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By

M. Mydeen Kunju
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SOLENOCERA INDICA NATARAJ 1945

Common name

Kolumbi (Marathi).

Diagnostic characters

Carapace smooth and glabrous. Rostrum straight, lanceolate and slightly ascending, reaching to tip of basal segment of antennular peduncle, armed with 9 to 10 teeth on upper margin. Post-rostral carina feeble, becoming distinct towards posterior region of carapace. Orbital angle dentiform. Post-orbital, antennal and hepatic spines small, thin and sharp. No branchiostegal or pterygostomian spine. Cervical groove oblique, deep and broad on sides, continues with that on the other side through very faint notch on post-rostral carina. Branchiostegal sulcus originates from angle of inferiolateral curve and runs backwaters towards posterior border of carapace (fig. 28).

Fourth, 5th, 6th and posterior half of 3rd abdominal segments sharply carinated dorsally; carina of 6th segment terminated in spine. A median sternal spine between each pleopod pair, spines decreasing in size from anterior to posterior.

Telson deeply sulcate mid-dorsally on anterior two-thirds; Lateral margins devoid of spines; tip pointed and shorter than exopod of uropods.

Antennular peduncle slightly less than half length of carapace including rostrum, and shorter than antennal scale. Antennular flagella each slightly longer than carapace including rostrum; inferior flagellum twice as wide as superior one.

Mandibular palp 2-jointed, basal joint triangular, as long as distal width; distal joint narrow, slightly less than twice as long as basal segment.

Third maxilliped reaches tip of antennular squama; exopod reaches middle of ischium. All legs with slender exopods. Second cheliped reaches tip of antennal scale; 3rd cheliped (the longest) reaches middle of antennules.

The two halves of petasma united anteriorly; each half of 4 lobes fused together posteriorly and free at distal margins. Inner lobe longest, with tips swollen into spongy mass with toothless outer margin; next lobe with angular border, distal portion fringed with a row of recurved spines, hard chitinous angular plate projecting from near tip; 3rd lobe with broadly rounded outer border fringed with row of small recurved spines; 4th lobe lies inside 3rd; thickened circular end curving outwards.

Thelycum consists of hard plate protruding from sternum behind 5th pair of legs, with tubercular projection between bases of legs; pair of closely approximated small knobs originating from sternum between 4th and 5th pairs of legs; hard vertical plate between 4th pair of legs; small inner lobe on coxa of 3rd leg.

Proximal part of appendix masculina with bar-shaped projection on inner surface, convex at apex, directed ventro-laterally; ridge-like elevation on anterior surface.

Cardiac plate armed on inner surface with about 16 pointed spinules arranged in longitudinal series. Cardiac ossicle sub-oval, pterocardiac bar-shaped, prezygocardiac minute and subrectangular, urocardiac with triangular anterior dilatation, zygocardiac with 2 large sharp conical teeth anteriorly and a row of 11 acute long teeth just above upper large tooth, prepyloric with about 10 slender acute teeth on each side. No tooth near anterior end of inner wall of pyloric chamber.

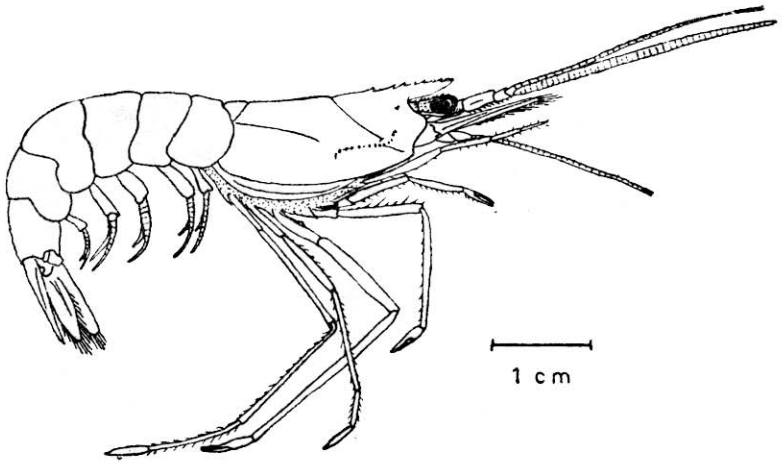

Fig. 28. *Solenocera indica* Nataraj Female (After Kubo 1949)

