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Five new species of freshwater atyid shrimps of the genus  
*Caridina* H. Milne Edwards from Dharwar area  
(Karnataka State, India)

by  
D. R. JALIHAI, S. SHENOY AND K. N. SANKOLLI

Issued by the Director  
Zoological Survey of India, Calcutta

RECORDS  
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FIVE NEW SPECIES OF FRESHWATER ATYID SHRIMPS OF THE  
GENUS *CARIDINA* H. MILNE EDWARDS FROM DHARWAR AREA  
(KARNATAKA STATE, INDIA)

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सत्यमेव जयते

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## INTRODUCTION

During the work (from 1970 to 1978) on freshwater Atyid and Palaemonid prawns from Dharwar area of Karnataka State, India, five new species of Atyids belonging to the genus *Caridina* H. Milne Edwards were found which are described in the present paper.

Following abbreviations are used for lengths of: carapace—C, antennular peduncle—A<sub>1</sub>, 6th abdominal segment—6abd, propodus of third pereopod—Prpd<sub>3</sub>, propodus of fifth pereopod—Prpd<sub>5</sub>. Also, relative lengths of carapace and above appendages is given in the description of the carapace itself. Number of rostral teeth is represented as Rostral formula =  $\frac{\text{number of teeth on upper margin}}{\text{number of teeth on lower margin}}$  (postorbitals).

### 1. *Caridina williamsoni* n. sp.

(Figs. 1 to 3)

Synonym.—*Caridina nilotica* var. *chauhani* Chopra and Tiwari, 1947 : 219-223.

*Material examined*.—160 specimens collected from various impounded freshwater bodies in and around Dharwar viz. Sadhankeri tank, University pond, Karnatak College ponds, Hosayellapur tank (Hirekeri), Someshwar tank, Kelgeri tank, Nuggikeri tank etc and 60 specimens collected in the river Malaprabha, Khanapur (Dist. Belgaum)—near old bridge. Size : males—20.0 to 33.0 mm, non-berried females 22.0 to 38.0 mm and berried females—23.0 to 35.0 mm.

*Holotype* : 1 berried female of 24.0 mm deposited in the National Museum of Zoological Survey of India, Calcutta (Regd. No. C 2694/2).

*Paratypes* : 3 berried females of 23.0 to 26.0 mm and 3 males of 21.0 to 24.0 mm deposited in the National Museum of Zoological Survey of India, Calcutta (Regd. No. C 2695/2) and 1 berried female of 25.0 mm and 1 male of 24.0 mm deposited in the National Museum of Natural History, Smithsonian Institution, Washington, D. C. 20560 U. S. A. (Regd. No. 170245).

*Type locality* : Sadhankeri tank, Dharwar.

*Description* : Rostrum always longer than antennular peduncle extending upto tip of antennal scale and sometimes slightly overreaching it. Rostral formula  $\frac{30-50}{8-17}$  (3 to 5), usually  $\frac{31-44}{8-14}$  (3 or 4).

Upper margin straight or slightly concave in middle with tip slightly downturned ; teeth present all along its length, almost equidistant,

decreasing in size at both extremities wherein they are arranged more closely. Lower margin subtriangular, broadest in middle with midrib almost straight, teeth equidistant, bigger than those of upper margin and present only on distal part (tip without teeth).

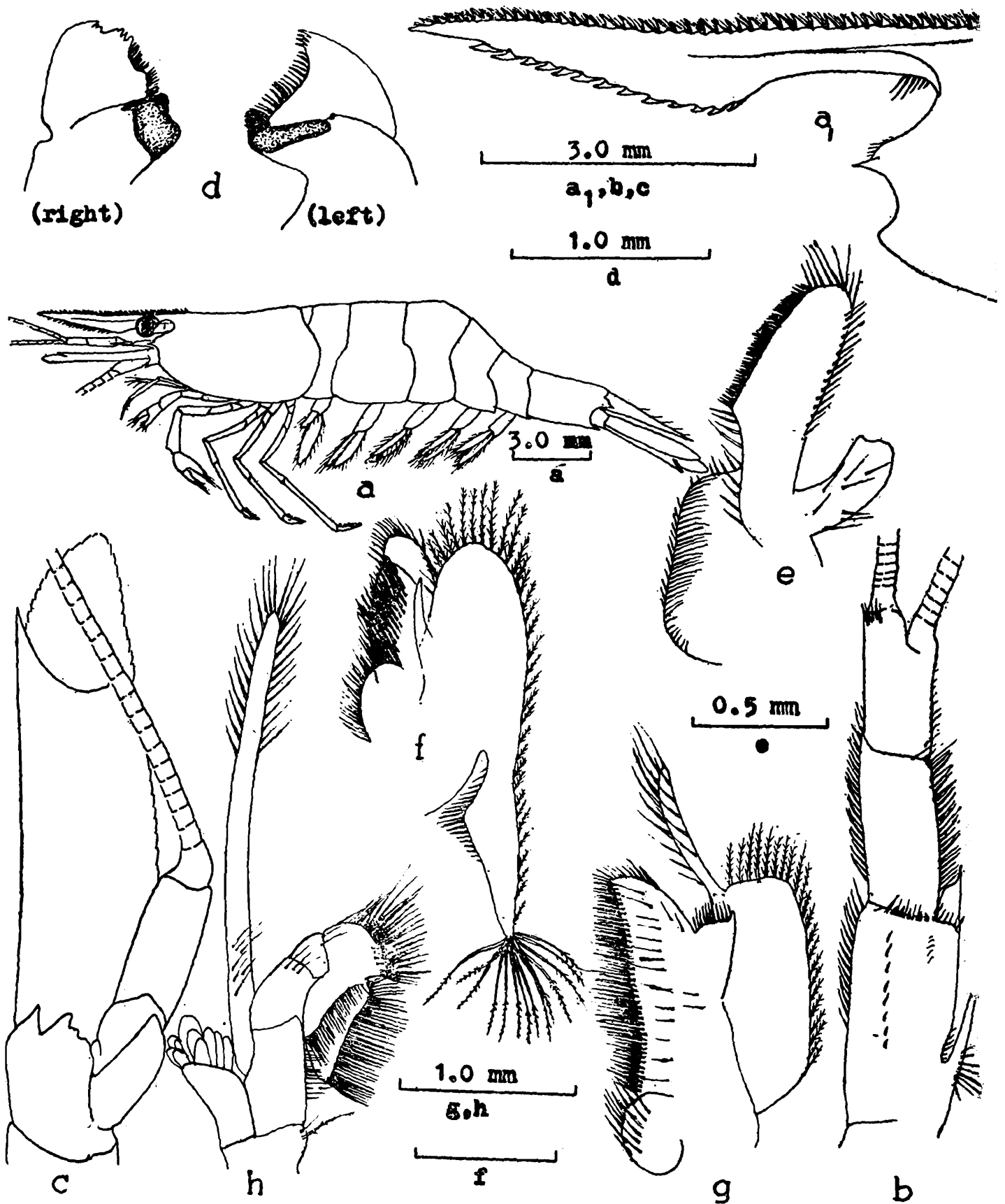


Fig. 1. *Caridina williamsoni* n. sp.—Male, 27.0 mm. a—entire animal (lateral view); a<sub>1</sub>—rostrum and anterior part of carapace, b—antennule, c—antenna, d—right and left mandibles, e—first maxilla, f—second maxilla, g—first maxilliped, h—second maxilliped.

Carapace with a distinct antennal spine placed at some distance below rounded orbital angle. Pterygostomian angle rounded.  $\frac{A_1}{C} = 0.68$  to 1.00,  $\frac{Prpd_3}{C} = 0.35$  to 0.45,  $\frac{Prpd_5}{C} = 0.45$  to 0.60,  $\frac{6abd}{C} = 0.50$  to 0.65.

Cornea broad and with yellowish brown pigmentation.

Anterolateral margin of basal segment of antennular peduncle produced into a well developed broad and sharp spine reaching about proximal  $\frac{1}{3}$ rd of 2nd segment. Antennular carina not prominent. Antennal scale 3.30 to 3.80-times as long as broad.

Mouth parts normal as in figure. Third maxilliped with epipod and extending upto 2nd segment of antennular peduncle.

First cheliped extending upto middle of antennal peduncle. Fingers 0.87 to 1.30 (average=1.12)-times as long as palm. Chela robust, being 2.31 to 2.54 (average=2.41)-times as long as broad. Carpus without anterior excavation, shorter than chela, almost equal to merus, subtriangular in lateral view and 2.06 to 2.19 (average=2.14)-times as long as broad.

Second cheliped slender than first, extending with fingers beyond antennal peduncle. Fingers 1.17 to 1.31 (average=1.27)-times as long as palm. Chela 2.50 to 3.30 (average=2.90)-times as long as broad. Carpus 5.00 to 5.50 (average=5.22)-times as long as broad, slightly longer than merus and distinctly longer than chela.

Dactylus of third pereopod 2.95 to 3.14 (average=3.05)-times as long as broad and with 1 big terminal and 7 to 10 spines on posterior margin gradually decreasing in size proximally. Propodus 9.30 to 12.18 (average=10.52)-times as long as broad, 4.06 to 4.87 (average=4.73)-times as long as dactylus and bearing 2 rows of small spines all along its length. Carpus 0.58 to 0.65-times propodus, with a big subterminal spine and an inner row of small spinules along posterior margin. Merus 1.70 to 1.90-times as long as carpus, with 4 big spines on posterior margin. Ischium much smaller than merus and with a large spine on posterior margin. Fourth pereopod similar to third.

Dactylus of fifth pereopod 3.27 to 5.26 (average=4.12)-times as long as broad with 30 to 57 (mostly 40 to 50) comb-like spinules on posterior margin. Propodus 10.21 to 11.42 (average=11.25)-times as long as broad with 2 rows of small spinules, 3.12 to 4.38 (average=3.75)-times as long as dactylus. Carpus 0.50 to 0.55-times as long as propodus with a big subterminal and an inner row of small spinules. Merus 1.40

to 1.50-times as long as carpus and with 3 large spines on posterior margin. Ischium smooth without any spines.

Epipod present of first 4 pereopods and 1 setobranch each on all pereopods.

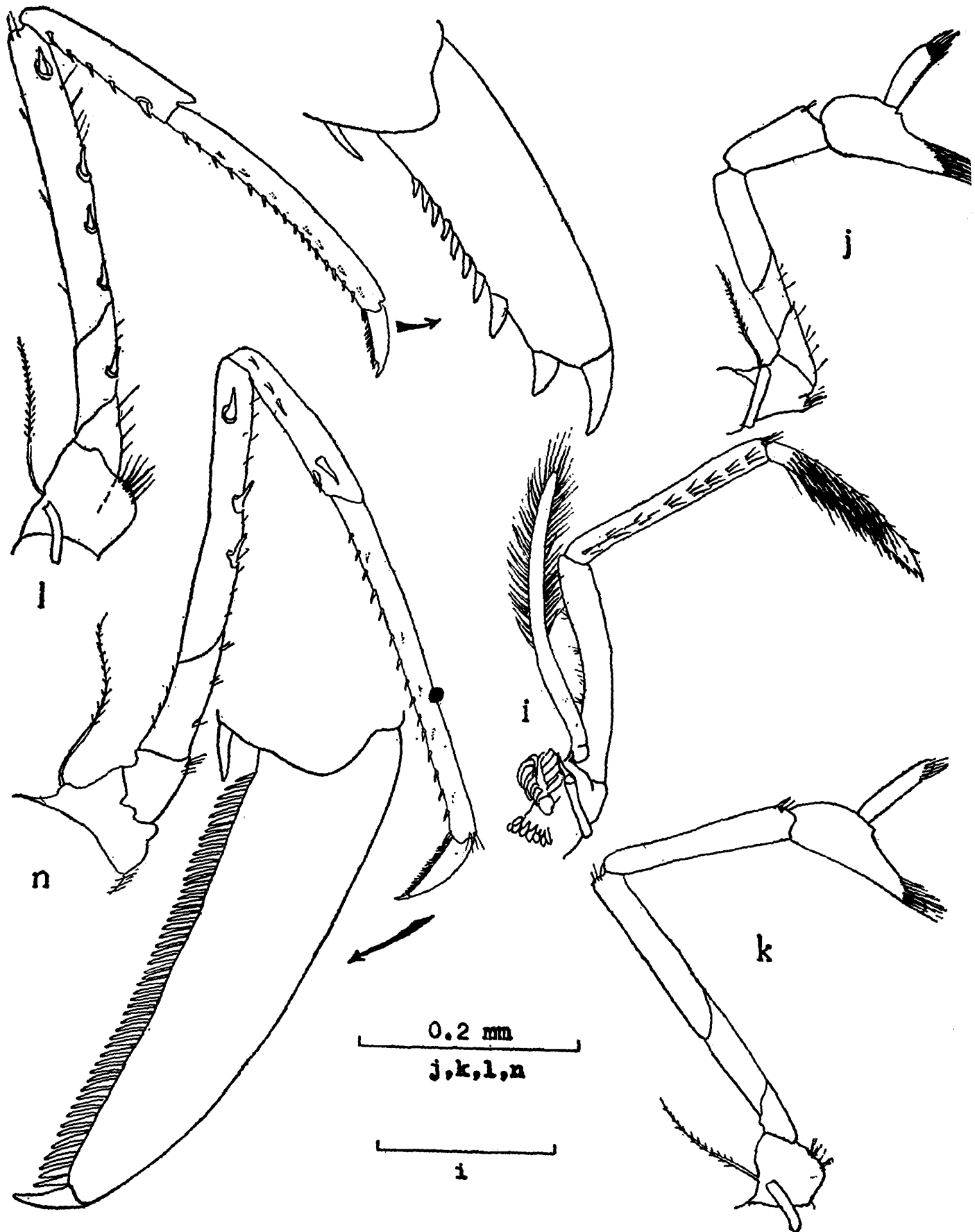


Fig. 2. *Caridina williamsoni* n. sp.—Male, 27.0 mm. i—third maxilliped, j—first pereopod, k—second pereopod, l—third pereopod, n—fifth pereopod.

Abdomen with a dorsal hump on 3rd segment.

