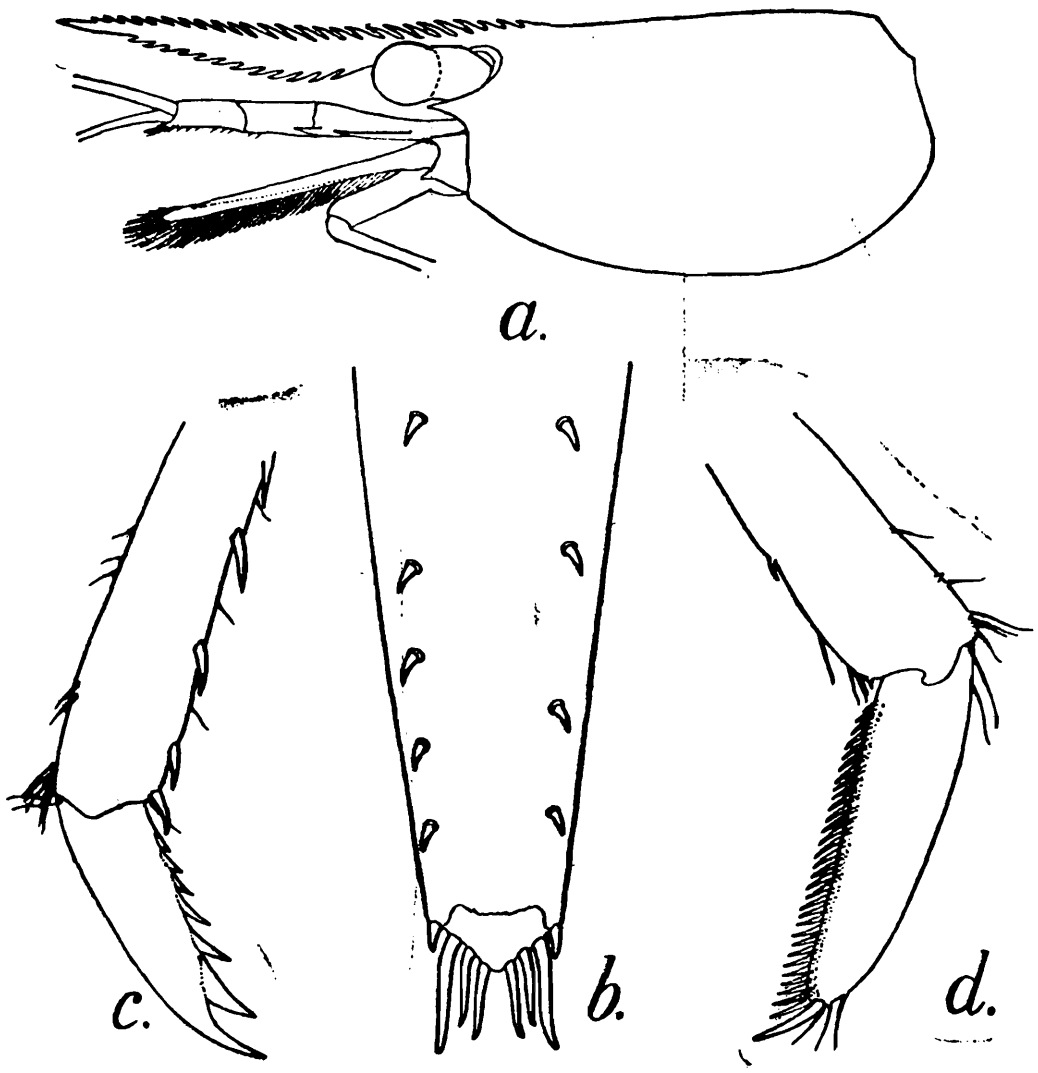
[1]Named after Dr. B. S. Chauhan, Asstt. Spudt., Zoological Survey of India.
[2]Edmondson, C. H., *Occ. Pap. Bishop Mus. Honolulu* LXI, No. 3, pp. 1-19 (1935-36).
[3]Kemp, S., *Mem. As. Soc. Bengal* VI, pp. 279-82,

The rostrum (Text-fig. 2, *a*) usually exceeds the length of the antennular peduncle, and in some cases extends a little beyond the antennal scale. It is generally straight, sometimes slightly upturned distally, and is armed above with a series of 24 to 40 (usually 26 to 33) teeth, of which two to four are situated on the carapace behind the orbital notch. The number of rostral teeth in 61 examples from the Patna State are shown below.