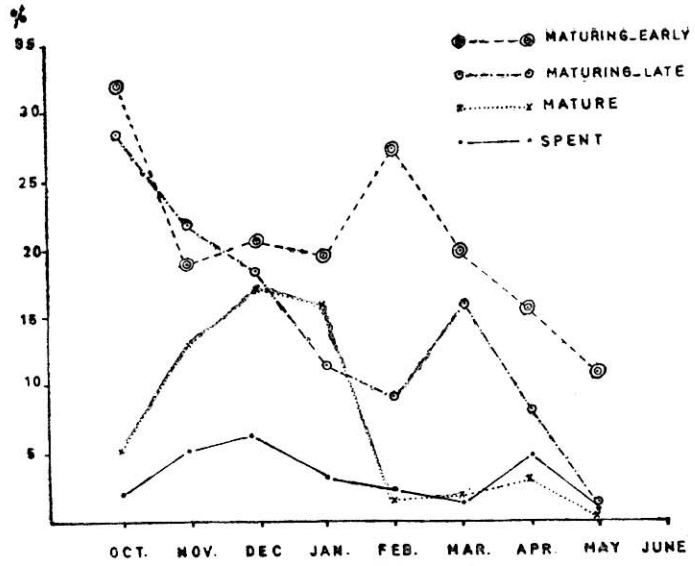

Fig. 29. Incidence of maturity stages of female *Solenocera indica* at Versova (From Kunju 1967)