First pleopod of male with a distinct *appendix interna* which is short (being only 0.95 to 1.20-time as long as endopod) and stout (1.60 to 2.70-times as long as long as broad). *Appendix masculina* armed with stiff setae on inner margin and submarginally, about twice as long as *appendix interna* and 0.38 to 0.40-times as long as endopod.

Preanal carina small, blunt, without any spine, but with a few small hairs.

Telson with 4 to 6 (mostly 4 or 5) pairs of dorsal spines including the last subterminal pair. Sometimes an extra unpaired spine is also found. Posterior margin shows great variation in its shape—between broadly rounded to narrowly triangular—but always with a small distinct triangular median point and bearing 5 to 10 (mostly 7 to 10) long, broad, plumose setae, outermost being longest and stoutest and plumose only on inner margin.

Uropod with 11 to 15 (mostly 12 or 13) spinules on diaeresis.

*Eggs and development.*—Eggs small, greenish brown in colour, measuring 0.30 to 0.50×0.50 to 0.67 mm. Fecundity 180 to 410. Development prolonged, consisting of 6 larval+1 postlarval stages when reared in laboratory.

*Colouration* : Great variation in colour pattern. When collected from darkly shaded areas these prawns are completely black with small yellowish horizontal bars dorsally at junctions of abdominal segments and a longitudinal narrow streak running from base of rostrum to base of telson. But those collected in lighted areas are either orange-red or green coloured due to densely set stellate chromatophores of these colours all over the body. Even the black coloured prawns turn either orange-red or green when kept for 2 or 3 days in the laboratory where they gradually lose colour in a few days becoming nearly transparent. Such transparent forms are mainly found during the afternoon hours in ponds and tanks with poor vegetation where at other times they are either black, orange-red or greenish.

*Ecology* : This is a very common species found in almost all sorts of water bodies right from seasonal ponds to big rivers. Mostly they prefer aquatic weeds of any variety wherein they readily take shelter. In the type locality Sadhankeri tank (Dharwar) this was the only species of *Caridina* available, but in other localities around Dharwar it was found commonly alongwith *Caridina kempi* n. sp. In the river Malaprabha 2 other species of *Caridina* viz. *C. shenoyi* n. sp. and *C. gurneyi* n. sp. were found alongwith the present species.

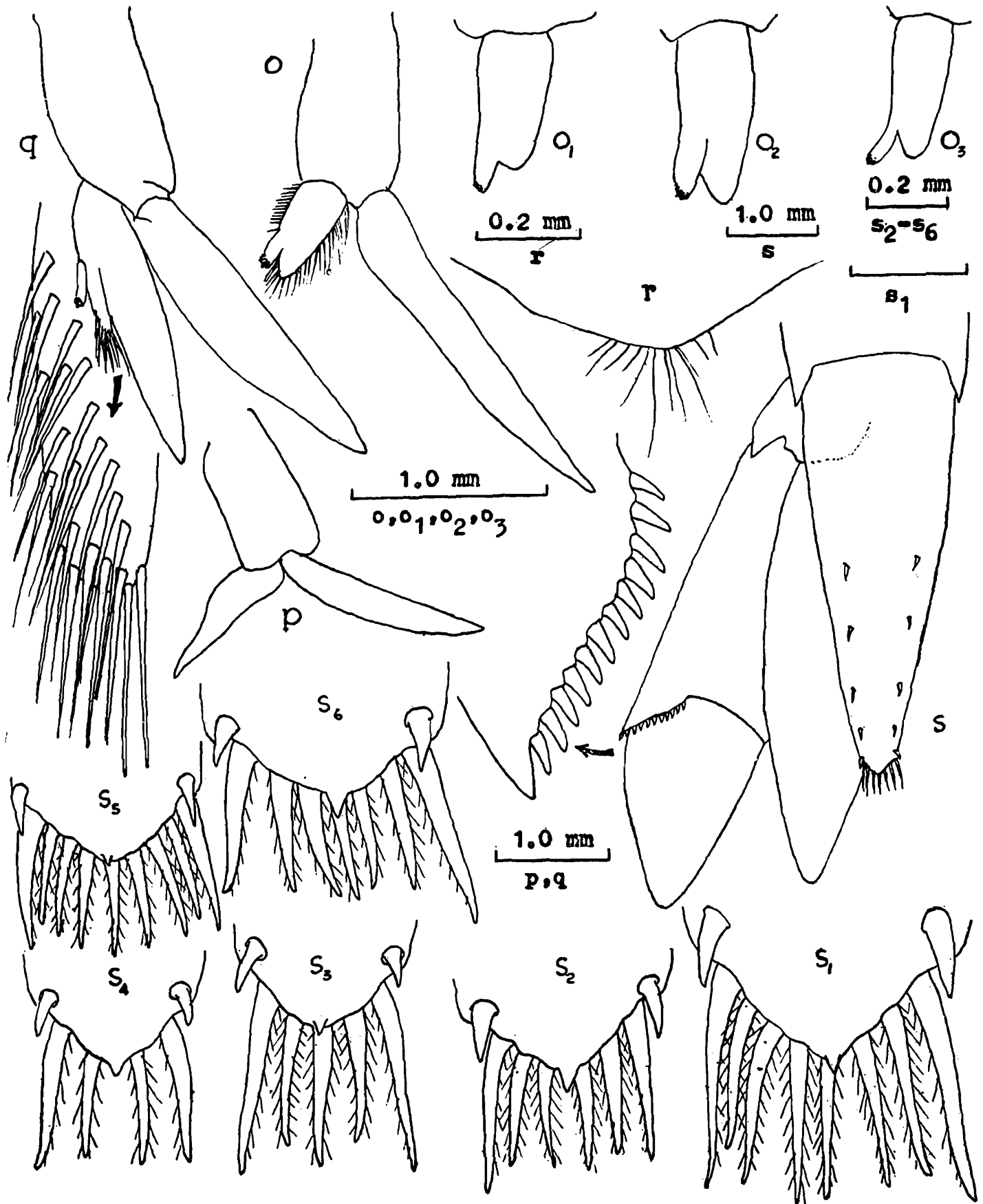


Fig. 3. *Caridina williamsoni* n. sp. —Male, 27.0 mm. o—first pleopod, o<sub>1</sub> to o<sub>3</sub>—endopods of first pleopods of 3 different males, p—first pleopod of female, q—second pleopod, r—preanal carina, s—telson—uropods, s<sub>1</sub>—posterior part of telson magnified, s<sub>2</sub> to s<sub>6</sub>—posterior parts of telsons of 5 different specimens.

*Remarks* : The new species closely resembles *Caridina rajadhari* Bouvier, 1918, but can be easily separated from it mainly by telson character. Incidentally *C. rajadhari* itself is a rather confused species. However, in light of actual examination of syntype material (No. 868—1 non-berried female of 22.0 mm, deposited in the MNHN i.e. Museum National D'Histoire Naturelle, Paris) corroborating Bouvier's excellent figures (1918, p. 388, Fig. 3, c and 1925, p. 173, Fig. 367), the telson in *C. rajadhari* is without any median triangular point. Based on this character the following 2 Indian materials belong to true *C. rajadhari* :

1. *C. rajadhari* described by Ravindranath (1977) from Guntur (Andhra Pradesh) which was earlier assigned by Dutt and Ravindranath (1975) to *C. brachydactyla peninsularis* Kemp, 1918 (27 males and 27 females measuring 11.5 to 25.0 mm).
2. *C. rajadhari* described by Almelkar (1983) from Bombay, Maharashtra (150 specimens—males ranging from 16.0 to 20.0 mm and females from 18.0 to 28.0 mm).

Thus, the new species differs distinctly from *C. rajadhari* in having a distinct median triangular point on the posterior margin of telson.

Another important point of difference between the two species is in the first pleopod of male—the *appendix interna* in the new species is stouter and shorter (1.60 to 2.70-times as long as broad and 0.95 to 1.20-time as long as endopod) than that of *C. rajadhari* (2.80 to 4.20-times as long as broad and 1.25 to 1.50-times as long as endopod). Bouvier (1918 and 1925), however, does not describe this appendage since his material contained only 4 females and 2 juveniles and no males—as also stated by Dr. Jacques FOREST of MNHN, Paris (personal communication). As such, information on this appendage is collected from actual examination of Almelkar's (1983) Bombay material and the description and good figures of *C. rajadhari* by Ravindranath (1977).

In addition to the above the two species also show the following adult and larval differences :

*Adults*.—

Characters	<i>C. williamsoni</i> n. sp.	<i>C. rajadhari</i> Bouvier
1. Second cheliped		
(a) Carpus	5.0 to 5.50-times as long as broad	4.82-times as long as broad
(b) $\frac{\text{Fingers}}{\text{Palm}} =$	1.17 to 1.31	1.42

Characters	<i>C. williamsoni</i> n. sp.	<i>C. rajadhari</i> Bouvier
2. Third pereopod		
Merus	With 4 spines	With 3 spines
3. Fifth pereopod		
Dactylus	With 30 to 57 spinules	With 30 to 40 spinules
4. Uropod diaeresis	With 11 to 15 spinules	With 8 to 10 spinules
5. Fecundity	180 to 410	145 to 260
6. Size (in mm)		
(a) Males	16.0 to 33.0	11.5 to 20.0
(b) Females	21.0 to 38.0 (Bigger species)	18.0 to 28.0 (Smaller species)

*Larvae* : Compared with *C. rajadhari* larvae described by Ravindranath (1981) and Almelkar (1983).

Characters	<i>C. williamsoni</i> n. sp.	<i>C. rajadhari</i> Bouvier
1. First zoea		
(a) First maxilla	With 3 exopod setae (all 3 setae present even in second zoea)	With 2 exopod setae (reduced or almost absent in second zoea)
(b) Maxillipeds	Exopods without annulations	Exopods with annulations
(c) First maxilliped	Basis with 5 broad teeth	Basis without any teeth
2. Degree of development of		
(a) Second maxilliped endopod outer seta	Appears in second zoea	Appears in fourth zoea
(b) Pleopods	Appears in fifth zoea	Appears in sixth zoea

Another Indian form closely resembling the new species is *Caridina nilotica* var. *chauhani* described by Chopra and Tiwari (1947) from various localities of Patna State, Orissa (presently Bihar). This variety

was erroneously synonymised under *C. rajadhari* by Ravindranath (1977). Careful examination of the type material of this variety (No. C  $\frac{2534}{1}$ , 2 females measuring 21.0 and 23.0 mm and 2 males measuring 16.0 and 17.0 mm, collected at Chandanbhati, Sukhtel River, Patna State, Orissa and deposited in the ZSI i.e. Zoological Survey of India, Calcutta), however, reveals that in possessing among other characters a prominent median triangular point at telson tip (the figure of telson tip as given by the original authors Chopra and Tiwari, 1947, p. 221, Fig. 2, b, however, does not show the median triangular point and in all probabilities appears to be wrong), more number of uropod diaeresis spinules (8 to 15) and a stouter and shorter *appendix interna* (2.15 to 2.35-times as long as broad and 1.15 to 1.20-times as long as endopod) it closely resembles the new species and not *C. rajadhari*.

Regarding the proper status of *Caridina nilotica* var. *chauhani*—this form does not have the distal gap on the dorsal margin of rostrum which is a characteristic of '*C. nilotica* complex' (De Man, 1908 and Bouvier, 1925) and, therefore, its designation to *C. nilotica* is basically wrong. Also, in view of its close similarities it is rightfully synonymised here with the present new species.

*Etymology* : The new species is named after Dr. D. I. Williamson of Port Erin, U. K., as a token of gratitude for his great contribution to the knowledge of decapod larvae.

## 2. *Caridina panikkari* n. sp.

(Figs. 4 & 5)

*Material examined* : Only 2 specimens—1 male of 22.0 mm and 1 non-berried female of 22.0 mm—collected from Hosayellapur tank (Hirekeri) at Dharwar in August 1974.

*Holotype* : 1 non-berried female of 22.0 mm deposited in the National Museum of Natural History, Smithsonian Institution, Washington, D. C. 20560 U. S. A. (Regd. No. 170246).

*Type locality* : Hosayellapur tank (Hirekeri), Dharwar.

*Description* : Rostrum straight in proximal half and characteristic crescent-shaped in distal half with tip turned upwards, extending as far as distal end of 2nd antennular segment and armed only on upper margin. Rostral formula  $\frac{19 \ \& \ 26}{0}$  (3). Teeth in proximal half equidistant and almost equal-sized, in distal half gradually becoming smaller anteriorly, tip part naked.