Number of dorsal teeth.	Number of examples.	Number of ventral teeth.	Number of examples.
24	1	4	1
25	2	5	2
26	6	6	3
27	6	7	7
28	8	8	10
29	13	9	6
30	5	10	9
31	4	11	12
32	2	12	5
33	6	13	5
34	2	14	1
35	2		Total 61
36	2		
37	0		
38	1		
39	0		
40	1		
	Total 61		

In all the specimens, except one, the teeth are continuous nearly up to the apex of the rostrum (Text-fig. 2, *a*) without any break, there being no, or very short, unarmed distal part. One specimen, however, presents an interesting condition. Proximally it bears 26 continuous teeth, followed by two small ones, then a short gap, at the end of which one tooth is placed. This condition agrees with that described by Kemp in some examples of *peninsularis* (*op. cit.*), in which there is a distinct break distally, followed by a number of sub-terminal teeth. The teeth at the base of the rostrum are usually small in size. They are crowded, when more numerous, but in specimens with a smaller number of teeth, the interspaces between them increase as they approach the tip. In many cases the rostrum presents a convexity just above the orbital

border, with the result that the entire rostrum appears to be bent slightly downwards. The lower border of the rostrum bears from four



TEXT-FIG. 2.—*Caridina nilotica* var. *chauhani*, nov. *a*. Anterior portion of the body: x 8; *b*. Posterior end of telson: x 33; *c*. Dactylus of third peraeopod: x 66; *d*. Dactylus of fifth peraeopod: x 66.

to 14 (usually six to 13) teeth, which, when numerous, may extend throughout the anterior two-thirds of the lower border.

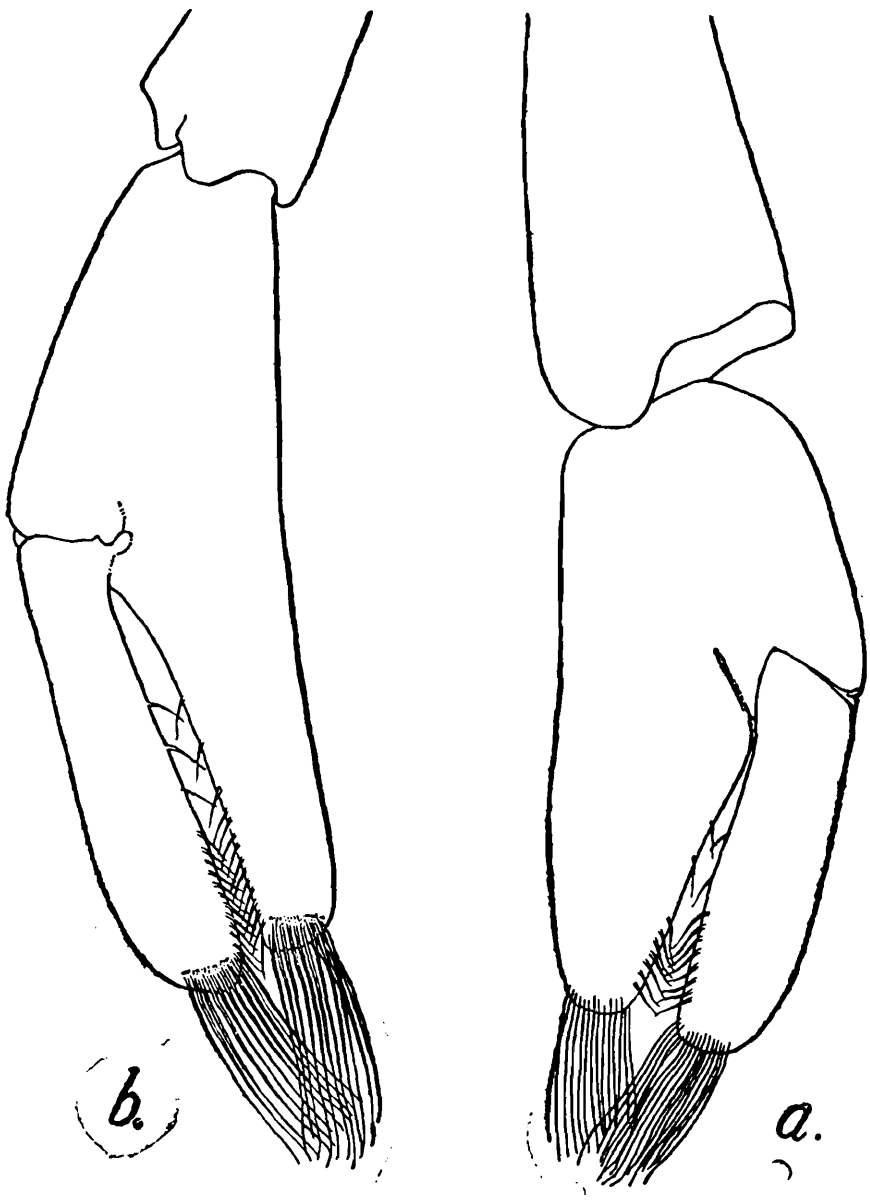
The cornea in dorsal view is shorter than the stalk, whereas in Kemp's *peninsularis* the reverse is the case.