Carapace about 1.45-times as long as rostrum; antennal spine distinct, sharply pointed and placed at some distance below rounded orbital angle. Pterygostomial angle smooth, broadly rounded and

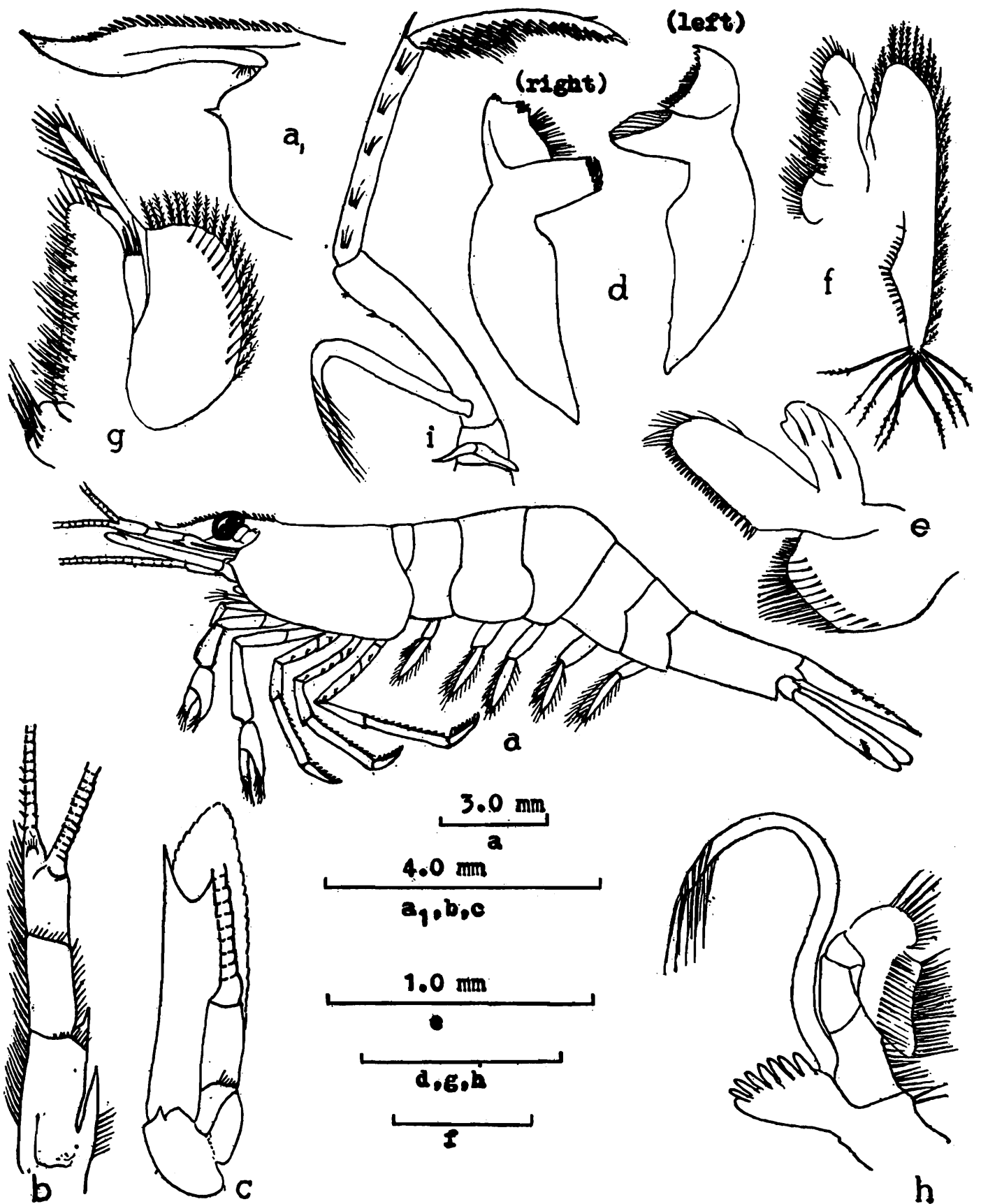


Fig. 4. *Caridina panikkari* n. sp. —Male, 22.0 mm, a—entire animal (lateral view), a<sub>1</sub>—rostrum and anterior part of carapace, b—antennule, c—antenna, d—right and left mandibles, e—first maxilla, f—second maxilla, g—first maxilliped, h—second maxilliped, i—third maxilliped.

without any projections.  $\frac{A_1}{C} = 0.74$ ,  $\frac{Prpd_3}{C} = 0.42$ ,  $\frac{Prpd_5}{C} = 0.50$ ,  
 $\frac{6abd}{C} = 0.52$ .

Cornea broad and well pigmented.

Anterolateral angle of basal segment of antennular peduncle produced into a sharp spine extending to about proximal third of 2nd segment. Antennular carina not prominent. Antennal scale about 3.75-times as long as broad.

Mouth parts normal as in figure. Third maxilliped with an epipod and extending upto 2nd antennular segment.

First cheliped fingers about 1.14-times as long as palm. Chela about 2.26-times as long as broad. Carpus without anterior excavation, about 2.00-times as long as broad, shorter than chela and subequal to merus.

Second cheliped slender than first. Fingers about 1.27-times as long as palm. Chela about 3.10-times as long as broad. Carpus slender, elongated, about 5.85-times as long as broad, subequal to merus and longer than chela.

Dactylus of third pereopod about 3.0-times as long as broad, almost spatulate, terminating in a big, strong, tooth-like spine, posterior margin with 7 or 8 spines gradually decreasing in size proximally. Propodus about 11.33-times as long as broad, bearing small spinules in posterior and dorsal rows as in figure and about 5.70-times as long as dactylus. Carpus about 0.70-times as long as propodus with a big subterminal spine and an inner row of small spinules. Merus about 1.65-times as long as carpus, rather stout being broadest in middle and with 4 large spines on posterior margin. Ischium much smaller than merus and smooth without any spine. Fourth pereopod similar to third.

Fifth pereopod much slender than third. Dactylus about 4.0-times as long as broad and with 37 to 46 comb-like spinules on posterior margin. Propodus about 12.0-times as long as broad, with usual rows of spinules and about 4.0-times as long as dactylus. Carpus about half as long as propodus with a big subterminal and an inner row of small spinules. Merus about 1.57-times as long as carpus and with 3 large spines on posterior margin. Ischium smaller than merus and smooth without any spine.

Epipod present on first 4 pereopods and 1 setobranch each on all pereopods.

Abdomen with a dorsal hump on 3rd segment.

Endopod of first pleopod of female small and about 0.45-times exopod. Endopod of first pleopod of male about 2.40-times as long as broad, rather rectangular, about 0.28-times exopod and with a well

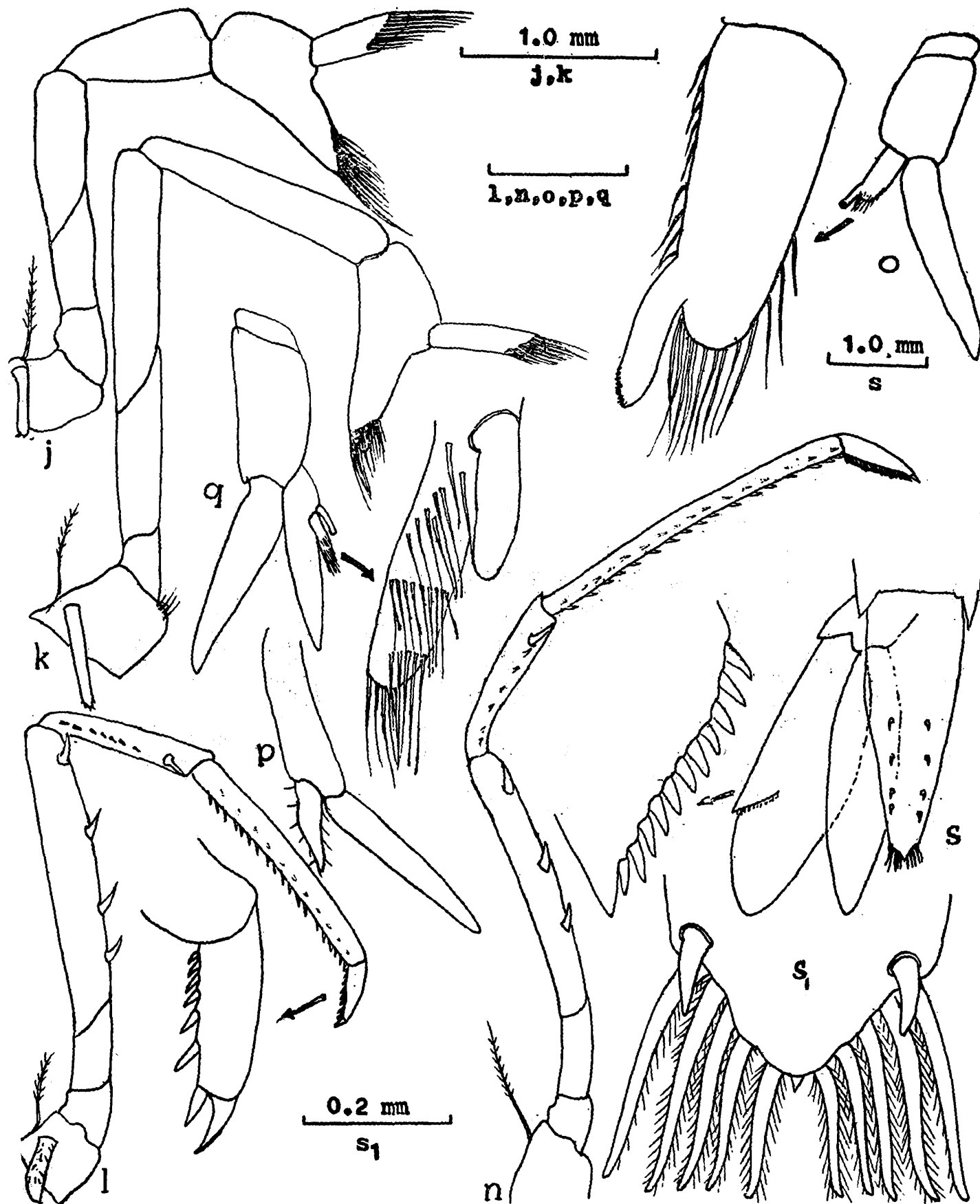


Fig. 5. *Caridina panikkari* n. sp. —Male, 22.0 mm. j—first pereopod, k—second pereopod, l—third pereopod, n—fifth pereopod, o—first pleopod, p—first pleopod of female, q—second pleopod, s—telson + uropods, s<sub>1</sub>—posterior part of telson magnified.

developed *appendix interna*, extending well beyond tip of endopod. *Appendix masculina* about 1.80-times as long as *appendix interna*, about 0.40-times as long as endopod and armed with rows of stiff setae.

Dorsal surface of telson bearing 5 or 6 pairs of small spines. Posterior margin triangularly rounded with a small, sharp triangular point in middle, bearing 6 to 9 long plumose but blunt setae, outermost being stoutest, sparsely plumose but only on inner margin.

Uropod diaeresis with 11 to 13 spinules.

*Colouration* : Could not be observed.

*Remarks* : *C. panikkari* n. sp. appears to be a rather rare species since so far only 2 specimens could be collected only once (August 1974) from Hosayellapur tank (Hirekeri), Dharwar, inspite of repeated attempts.

The new species can be at once distinguished from the other known species of *Caridina* by its unique crescent-shaped rostrum.

*Etymology* : The new species has been so named as a tribute to late Dr. N. K. Panikkar, one of the most eminent scientist pioneers who strived for the allround development of Marine Sciences and Fisheries in India.

### 3. *Caridina kemp* n. sp.

(Figs. 6 to 8)

*Material examined* : 200 specimens collected from various ponds, tanks, lakes etc in and around Dharwar viz. Saptapur pond, Lamanikeri, Karnatak College ponds, Kelgeri, Hosayellapur tank (Hirekeri) and Nuggikeri. Size : males—13.0 to 19.0 mm, non-berried females—15.0 to 30.0 mm and berried females-16.0 to 29.0 mm.

*Holotype* : 1 male of 18.0 mm deposited in the National Museum of Zoological Survey of India, Calcutta (Regd. No. C 2696/2).

*Paratypes* : 3 females of 20.0 to 26.0 mm and 3 males of 15.0 to 17.0 mm deposited in the National Museum of Zoological Survey of India, Calcutta (Regd. No. C 2697/2) and 1 female of 17.0 mm and 1 male of 16.0 mm deposited in the National Museum of Natural History, Smithsonian Institution, Washington, D. C. 20560 U. S. A. (Regd. No. 170242).

*Type locality* : Hosayellapur tank (Hirekeri), Dharwar.

*Description* : Rostrum always reaching beyond  $\frac{1}{4}$ th of 2nd antennular segment, mostly upto its tip and sometimes even extending upto

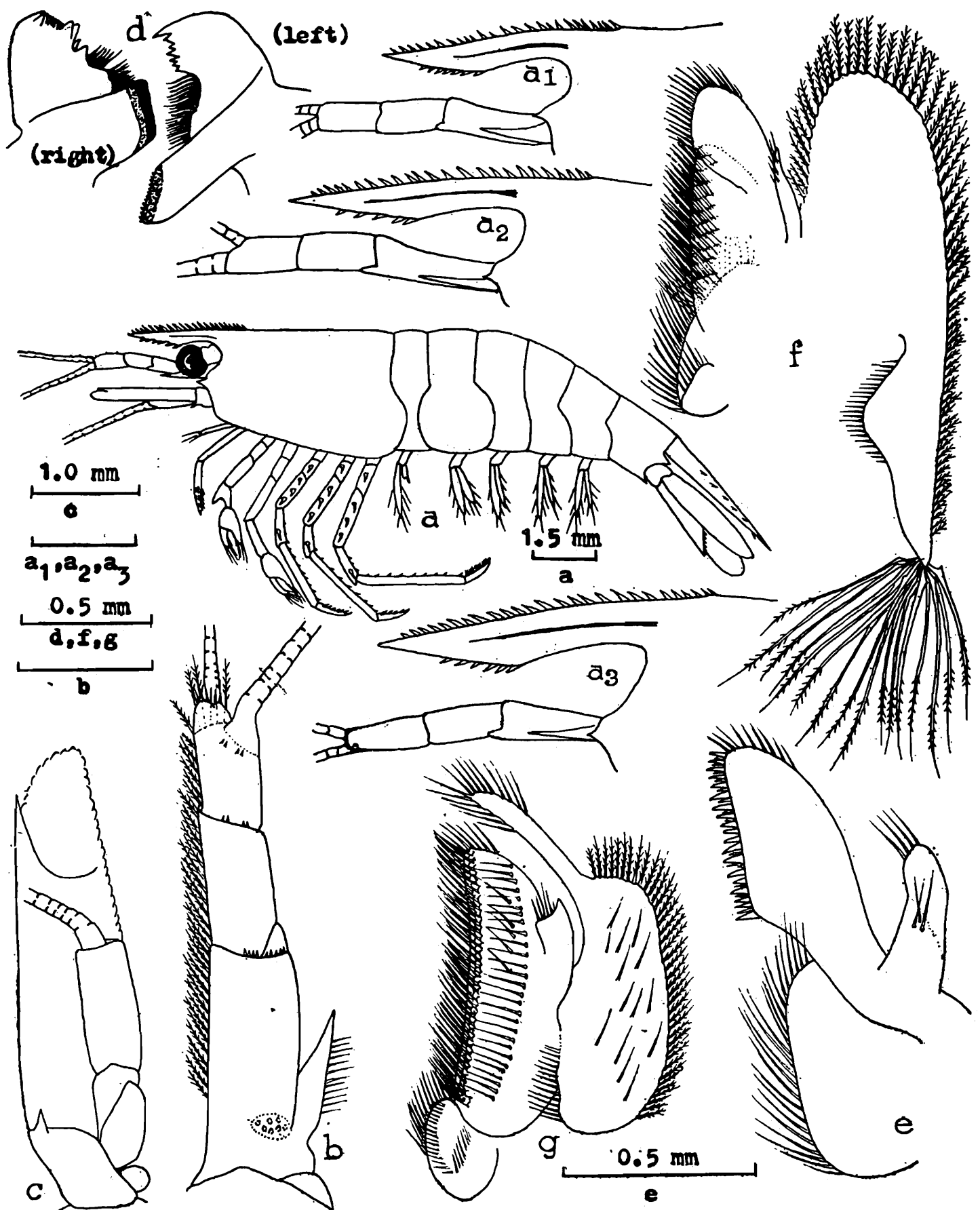


Fig. 6. *Caridina kempfi* n. sp. —Male, 16.0 mm. a—entire animal (lateral view), a<sub>1</sub> to a<sub>3</sub>—rostrum of 3 different specimens, b—antennule, c—antenna, d—right and left mandibles, e—first maxilla, f—second maxilla, g—first maxilliped.

$\frac{3}{4}$ th of 3rd segment. It also exhibits considerable range of variation in its shape and dentition. Rostral formula  $\frac{17-28}{3-12}$  (5-8), usually  $\frac{19-25}{4-8}$  (6 or 7), average =  $\frac{22.28}{6.37}$ . Upper margin either straight or gradually sloping down anteriorly, with teeth almost equidistant all along its length except a small distal gap, teeth gradually decreasing in size at both extremities, ventral margin broadest at about middle, teeth only in anterior half and almost equidistant.

Carapace 1.55 to 2.50 (average=1.90)-times as long as rostrum. Antennal spine distinct, sharply pointed and placed at some distance below rounded orbital angle. Pterygostomial angle mostly rounded but in about 17% of specimens produced into a minute spine.  $\frac{A_1}{C} = 0.54$  to 0.70 (average=0.62),  $\frac{Prpd_s}{C} = 0.31$  to 0.38 (average=0.34),  $\frac{Prpd_e}{C} = 0.38$  to 0.51 (average=0.44),  $\frac{6abd}{C} = 0.34$  to 0.40 (average=0.37).

Anterolateral tooth of basal segment of antennule rather blunt, triangular, reaching about  $\frac{1}{4}$ th of 2nd segment. Antennular carina prominent. Antennal scale about 3.35-times as long as broad.

Mouth parts normal as in figure. Third maxilliped with epipod and extending upto tip of antennular peduncle.

First cheliped extending beyond half of antennal peduncle, sometimes reaching its tip. Fingers 0.94 to 1.17 (average=1.06) times as long as palm. Chela robust being 2.02 to 2.50 (average=2.36)-times as long as broad. Carpus deeply excavated anteriorly, 1.43 to 1.69 (average=1.56)-times as long as broad, shorter than chela and subequal to merus.

Second cheliped extending with chela or fingers beyond tip of antennal peduncle. Fingers 1.25 to 1.56 (average=1.36)-times as long as palm. Chela 2.92 to 3.40 (average=3.17)-times as long as broad. Carpus without anterior excavation, slender, elongated, being 4.88 to 6.00 (average=5.42)-times as long as broad, longer than chela and subequal to merus.

Dactylus of third pereopod 2.83 to 3.71 (average=3.14)-times as long as broad, with its posterior margin bearing 6 to 9 (mostly 6 to 8) spines. Propodus 8.62 to 11.00 (average=9.68)-times as long as broad and 5.16 to 5.30 (average=4.76)-times as long as dactylus. Carpus about  $\frac{3}{4}$ th of propodus with a big subterminal spine and an inner row of small spinules. Merus stout, broadest in middle with 4 large spines on

posterior border, about 6.0-times as long as broad and about 1.70-times as long as carpus. Ischium much smaller than merus and with a large spine on posterior margin. Fourth pereopod similar to third. Fourth pereopod similar to third.

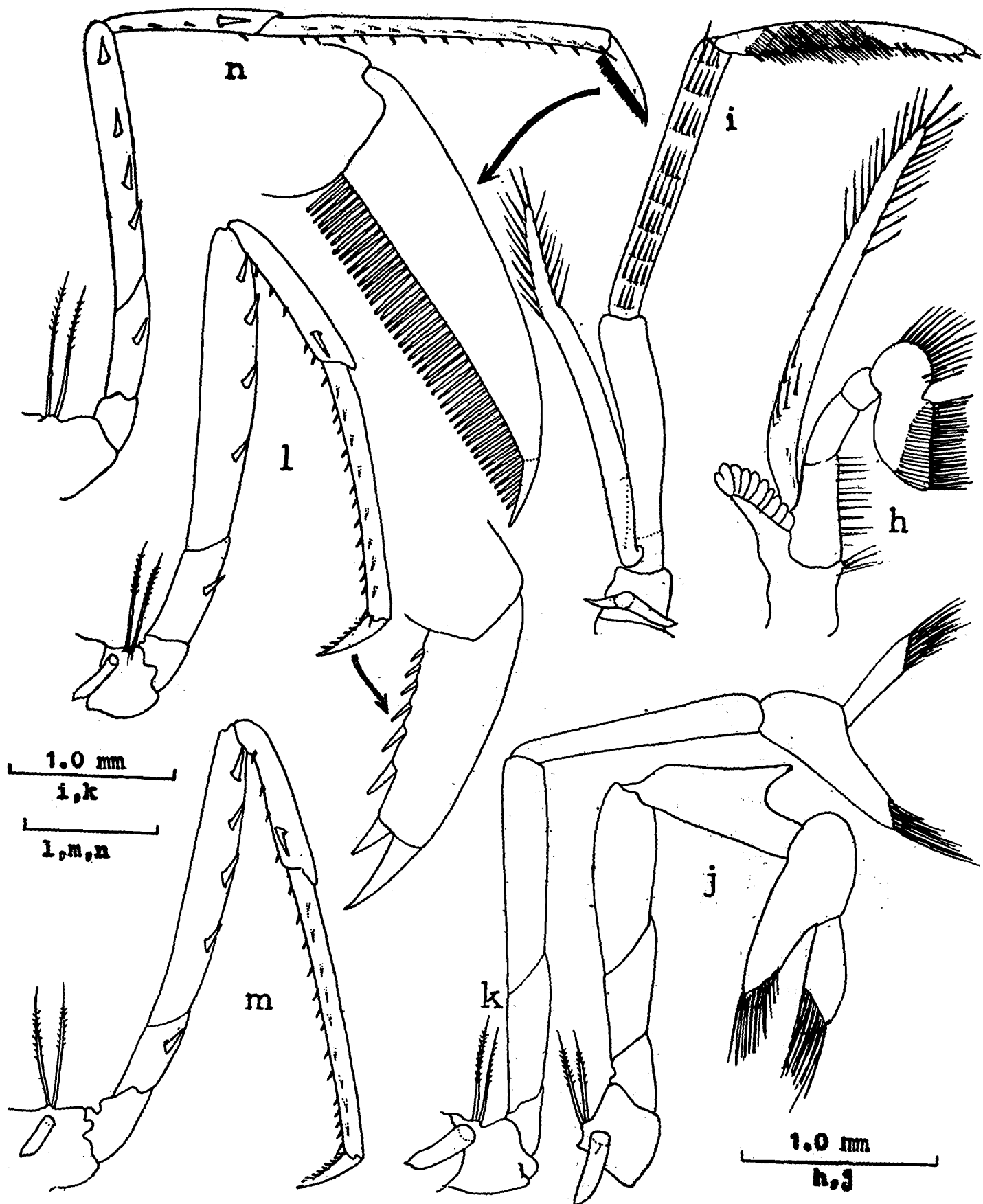


Fig. 7. *Caridina kempfi* n. sp. —Male, 16.0 mm. h—second maxilliped, i—third maxilliped, j—first pereopod, k—second pereopod, l—third pereopod, m—fourth pereopod, n—fifth pereopod.

Fifth pereopod extending with dactylus beyond the tip of antennal peduncle. Dactylus 3.75 to 4.60 (average=4.21)-times as long as broad and with 35 to 55 (average=43.75) comb-like spinules on posterior margin. Propodus 9.07 to 13.33 (average=11.62)-times as long as broad and 3.63 to 4.40 (average=4.00)-times as long as dactylus. Carpus about half as long as propodus, with a large subterminal and an inner row of small spinules. Merus about 1.55-times as long as carpus and with 4 large spines on posterior margin. Ischium with a large spine on posterior margin.

Epipod present on first 4 pereopods and 2 setobranchs each on all pereopods.

Abdomen stout and without any dorsal hump.

Endopod of first pleopod of females almost equal to exopod and triangular in shape. Endopod of first pleopod in males 1.85 to 2.00-times as long as broad, 0.33 to 0.37-times exopod and with a well developed *appendix interna* extending well beyond its tip. *Appendix masculina* well setose on inner margin, 1.75 to 1.90-times as long as *appendix interna* and 0.47 to 0.50-times as long as endopod.

Preanal carina distinct, triangular with broad base and rounded tip directed posteriorly and armed with a bunch of long setae.

Dorsal surface of telson bearing 5 to 7 (mostly 5 or 6) pairs of small spines. Sometimes unpaired spines are also found. Posterior margin broadly triangular or rounded with a sharp triangular median point, bearing 6 to 8 broad plumose processes, outermost being longest and stoutest and sparsely plumose that too only on inner margin and 4 or 5 pairs of small hairs arising rather dorsally.

Uropod with 15 to 20 (average=16.85) spinules on diaeresis.

*Eggs and development* : Eggs brownish in colour, rather small, elliptical, measuring 0.33 to 0.40 × 0.58 to 0.65 mm. Fecundity 240 to 930. Development consisting of 6 larval+1 postlarval stages when reared in laboratory.

*Colouration* : The ground colour is either dark-green or dark-red but appears completely black with greyish-yellow colouration as follows : 1) Distal  $\frac{1}{2}$ th of uropods, 2) small horizontal bars dorsally at joints of abdominal segments and 3) a thin longitudinal streak running middorsally along entire length of body. After bringing to laboratory and keeping in plastic containers for a few days they tend to lose their dark colouration becoming almost transparent.

*Ecology* : This species is found both in seasonal and perennial tanks almost throughout the year. The perennial tanks viz.

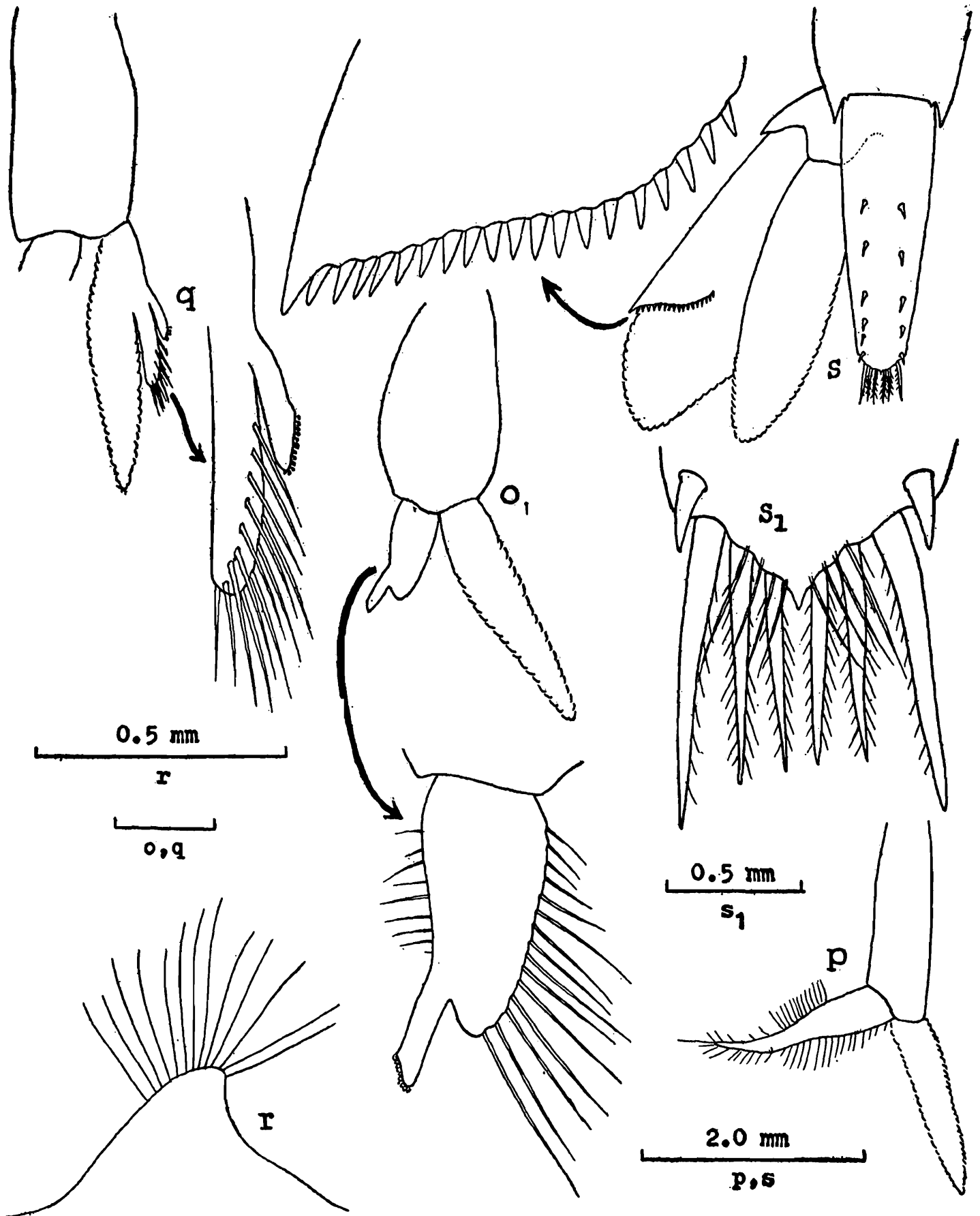


Fig. 8. *Caridina kempfi* n. sp. —Male, 16.0 mm. o—first pleopod, p—first pleopod of female, q—second pleopod, r—preanal carina, s—telson + uropods, s<sub>1</sub>—posterior part of telson magnified,

Hosayellapur tank (Hirekeri), Nuggikeri and Someshwar tank etc rich in aquatic vegetation yield maximum harvest. The species usually occurs alongwith 2 other prawns viz. *Caridina williamsoni* n. sp. and a new species of *Macrobrachium* (being published elsewhere). It breeds throughout the year with its peak being immediately after onset of rains till completion of monsoon.