The pre-ocular length of the antennular peduncle is from 0·83 to 0·89 times the post-orbital length of the carapace. The antennal scale is about 3·5 times as long as broad.

The antero-inferior angle of the carapace is bluntly obtuse and does not bear a pterygostomian spine. The second segment of the antennal peduncle is produced distally into a spine immediately below the insertion of the scale.

The carpus of the first peraeopods (Text-fig. 3, *b*) is from 2·0 to 2·5 times as long as broad. The length of the chela is from 2·1 to 2·6 times its breadth. The finger is 1·5 or more times longer than the palm.

In the second peraeopods (Text-fig. 3, *a*) the carpus is 4·6 to 6·7 times as long as broad. The length of the finger is generally less than



TEXT-FIG. 3.—*C. nilotica* var. *chauhani* nov. *a*. Chela of second peraeopod: x 66; *b*. Chela of first peraeopod: x 66.

1·5 times the length of the palm.[1]

In the proportions of the third and fifth peraeopods this variety shows conspicuous differences from other forms. The dactylus in both these peraeopods (Text-fig. 2 *c*, *d*) is proportionately longer, and subparallel in shape. The merus in both peraeopods bears 3 or 4 spines on its lower edge. The propodus of the third pair is 2·6 to 4·0 (exceptionally up to 5·0) times as long as the dactylus (Text-fig. 2, *c*). The length of the dactylus is from 3·1 to 5·0 times its breadth (excluding the terminal spine). It bears from 5 to 7 (usually 6) spines, including the terminal. In the fifth peraeopods (Text-fig. 2, *d*) the propodus is 2·7 to 3·5 times as long as the dactylus, the length of the dactylus is 4·0 to 6·3 (rarely 3·0) times its maximum breadth ; and it bears from 27 to 43 (usually 34 to 41) spinules.

[1] This ratio is in most cases between 1·17 to 1·44 but in a few exceptional cases it is as much as 1·7.

There are from five to six pairs of dorsal spines on the telson (Text-fig. 2, *b*) and from five to seven spines on the apex. The telson is long and narrow. The outer uropod bears from 8 to 15 movable spines.

The eggs vary from 0·62 to 0·69 mm. in length and from 0·36 to 0·4 mm. in breadth.