*Remarks* : The new species resembles the Indian species *Caridina babaulti* Bouvier, 1918, belonging to Bouvier's (1925) '*C. brevisrostris* group' and also resembles *C. weberi* var. *sumatrensis* De Man, 1892 belonging to Bouvier's '*C. typus* group'. Comparisons with *C. babaulti* are based not only on the descriptions of the species by Bouvier (1918 and 1925) but also on the actual examination of the syntype material (No. 670-1 male of 14.0 mm and No. 668-3 females of 16.0 to 20.0 mm) deposited in the MNHN, Paris. *C. babaulti* can be at once distinguished by the presence of a well developed spine on the anterolateral angle of basal segment of antennule (a primitive character in the genus *Caridina*) as against the blunt projection in the new species (an advanced condition). Other differences between the two species are as under :

Characters	<i>C. kempfi</i> n. sp.	<i>C. babaulti</i> Bouvier
1. Rostral formula	$\frac{17-28}{3-12}$	$\frac{16-24}{2-5}$
2. Postorbitals	5 to 8	3 to 6
3. Pterygostomial spine	Mostly absent	Mostly present and well developed
4. Antennal scale	3.35-times as long as broad	2.83-times as long as broad
5. First cheliped		
(a) $\frac{\text{Carpus length}}{\text{Carpus breadth}}$	=1.43 to 1.69	1.73 to 2.00
(b) $\frac{\text{Chela length}}{\text{Chela breadth}}$	=2.02 to 2.50	2.56 to 2.73
6. Preanal carina	Distinct, acutely triangular with tip directed posteriorly	Just an elevation with broad base and a blunt, obtuse tip not directed posteriorly
7. Telson		
(a) Dorsal margin	Mostly with 5 or 6 pairs of spines	Mostly with only 4 pairs of spines

Characters	<i>C. kempfi</i> n. sp.	<i>C. babaulti</i> Bouvier
(b) Posterior margin	Outermost process longer and stouter than inner processes	Innermost process longer and all processes of almost equal thickness
8. First pleopod of male		
<i>Appendix interna</i>	Straight and stout (4.2-times as long as broad), shorter being about 1.2-times as long as endopod	Bent outside and slender (6.0-times as long as broad), longer being about 1.4-times as long as endopod
9. Second pleopod of male		
<i>Appendix masculina</i>	Longer being 1.75 to 1.90-times as long as <i>appendix interna</i>	Shorter being only 1.12 to 1.15-times as long as <i>appendix interna</i>
10. $\frac{6abd}{C} =$	0.34 to 0.40	0.43 to 0.53
11. Size of eggs (mm)	0.33 to 0.40 × 0.58 to 0.65 (Smaller)	0.40 to 0.60 × 0.70 to 1.20 (Bigger)

*Caridina weberi* var. *sumatrensis* is one of the most misunderstood forms and therefore, comparison with that form is restricted only to the original account as given by De Man (1892), syntype description of Bouvier (1925) and personal examination of type locality material (Deli, Sumatra) collected by L. Martin and N. Annandale and deposited in the ZSI, Calcutta (Regd. No.  $\frac{3708}{7}$  C  $\frac{15.57}{1}$ ). It differs from the present new species in the following characters :

Characters	<i>C. kempfi</i> n. sp.	<i>C. weberi</i> var. <i>sumatrensis</i>
1. Rostral formula	$\frac{17-28}{3-12}$ (av. = $\frac{22.28}{6.37}$ )	$\frac{16-20}{3.6}$ (av. = $\frac{17.62}{4.57}$ )
2. Postorbitals	Mostly 6 or 7	Mostly 4 to 6
3. $\frac{\text{Carapace}}{\text{Rostrum}} =$	1.55-2.50 (av. = 1.90)	2.44-2.64 (av. = 2.56)
4. Third pereopod		
(a) Dactylus	with 7 to 10 spines	with 6 or 7 spines
(b) $\frac{\text{Propodus}}{\text{Dactylus}} =$	4.16 to 5.30	5.91 to 6.66

Characters	<i>C. kemp</i> n. sp.	<i>C. weberi</i> var. <i>sumatrensis</i>
5. Fifth pereopod		
$\frac{\text{Propodus}}{\text{Dactylus}} =$	3.63 to 4.40	4.77 to 6.78
6. First pleopod of male	Endopod 1.85 to 2.00-times as long as broad	Endopod 1.95 to 2.50-times as long as broad
7. <i>Appendix masculina</i>	1.75 to 1.90-times as long as <i>appendix interna</i>	About 1.50-times as long as <i>appendix interna</i>
8. Eggs		
(a) Size in mm	0.33 to 0.40 × 0.58 to 0.65 (Bigger)	0.22 to 0.25 × 0.33 to 0.42 (Smaller)
(b) Number	240 to 630	700 to 1300

*Etymology* : Kemp's (1910 to 1925) monumental contributions to the Indian carcinology cannot be acknowledged in words alone. We take it not only as privilege but also as duty to name this new species in honour of this great carcinologist.

#### 4. *Caridina shenoyi* Jalihal and Sankolli, n. sp. \*

(Figs. 9 to 11)

*Material examined* : 15 berried females measuring 20.0 to 27.0 mm collected from river Malaprabha near Khanapur (Dist. Belgaum). Besides, 100 adult specimens were examined from those obtained by laboratory rearing which ranged in size as follows : males—12.0 to 16.0 mm, non-berried females—19.0 to 26.0 mm and berried females—19.0 to 25.0 mm.

*Holotype* : 1 laboratory reared berried female of 24.0 mm deposited in the National Museum of Zoological Survey of India, Calcutta (Regd. No. C 2698/2).

*Paratypes* : 3 laboratory reared berried females of 19.0 to 22.0 mm and 3 laboratory reared males of 13.0 to 15.0 mm deposited in the National Museum of Zoological Survey of India, Calcutta (Regd. No. C 2699/2) and 1 berried female of 23.0 mm and 1 laboratory reared non-

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\*As cited the authors for this species are only Jalihal and Sankolli and the description of this species is the responsibility of these 2 authors alone.

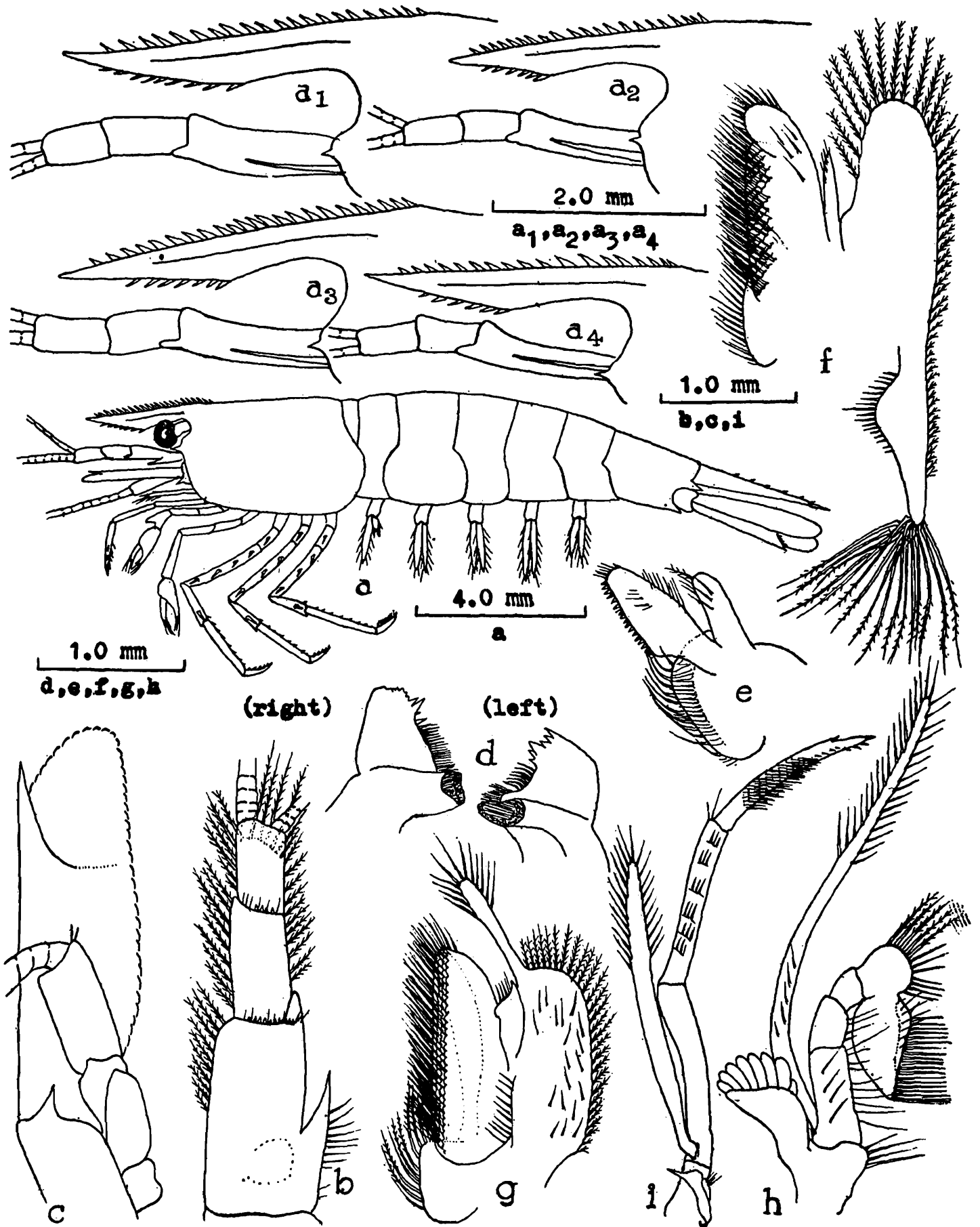


Fig. 9. *Caridina shenoyi* n. sp. —Male, 15.0 mm. a—entire animal (lateral view), a<sub>1</sub> to a<sub>4</sub>—rostrum of 4 different specimens, b—antennule, c—antenna, d—right and left mandibles, e—first maxilla, f—second maxilla, g—first maxilliped, h—second maxilliped, i—third maxilliped.

berried female of 23.0 mm deposited in the National Museum of Natural History, Smithsonian Institution, Washington, D. C. 20560 U. S. A. (Regd. No. 170243).

*Type locality* : Malaprabha river—near old bridge, Khanapur (Belgaum District).

*Description* : Rostrum atleast reaching tip of 2nd antennular segment, mostly half or  $\frac{3}{4}$ th of 3rd segment and sometimes even extending upto its tip exhibiting considerable range of variation in its shape and dentition. Rostral formula  $\frac{16-26}{3-9}$  (5 to 8), usually  $\frac{19-23}{5-8}$  (5 or 6), average =  $\frac{20.63}{6.33}$ . Upper margin gradually sloping downwards with almost equidistant teeth present throughout its length except for a small distal gap. Lower margin broadest in middle, teeth almost equidistant and only on anterior half.

Carapace 1.79 to 2.52 (average = 2.04)-times as long as rostrum. Antennal spine distinct, sharply pointed and placed at some distance below rounded orbital angle. Pterygostomial angle mostly rounded, but produced into a minute spine in about 10% of specimens.  $\frac{A_1}{C} = 0.49$  to 0.56 (average = 0.53),  $\frac{Prpd_3}{C} = 0.32$  to 0.36 (average = 0.33),  $\frac{Prpd_5}{C} = 0.39$  to 0.45 (average = 0.42),  $\frac{6abd}{C} = 0.36$  to 0.41 (average = 0.39).

Cornea broad and with dark pigmentation.

Anterolateral tooth of basal segment of antennular peduncle rather small, blunt and reaching about proximal  $\frac{1}{3}$ rd of 2nd segment. Outer flagellum of antennule with 6 or 7 aesthetasc-bearing segments in females and 8 to 10 aesthetasc-bearing segments in males. Antennular carina prominent. Antennal scale 3.00 to 3.20-times as long as broad.

Mouth parts normal as in figure. Third maxilliped with an epipod and reaching upto tip of antennular peduncle.

First cheliped extending upto middle of antennal peduncle. Fingers 0.86 to 1.08 (average=0.94)-times as long as palm. Chela robust being 2.09 to 2.51 (average=2.26)-times as long as broad. Carpus deeply excavated anteriorly, 1.31 to 1.61 (average=1.48)-times as long as broad, shorter than chela and almost equal to merus.

Second cheliped extending with chela beyond antennal peduncle. Fingers 1.18 to 1.47 (average=1.35)-times as long as palm. Chela 2.78 to 3.35 (average=3.07)-times as long as broad. Carpus slender,

elongated being 5.00 to 6.44 (average=5.48)-times as long as broad, subequal to merus and longer than chela.

Dactylus of third pereiopod 2.38 to 2.87 (average=2.62)-times as

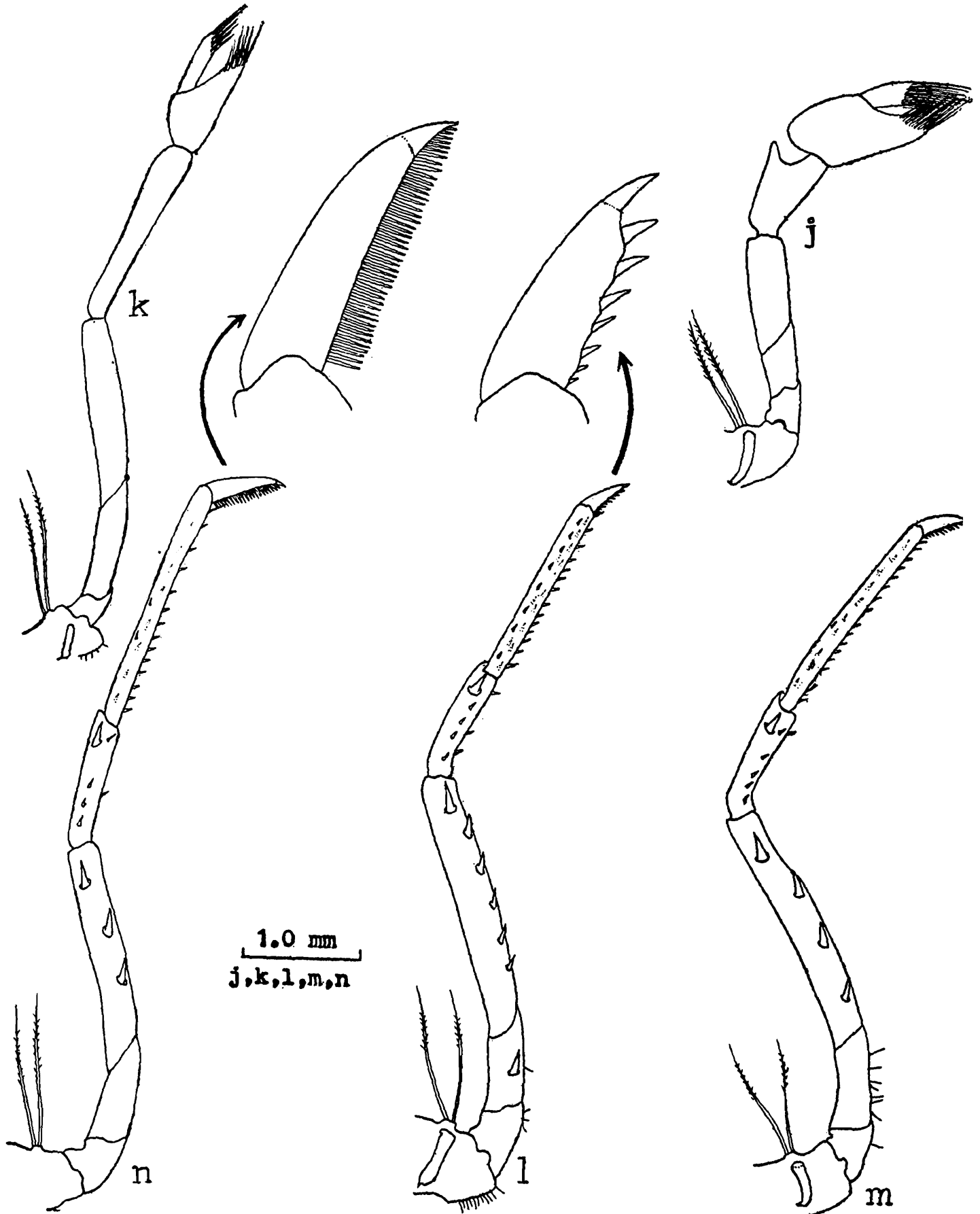


Fig. 10. *Caridina shenoyi* n. sp. —Male, 15.0 mm. j—first pereiopod, k—second pereiopod, l—third pereiopod, m—fourth pereiopod, n—fifth pereiopod.

long as broad, with a strong terminal spine ; its posterior margin bearing 6 to 8 (mostly 6) spines gradually decreasing in size proximally Propodus 9.11 to 11.23 (average=9.92)-times as long as broad, bearing the usual rows of spinules and 4.27 to 6.27 (average=5.36)-times as long as dactylus. Carpus about  $\frac{3}{4}$ th of propodus, with a big subterminal spine and an inner row of small spinules. Merus stout, uniformly broad with 4 to 6 large spines on the posterior border, about 7.0-times as long as broad and nearly twice as long as carpus. Ischium with a large spine on the posterior margin.

Fourth pereopod similar to third but without ischial spine.

Fifth pereopod reaching upto tip of antennal peduncle. Dactylus 3.55 to 4.38 (average=3.96)-times as long as broad and with 39 to 54 (average=45.22) comb-like spinules on posterior margin. Propodus 11.62 to 13.71 (average=12.30)-times as long as broad, with 3 rows of small spinules and 3.79 to 4.94 (average=4.29)-times as long as dactylus. Carpus about half as long as propodus with a big subterminal and an inner row of small spinules. Merus about 1.55-times as long as carpus and with 3 large spines on posterior margin. Ischium much smaller than merus and without any spine.

Epipod present on first 4 pereopods and 2 setobranchs each on all pereopods.

Abdomen stout and without any dorsal hump.

Endopod of first pleopod in females subequal to exopod being broad in the proximal half and abruptly narrowing in the distal half. Endopod of first pleopod in males 0.33 to 0.45-times exopod, triangular being 1.54 to 2.00 (average=1.64)-times as long as broad and with a well developed *appendix interna*. *Appendix masculina* well setose on inner margin, about 0.62 to 0.64-times as long as endopod and 1.33 to 1.35-times as long as *appendix interna*.

Preanal carina distinct, subtriangular with broad base and the acutely rounded tip directed posteriorly, armed with long setae on its distal half.

Dorsal surface of telson bearing 5 to 7 pairs of small spines, placed at regular intervals. Posterior margin nearly rounded with a sharp, triangular median point and bearing 6 to 8 long blunt plumose setae, outermost being stoutest and sparsely plumose only on inner margin and with 3 to 5 pairs of small hairs arising rather dorsally.

Uropod diaeresis with 17 to 23 (average=19) spinules.

*Eggs and development* : Eggs rather small, elliptical, measuring 0.33 to 0.44 × 0.57 to 0.68 mm. Immature eggs are blackish brown in colour

turning more brownish on maturation. Fecundity—240 to 360. The development consists of 5 larval+1 postlarval stages when reared in laboratory.

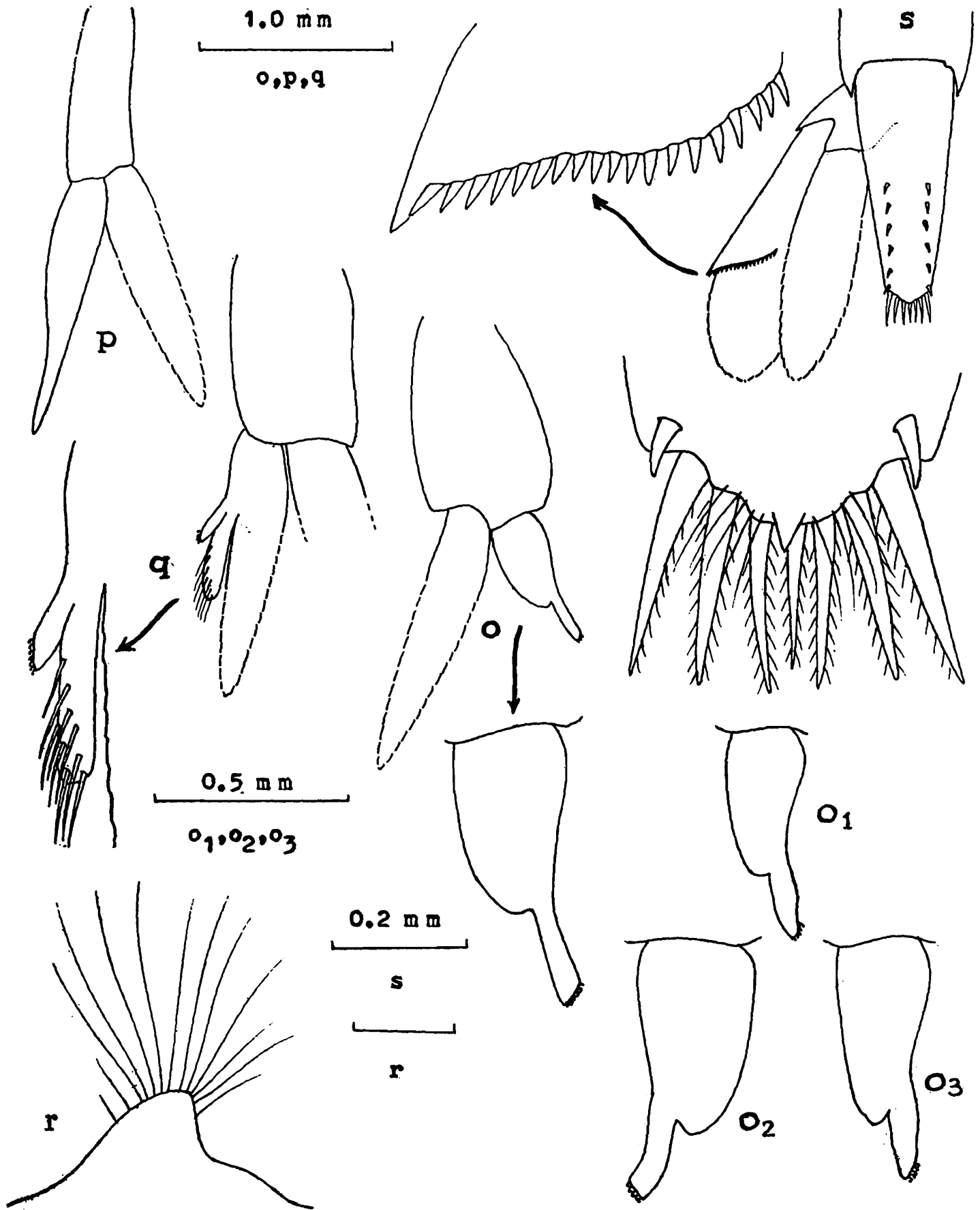


Fig. 11. *Caridina shenoyi* n. sp. —Male, 15.0 mm. o—first pleopod, o<sub>1</sub> to o<sub>3</sub>—endopods of first pleopods of 3 different males, p—first pleopod of female, q—second pleopod, r—preanal carina, s—telson+uropods, s<sub>1</sub>—posterior part of telson magnified.

*Colouration* : The ground colour is generally violet or greenish blue with orange-yellow chromatophores arranged as follows : 1) Distal  $\frac{1}{4}$ th of uropods and outer  $\frac{1}{4}$ th of exopod of uropod, 2) small horizontal bars dorsally at junction of 3rd and 4th, 4th and 5th abdominal segments and 3) a thin long, middorsal streak running from base of rostrum to base of telson.

After bringing to laboratory and keeping alive for a couple of days in glass containers, they lose their dense colouration and as days pass, become almost transparent.

*Ecology* : The species was collected at the river-head of Malaprabha at Khanapur which is at an altitude of about 670 metres above mean sea level. The prawns were generally found to occur in knee deep water either in heaps of decaying leaves or among the water weeds, grasses etc. Other prawns found in the same locality are *Caridina williamsoni* n. sp., *C. gurneyi* n. sp., *Macrobrachium hendersonianum* (Tiwari), and 2 new species of *Macrobrachium* (the last two species of *Macrobrachium* are under publication).

*Remarks* : This species can be confused with *Caridina kempi* n. sp. described earlier. However, both the species can be distinguished based on adult as well as larval characters as given below :

*Adults.*—

Characters	<i>C. shenoyi</i> n. sp.	<i>C. kempi</i> n. sp.
1. Ischium of fourth and fifth pereopods	Without any spines	With a large spine
2. Dactylus of third pereopod	Stout being 2.38-2.87 (av.=2.62)-times as long as broad	Slender being 2.83-3.71 (av.=3.14)-times as long as broad
3. $\frac{A_1}{C} =$	0.49-0.56 (av.=0.53)	0.54-0.70 (av.=0.62)
4. Endopod of first pleopod of male	Acutely triangular being 1.54 to 2.00-times as long as broad	Obtusely triangular being 1.85 to 2.00-times as long as broad
5. <i>Appendix masculina</i>		
	(i) 0.62 to 0.64-times as long as endopod	0.47 to 0.50-times as long as endopod
	(ii) 1.33 to 1.35-times as long as <i>appendix interna</i>	1.75 to 1.90-times as long as <i>appendix interna</i>

Characters	<i>C. shenoyi</i> n. sp.	<i>C. kempi</i> n. sp.
6. Uropod diaeresis spinules	17 to 23 (av. = 19)	15 to 20 (av. = 17)
<i>Larvae.</i> —		
Characters	<i>C. shenoyi</i> n. sp.	<i>C. kempi</i> n. sp.
(I) First zoea		
1. Antennal scale	2.55-times as long as broad and with 4 distal segments	3.0-times as long as broad and with 3 distal segments
2. Pereiopods	Only first 2 pereiopods represented as uniramous buds	First 3 pereiopods represented as biramous buds
3. Telson	1.50-times as long as broad	1.65-times as long as broad
4. Chromatophores	Saffron chromatophores present on mandibles and antennular peduncles	Saffron chromatophores completely absent
(II) Degree of development of outer setae on endopod of maxillipeds		
1. First maxilliped	Without any densely plumose outer seta in any stage	A densely plumose outer seta appears in fifth zoea
2. Second maxilliped	A densely plumose outer seta appears in fourth zoea	A densely plumose outer seta appears in third zoea
3. Third maxilliped		
(a) 2nd segment	An outer seta appears in third zoea	An outer seta appears in fourth zoea
(b) 3rd segment	Without any outer seta in any stage	An outer seta appears in sixth zoea

The present new species *Caridina shenoyi* differs from *C. babaulti* Bouvier, 1918 and *C. weberi* var. *sumatrensis* De Man, 1892 in the same way as *C. kempi*.

*Etymology* : The species is named after Dr. (Smt.) Shakuntala Shenoy.

5. *Caridina gurneyi* n. sp.

(Figs. 12 to 14)

*Material examined* : 50 berried females of 21.0 to 30.0 mm collected in the river Malaprabha, Khanapur. Also, 100 adult specimens from laboratory grown material (4 months old) of following sizes : males—12.0 to 15.0 mm, non-berried females—18.0 to 24.0 mm and berried females—20.0 to 26.0 mm.

*Holotype* : 1 laboratory grown berried female of 20.0 mm deposited in the National Museum of Zoological Survey of India, Calcutta (Regd. No. C 2700/2).