The largest egg-bearing female measures 29·0 mm. In the majority of examples the rostrum is longer than the carapace, but in some cases, it is equal to, or even a little shorter.

The present variety differs from all other varieties of *C. nilotica* in the rostrum bearing continuous teeth up to the tip, and in the dimensions of the peraeopods. It bears the closest resemblance to *C. nilotica* var. *brachydactyla* in the dimensions of the first and second peraeopods. The form *peninsularis* of *C. nilotica* var. *brachydactyla* has a rostrum similar to that of var. *chauhani* but in the new variety *chauhani* the dactyli of the third and fifth peraeopods are proportionately longer and broader and sub-parallel in shape, the cornea is shorter than the ocular stalk in dorsal view, and the eggs are larger.

Locality.—Most of the specimens were obtained from tanks at Salebhata, Chandanbhati, Bolangir, Salepali and Titilagarh and a few were collected in weeds in the Ang River at Salebhata. This form appears to inhabit mostly muddy waters. No specimens of this variety were found in the hill-stream at Harishanker, though *Caridina weberi* prox. var. *sumatrensis* (*vide infra*) was quite abundant.

Type specimens.—C $\frac{2534}{1}$ Zoological Survey of India.

Caridina weberi prox. var. **sumatrensis** de Man.

1918. *Caridina weberi* prox. var. *sumatrensis*, Kemp, *Rec. Ind. Mus.* XIV, pp. 99-101.

A large series of specimens, collected in the hill-stream at Harishanker and in other localities in the Patna State, appears to belong to *Caridina weberi* prox. var. *sumatrensis* de Man, described by Kemp from the Inlé Lake in Southern Shan States, Burma.

In most of the examples examined by us the antero-inferior margin of the carapace is produced into a spine, a character which was noticed by Kemp in examples from the Inlé Lake. The rostrum is short and deep, reaching up to the middle or the end of the second segment of the antennular peduncle. The upper border of the rostrum bears from 11 to 23 teeth of which three to eight are placed on the carapace behind the orbit. In this respect, however, these examples are more like var. *sumatrensis* described by de Man[1] from *Flores*. The specimens from the Inlé Lake bear only three or four teeth behind the orbit on the carapace.

[1] De Man, J. G., *Weber's Zool. Ergebn. Reise Nied. Ost.-Ind.* II; p. 375, pl. xxii, fig. 23*g* (1892).

The number of rostral teeth in the Patna State specimens is shown below.

No. of Dorsal teeth.	No. of examples.	No. of Ventral teeth.	No. of examples.
11	2	3	9
12	2	4	16
13	3	5	6
14	1	6	3
15	4	7	1
16	2	8	1
17	3		TOTAL 36
18	5		
19	3		
20	4		
21	2		
22	2		
23	3		
	TOTAL 36		

The peraeopods agree with Kemp's description.

The telson carries from four to five pairs of dorsal spinules and six to nine terminal spines. The outer uropods bear 14 to 21 movable spines.

This variety, according to Kemp, appears to be widely distributed in India. In the specimens from Kobo, Dibrugarh and Darrang Districts, in Northern Assam, referred to by Kemp[2] as *Caridina weberi* var., no mention is made of the spine on the antero-inferior angle of the carapace which is so characteristic of the Patna State specimens and also of specimens from the Inlé Lake.

Caridina weberi prox. var. *sumatrensis* was found in abundance in the hill stream at Harishanker and in a tank connected with a river at Salepali. Three specimens were obtained from the Ang River at Salebhata, and a few examples were also collected in tanks at Bolangir and Titilagarh. This form appears to live chiefly in streams and small rivers, but may occasionally be found in tanks with muddy water.

The present form appears to represent a distinct variety of *Caridina weberi*, but we have refrained from giving it a name, as our knowledge of Indian Caridinas is still very limited.

[2]Kemp, S., *Rec. Ind. Mus.* VIII, pp. 395-96, pl. xix, figs. 24, 25 and pl. xx, figs. 26-28 (1913).