*Paratypes* : 3 laboratory reared berried females of 18.0 to 23.0 mm and 3 laboratory reared males of 13.0 to 16.0 mm deposited in the National Museum of Zoological Survey of India, Calcutta (Regd. No. C 2701/2) and 1 berried females of 23.0 mm + 1 laboratory reared non-berried female of 21.0 mm deposited in the National Museum of Natural History, Smithsonian Institution, Washington D. C. 20560 U. S. A. (Regd. No. 170244).

*Type locality* : Malaprabha river, near old bridge, Khanapur (Belgaum District).

*Description* : Rostrum always longer than half of 3rd antennular segment, mostly reaching its tip and in a few cases even extending slightly beyond it, exhibiting considerable variation in its shape and dentition. Rostral formula  $\frac{16-30}{3-11}$  (5 to 7), usually  $\frac{19-25}{5-8}$  (5 or 6), average =  $\frac{22.22}{6.27}$ . Upper margin gradually sloping down and armed with almost equidistant teeth all over except for a small subapical gap. Ventral margin broadest in middle, teeth only in anterior half.

Carapace 1.77 to 2.16 (average=1.92)-times as long as rostrum. Antennal spine distinct, sharply pointed and placed some distance below rounded orbital angle. Pterygostomial angle either rounded or acute or produced into a small spine (in 40% specimens).  $\frac{A_1}{C} = 0.50$  to 0.58 (average = 0.54),  $\frac{Prpd_s}{C} = 0.30$  to 0.36 (average = 0.33),  $\frac{Prpd_b}{C} = 0.29$  to 0.46 (average = 0.39),  $\frac{6abd}{C} = 0.36$  to 0.41 (average = 0.38).

Cornea broad and well pigmented.

Anterolateral margin of basal segment of antennular peduncle produced into a small, rather blunt, triangular tooth reaching about proximal  $\frac{1}{3}$ rd of 2nd segment. Outer flagellum with 7 to 11 (mostly 9 or 10)

aesthetasc-bearing segments in females and 14 to 17 aesthetasc-bearing segments in males. Antennular carina prominent. Antennal scale about 2.70-times as long as broad.

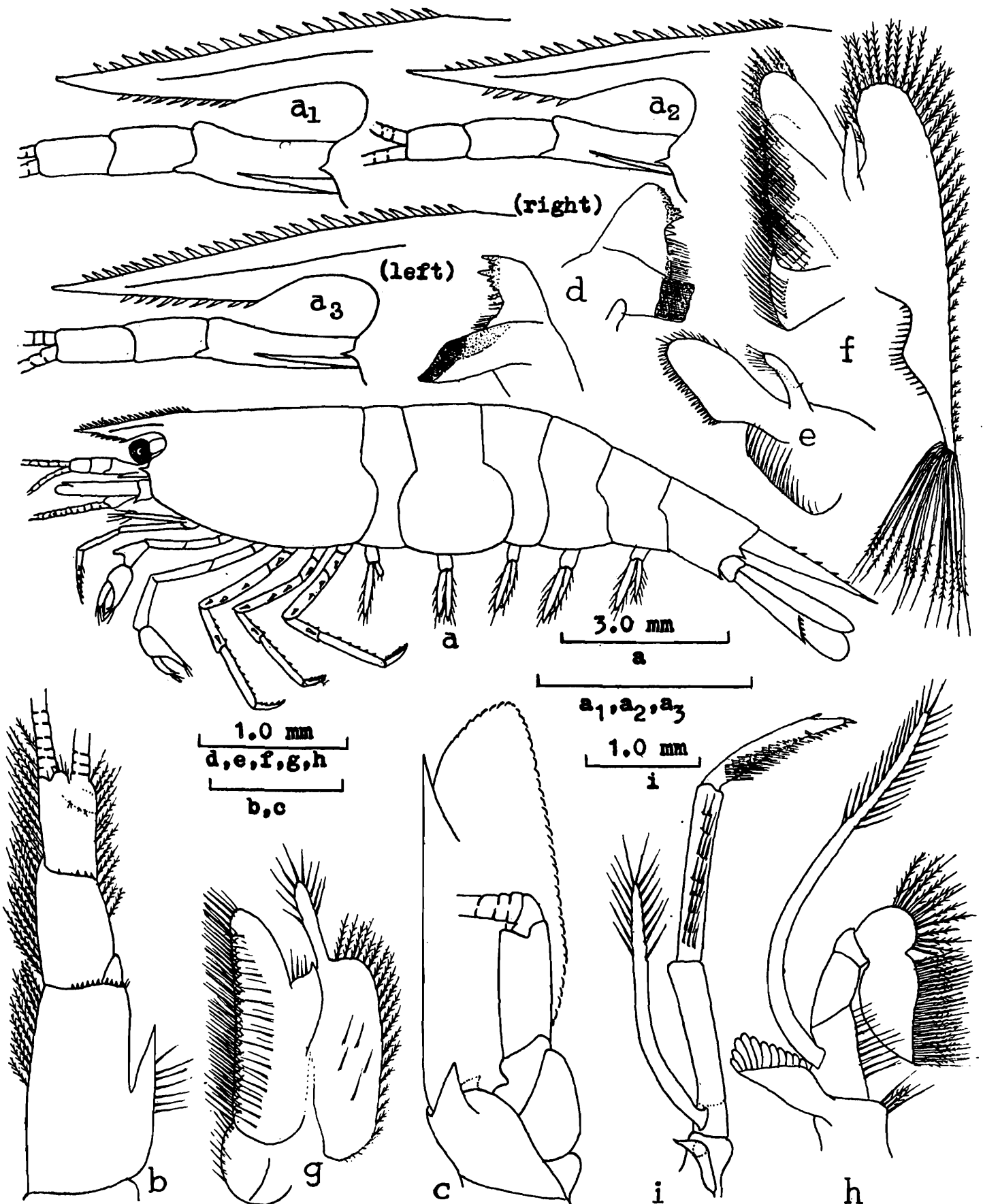


Fig. 12. *Caridina gurneyi* n. sp. —Male, 14.0 mm. a—entire animal (lateral view), a<sub>1</sub> to a<sub>3</sub>—rostrum of 3 different specimens, b—antennule, c—antenna, d—right and left mandibles, e—first maxilla, f—second maxilla, g—first maxilliped, h—second maxilliped, i—third maxilliped.

Mouth parts normal as in figure. Third maxilliped with an epipod and extending upto tip of antennular peduncle.

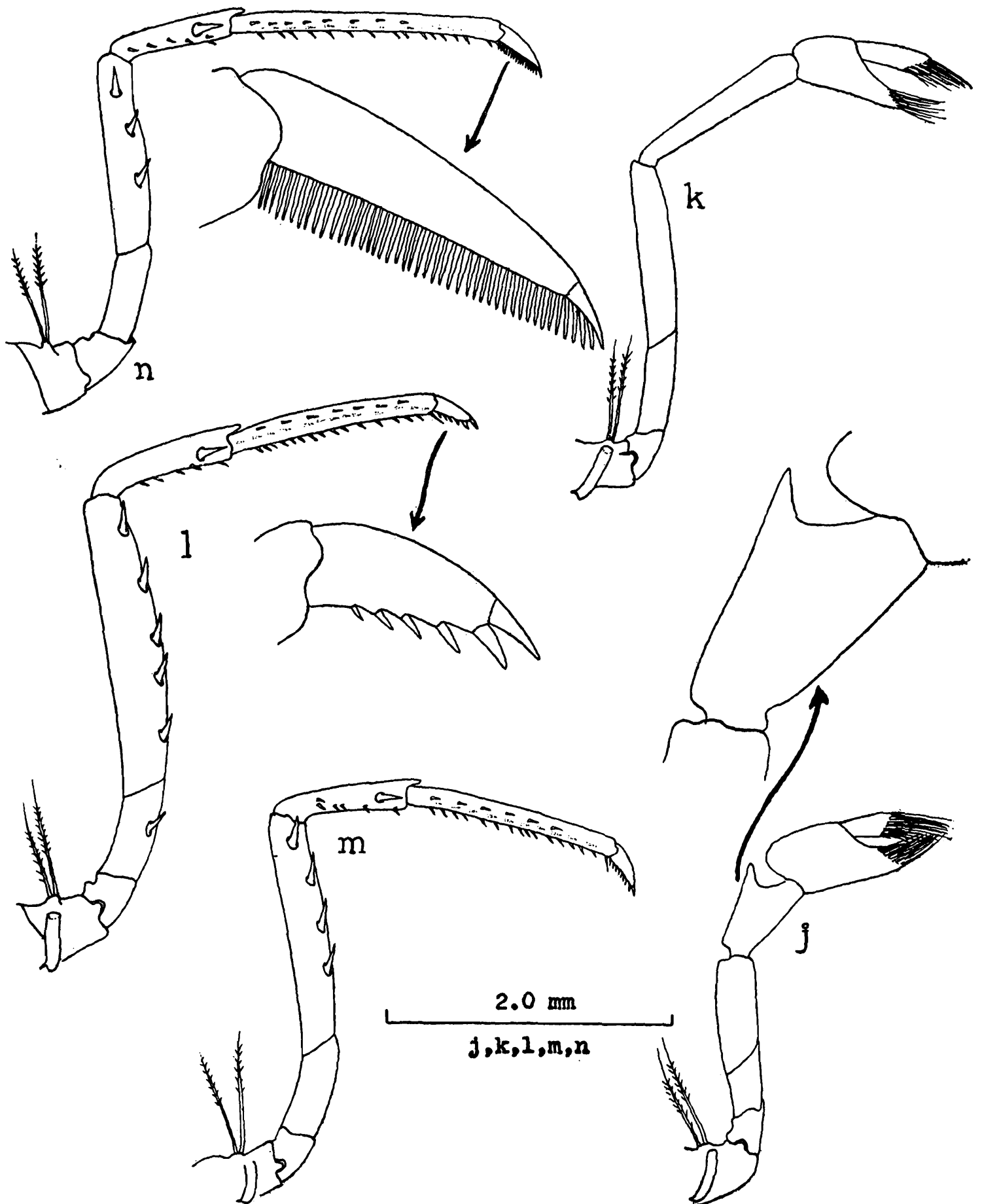


Fig. 13. *Caridina gurneyi* n. sp. —Male, 14.0 mm. j—first pereopod, k—second pereopod, l—third pereopod, m—fourth pereopod n—fifth pereopod.

First cheliped extending upto middle of antennal peduncle. Fingers 0.86 to 1.11 (average=0.99)-times as long as palm. Chela robust being 2.17 to 2.39 (average=2.29)-times as long as broad. Carpus deeply excavated anteriorly, 1.41 to 1.81 (average=1.60)-times as long as broad, shorter than chela and nearly equal to merus.

Second cheliped slender than first and extending with complete or half of chela beyond antennal peduncle. Fingers 1.24 to 1.52 (average=1.40)-times as long as palm. Chela 2.74 to 3.61 (average=3.17)-times as long as broad. Carpus slender, elongated being 5.00 to 6.00 (average=5.58)-times as long as broad, subequal to merus and distinctly longer than chela.

Dactylus of third pereiopod 2.38 to 2.75 (average=2.52)-times as long as broad, with a strong terminal spine and bearing on posterior margin 5 to 8 (mostly 6 or 7) spines. Propodus 8.73 to 10.26 (average=9.71)-times as long as broad and 4.66 to 7.00 (average=5.45)-times as long as dactylus. Carpus about  $\frac{3}{4}$ th of propodus, with a big subterminal spine and an inner row of small spinules. Merus about 1.80-times as long as carpus, stout, broad in middle with 5 large spines on its posterior margin. Ischium much smaller than merus and with a large spine on the posterior margin.

Fourth pereiopod similar to third but without ischial spine.

Epipod present on first 4 pereiopods.

Fifth pereiopod reaching tip of antennal peduncle. Dactylus 3.60 to 4.76 (average = 4.29)-times as long as broad and with 35 to 55 (average = 47.33) comb-like spinules on posterior margin. Propodus with 3 rows of small spinules, 9.00 to 14.00 (average = 12.08)-times as long as broad and 4.00 to 4.54 (average = 4.33)-times as long as dactylus. Carpus about half as long as propodus with a large subterminal and an inner row of small spinules. Merus about 1.45-times as long as carpus and with 3 large spines on posterior margin. Ischium smooth without any spine.

Chelipeds mostly with 3 setobranchs and remaining pereiopods with 2 setobranchs each.

Abdomen stout and smooth without any dorsal hump.

Endopod of first pleopod in females short, being about 0.71-times as long as exopod. Endopod of first pleopod in males 0.37 to 0.47-times exopod and acutely triangular being 1.96 to 2.35-times as long as broad and with a long *appendix interna*. *Appendix masculina* 0.61 to 0.69-times as long as endopod and 1.29 to 1.40-times as long as *appendix interna*.

Preanal carina distinct, triangular with a broad base and rounded tip, directing posteriorly and armed with long setae.

Dorsal surface of telson bearing 4 to 7 (mostly 4 or 5) pairs of small spines (sometimes unpaired spines are also found). Posterior margin nearly rounded with a sharp median point, bearing 5 to 10 long, blunt, plumose spines. Posterior spines usually arranged in pairs but sometimes an unpaired median spine present.

Exopod of uropod with 16 to 21 (average = 19) spinules on diaeresis which makes rather a broad angle with outer margin of exopod.

*Eggs and development* : Immature eggs are blackish brown in colour, but become more brownish on maturation. They are large, elliptical, measuring  $0.50$  to  $0.65 \times 0.75$  to  $0.90$  mm. Fecundity—80 to 170. Development is abbreviated, consisting of only 3 larval+1 postlarval stages when reared in laboratory.

*Colouration* : The ground colour is greenish blue or dark-green, in some almost black with grey colour arranged as follows : 1) Distal  $\frac{1}{4}$ th of uropods, 2) small horizontal bars dorsally at joints of all abdominal segments and 3) a thin long middorsal streak running from base of rostrum to base of telson.

As already mentioned the colouration fades after the prawns are brought to laboratory becoming almost transparent within a few days in glass aquaria.

*Ecology* : The species is found in the river Malaprabha, Khanapur, in the same locality where *Caridina williamsoni* and *C. shenoyi* are found. All these 3 species can be collected in a single haul even by a small rectangular hand-net.

*Remarks* : Of the 3 species found in the river Malaprabha, Khanapur, *Caridina williamsoni* can be readily distinguished by its slender body and the dorsal hump on the 3rd abdominal segment. The present new species *C. gurneyi* and *C. shenoyi* both stout and without abdominal hump, however, are so confusing that it is difficult to separate them from each other by any character other than the egg size. The eggs in *C. gurneyi* are conspicuously bigger ( $0.50$  to  $0.65 \times 0.75$  to  $0.90$  mm) and consequently less in number (80 to 170) than in *C. shenoyi* wherein the eggs are smaller ( $0.33$  to  $0.44 \times 0.57$  to  $0.68$  mm) and more in number (250 to 360). Thus initially it was difficult to separate the non-berried females and males of the two species. It was, therefore, decided to study the males and non-berried females by obtaining them from actual laboratory rearing from the respective berried

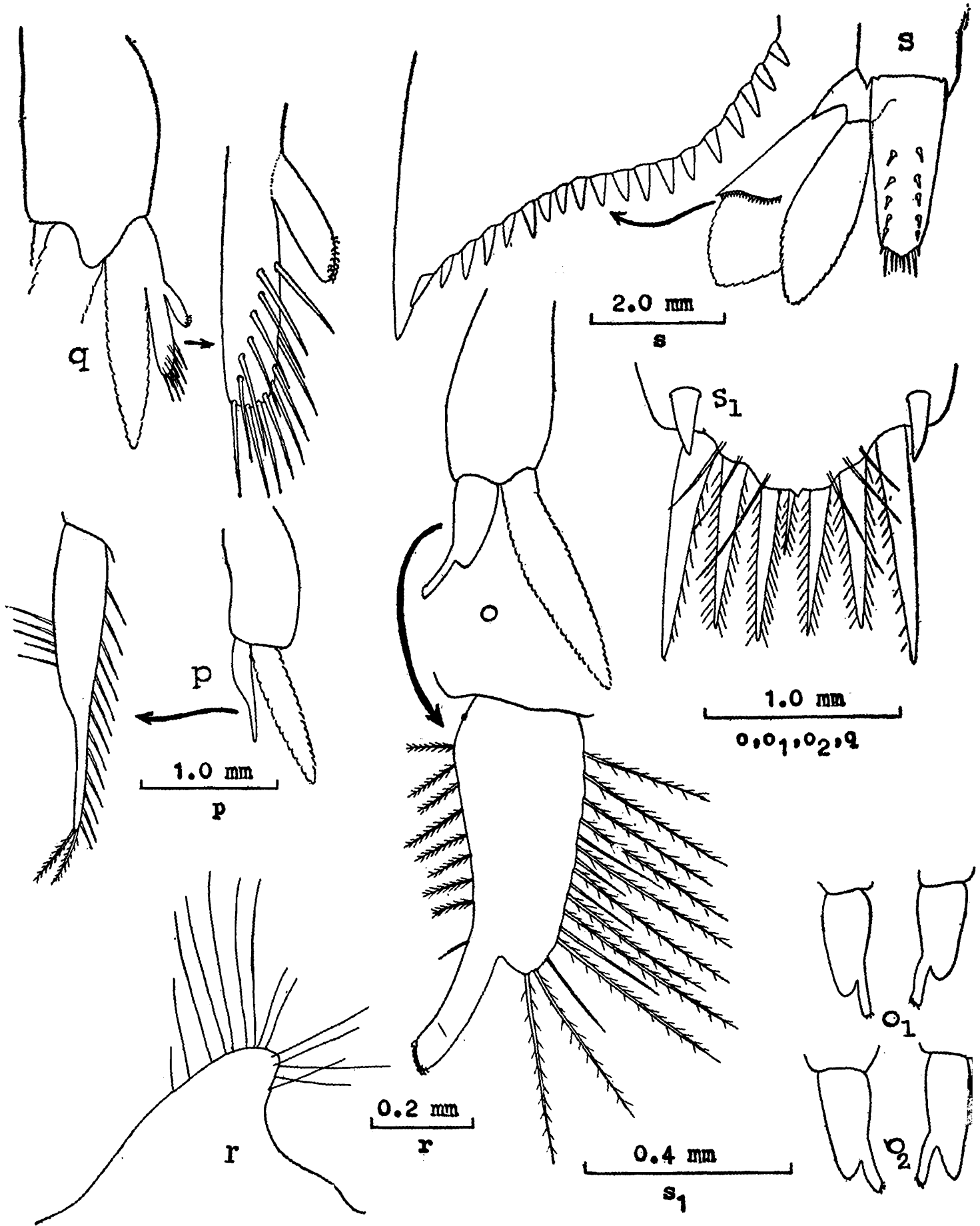


Fig. 14. *Caridina gurneyi* n. sp. —Male, 14.0 mm. o—first pleopod, o<sub>1</sub> & o<sub>2</sub>—endopods of first pleopods of right and left sides of 2 different males, p—first pleopod of female, q—second pleopod, r—preanal carina, s—telson + uropods, s<sub>1</sub>—posterior part of telson magnified.

females. Therefore, rearing was continued beyond postlarval stage until matured males with all the pleopodal characteristics of the species developed and also this generation could breed in the same rearing tanks.

Based on the above laboratory reared material, the males and non-berried females of the 2 species *C. gurneyi* and *C. shenoyi* could be distinguished as under :

Characters	<i>C. gurneyi</i> n. sp.	<i>C. shenoyi</i> n. sp.
(I) Males		
1. Endopod of first pleopod	1.96 to 2.35-times as long as broad	1.54 to 2.0-times as long as broad
2. Outer flagellum of antennule	With 14 to 17 aesthetasc bearing segments	With 8 to 10 aesthetasc bearing segments
(II) Non-berried females		
1. Outer flagellum of antennule	With 7 to 11 (mostly 9 or 10) aesthetasc bearing segments	With only 6 or 7 aesthetasc bearing segments
2. Chelipeds (of both males and females)	Mostly with 3 setobranchs	Always with 2 setobranchs

The larvae of the above 2 species can be easily distinguished since in *C. gurneyi* the development is partially abbreviated comprising 3+1 stages where in the larva hatches with all pairs of pereopod and pleopod buds whereas in *C. shenoyi* the development comprises 5+1 stages where in the larva hatches with only 2 pairs of uniramous pereopod buds but without pleopod buds.

Both *C. gurneyi* and *C. shenoyi* can be easily separated from *C. kempfi* by absence of ischial spine on fourth and fifth pereopods as well as other characters given in the key. Bigger eggs of *C. gurneyi* also help its easy separation from other 2 species.

*Caridina gurneyi* differs from *C. babaulti* Bouvier, 1918 (except in egg size) and *C. weberi* var. *sumatrensis* De Man 1892, in the same way as *C. kempfi* and *C. shenoyi*.

*Etymology* : The new species is named in honour of late Dr. Robert Gurney who is so aptly called as the 'father of Decapod larvae' and whose work imbibed in us the love for this intriguing group.

## DISCUSSION

Bouvier (1925) in his monographic revision of the family Atyidae divided all the till then known species of the genus *Caridina* into 5 groups viz. '*C. nilotica* group', '*C. laevis* group', '*C. africana* group', '*C. brevirostris* group' and '*C. typus* group', based mainly on following characters: 1) Extension and nature of rostrum. 2) Ratio of antennular peduncle to carapace. 3) Ratio of 6th abdominal segment to carapace. 4) Number of spinules on uropod diaeresis. 5) Number of setae on the posterior margin of telson.

Of the 5 new species described in the present paper, *Caridina williamsoni* fits into '*C. nilotica* group' in possessing 1) long rostrum reaching tip of antennal scale, 2) antennular peduncle nearly equal to carapace and 3) 6th abdominal segment about  $\frac{2}{3}$ rd of carapace. But as regards the uropod diaeresis spinules, *C. williamsoni* has 10 to 15 spinules while '*C. nilotica* group' has only 8 to 10 spinules.

The second species i. e. *C. panikkari* fits into '*C. laevis* group' of Bouvier in 1) possessing a rostrum shorter than antennular peduncle, which is about  $\frac{2}{3}$ th of carapace length and 2) uropod diaeresis with 11 to 13 spinules. However, it can be very easily distinguished from all other species of the genus by its unique crescent-shaped rostrum.

The remaining 3 new species viz. *C. kempi*, *C. shenoyi* and *C. gurneyi* share some of the characters each of Bouvier's '*C. brevirostris*' and '*C. typus* groups'.

The '*C. brevirostris* group' is characterised by: 1) Uropod diaeresis spinules around 15 and not exceeding beyond 20. 2) Antennular peduncle sometimes longer than 0.66-times carapace length. 3) 6th abdominal segment sometimes longer than 0.50-times the length of carapace.

The '*C. typus* group' is characterised by the following features: 1) Uropod diaeresis spinules about 20 or more. 2) Antennular peduncle always less than half the length of carapace. 3) 6th abdominal segment always less than half the length of carapace.

*C. kempi* in possessing 6th abdominal segment far less than half of carapace length (0.34 to 0.40-times) fits into '*C. typus* group', but in possessing always less than 20 uropod diaeresis spinules (15 to 20) and an antennular peduncle which in most cases is longer than 0.66-times carapace length (0.54 to 0.70-times) fits into '*C. brevirostris* group'.

*C. shenoyi* in possessing mostly 20 or more uropod diaeresis spinules (17 to 23) and 6th abdominal segment far less than half the carapace length (0.36 to 0.41-times) shows more affinities with '*C. typus* group',

but in possessing antennular peduncle a little longer than half the carapace length (0.49 to 0.56-times) shares features of '*C. brevirostris* group'.

*C. gurneyi* belongs to '*C. typus* group' in possessing 17 to 21 (average=19) uropod diaeresis spinules and a short 6th abdominal segment which never exceeds half (0.36 to 0.41-times) the carapace length. However, in possessing antennular peduncle more than half (0.50 to 0.58-times) as long as carapace length, it shares features of Bouvier's '*C. brevirostris* group'.

Thus, even in sharing characters of Bouvier's groups *C. kempfi* which has 2 characters of '*C. brevirostris* group' and 1 of '*C. typus* group' differs from *C. shenoyi* and *C. gurneyi* which have closer affinities in sharing 1 character of '*C. brevirostris* group' and 2 characters of '*C. typus* group'.

All the 5 new species described in the paper can be easily distinguished from one another based on the following key which for the first time incorporates both adult and larval characters. This is significant especially for a confusing group like Atyid which is known for its extreme range of variations and wherein the specific characters are not yet fully understood.

*Key to the new species of the genus Caridina of the Dharwar area*

1. Body slender, with a prominent dorsal hump on 3rd abdominal segment. Postorbital teeth not more than 5. Antennular peduncle long, equal to or atleast  $\frac{2}{3}$ th of carapace length. Antennular carina not prominent. Carpus of first cheliped without or with a very slight anterior excavation. Pereiopods with not more than 1 setobranch each. Sixth abdominal segment more than half of carapace length. Uropod diaeresis spinules not more than 15. ... 2
- Body stout, without any abdominal hump. Postorbital teeth always more than 5. Antennular peduncle always shorter than  $\frac{2}{3}$ th of carapace length. Carpus of first cheliped with a deep anterior excavation. Pereiopods with atleast 2 setobranchs each. Sixth abdominal segment less than half of carapace length. Uropod diaeresis spinules always more than 15. ... 3

2. Rostrum straight, extending atleast upto tip of antennal scale, teeth on both margins with rostral formula  $\frac{30-50}{8-17}$ . (Egg size: 0.30 to 0.50 × 0.50 to 0.67 mm. Fecundity : 180 to 410. Development : 7+1 stages) ...

*williamsoni* n. sp.

Rostrum crescent-shaped in its distal half, not reaching tip of antennal scale (extending only upto distal end of 2nd segment of antennular peduncle), teeth on upper margin only (in proximal half), with rostral formula  $\frac{19-26}{0}$ .

(Information on berried females or larvae not available.) ...

*panikkari* n. sp.

3. Ischium of fourth and fifth pereopods with a large spine. Dactylus of third pereopod long and slender, always more than 2.80 (2.83 to 3.71)—times as long as broad. Antennular peduncle usually more than 0.60 (0.54 to 0.70, average=0.62)-times carapace length. Endopod of first pleopod of male broadly triangular being 1.85 to 2.00-times as long as broad. *Appendix masculina* 0.47 to 0.50-times as long as endopod and 1.75 to 1.90-times as long as *appendix interna*. (Egg size : 0.33 to 0.40 × 0.58 to 0.65 mm. Fecundity : 240 to 630. Development : 6+1 stages). ...

*kempi* n. sp.

Ischium of fourth and fifth pereopods smooth without any spine. Dactylus of third pereopod shorter and stouter, not more than 2.80 (2.30 to 2.80)-times as long as broad. Antennular peduncle not exceeding 0.60 (0.49 to 0.58, average=0.53)-times carapace length. Endopod of first pleopod of male acutely triangular, being 1.54 to 2.35-times as long as broad. *Appendix masculina* 0.61 to 0.69-times as long as endopod and 1.29 to 1.40-times as long as *appendix interna*. ...

... 4

4. Endopod of first pleopod of male stouter being 1.54 to 2.0-times as long as broad. Chelipeds with only 2 setobranchs. Outer antennular flagellum of males with 8 to 10 and of females with 6 or 7 aesthetasc-bearing segments. Eggs small, maximum diameter not more than 0.70 mm (0.33 to 0.44 × 0.57 to 0.68 mm) and always more than 200 (250 to 360). Development : 5+1 stages. ...

*shenoyi* n. sp.

Endopod of first pleopod of male slender being 1.96 to 2.35-times as long as broad. Chelipeds mostly with 3 setobranchs. Outer antennular flagellum of males with 14 to 17 and of females with 7 to 11 aesthetasc-bearing segments. Eggs bigger, maximum diameter being 0.90 mm (0.50 to 0.65 × 0.75 to 0.90 mm) and always less than 200 (80 to 170). Development: 3+1 stages.

...

*gurneyi* n. sp.

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