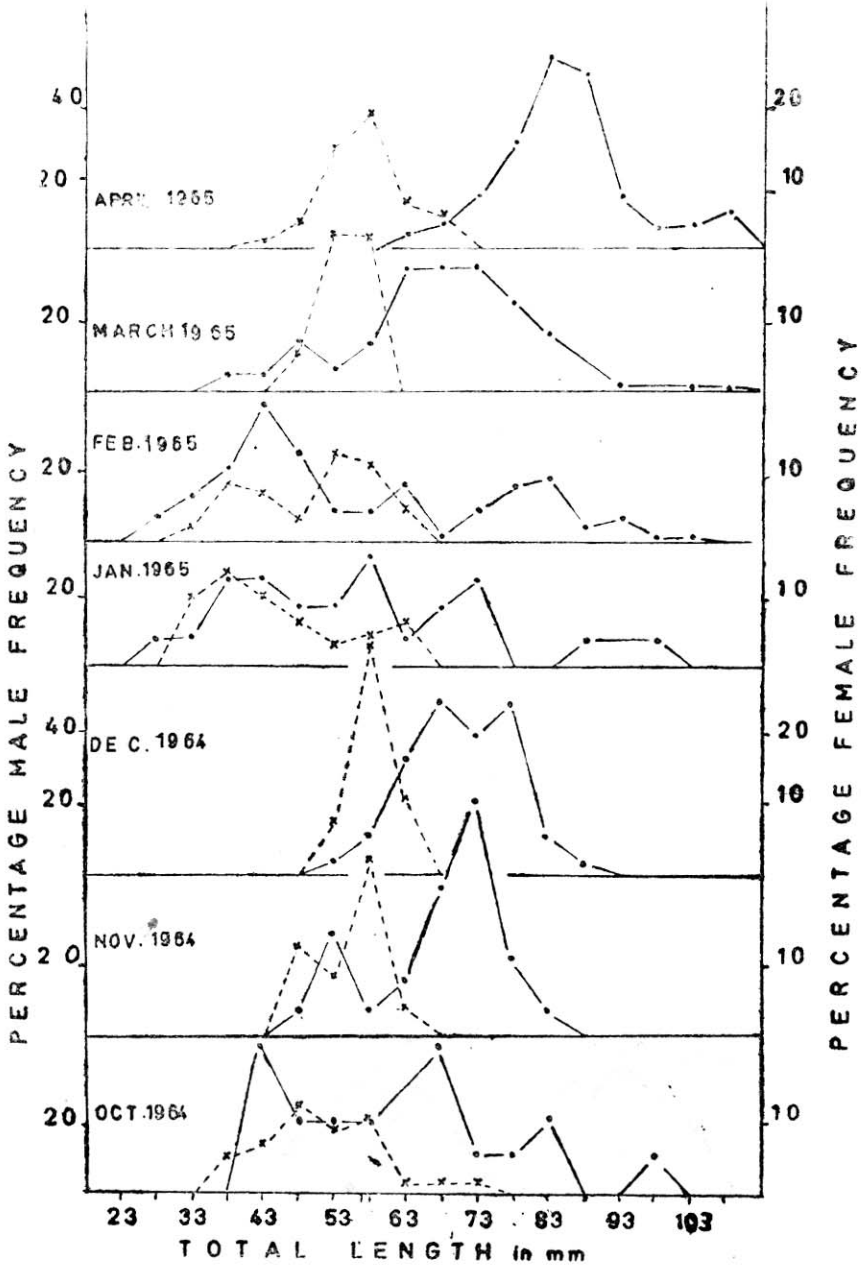

Fig. 30. Length frequency distribution of *Solenocera indica* at Versova. (From Kunju 1967)

Distribution

India, East Pakistan (Ahamed, 1957), Burma (Nataraj, 1945), Singapore and Malaysia (Hall, 1956, 1962) ; Borneo (Kubo, 1949) and Hong Kong (Cheung, 1960, 1963).

Biology and life history

Food and feeding:- Crustaceans such as *Acetes indicus* and *Palaemon tenuipes* and remains of small fishes constitue the major portion of the diet, both together forming about 67% of the stomach contents of 226 prawns examined from Bombay (Kunju, 1967). Other constituents are polychaetes and molluscs. Sand grains are invariably present in the stomach contents. About 26% of the contents are made up of finely divided unidentified matter, the so-called "detritus", which is considered by some authors as the main food of prawns (Panikkar and Menon, 1956; Dall, 1967). However the preponderance of crustaceans and fishes in the diet may not be the result of passive grazing or scavenging activities alone (Forster, 1951; Kunju, 1956, 1967). Hall (1962) found the prawn mainly feeding on polychaetes in the coasts of Malaysia.

Growth:- Studying the length frequency polygons of the species in the Bombay fishery during the period 1957-60, Mohamed (1967) recorded a monthly growth rate of 4-5 mm. The youngest size groups of this prawn begin to appear in the catches from October-November onwards. The dominant modes for males at 41-50 mm in November 1959 is seen shifting to 76-80 mm by May 1960, showing a growth of about 30 mm in 6 months. In females the mode at 61-70 mm observed in December is seen shifting to 86-90 mm in 5 months, showing the same rate of growth. With this growth rate he concluded that the entire fishery was constituted by 0-year class of males and 1-year class of females.

As derived from averages of modal progression for a number of years Kunju (1967) arrived at a slightly faster growth rate of 6.96 mm and 6.49 mm per month for females and males respectively in the case of prawns of over 33 mm length. Juvenile prawns of less than 33 mm length (both sexes) may have a faster growth. Taking into consideration these monthly average growth and the approximate age of the juveniles, female prawns of about 110 mm size may be 14 or 15 months old and males of 80 mm 9 to 10 months.

Movements:- Two types of migratory movements are discernible, one in connection with spawning and the other in relation to salinity (Kunju, 1967). In the spawning migration the females alone move out of the fishing grounds while the males stay back. How far out they migrate and their further destiny are not known. The population *en masse* moves offshore when the salinity of the coastal waters decreases from June to nearly October as a result of the southwest monsoon rains.

Reproduction:- Kunju (1967) recognised five maturity stages viz., immature, maturing-early, maturing-late, mature and spent. The distribution of these stages in different months (Fig. 29) shows that there is a gradual decline in the incidence of the various stages from October onwards. Among the maturing-early stage there are two peaks in October and February, which are found progressing towards the spawning stage in December and April. The peaks formed by the mature and spent prawns are found in the same period, which indicates that spawning follows soon after the ovary reaches the mature stage.

The immature prawns take about three months to attain the mature condition and eventually spawn. There is a gradual raduction in the relative abundance of prawns in progressive conditions of maturity, from the immature to the spent, the number of spent prawns being conspicuously low, compared to the other stages. Therefore it is possible that the main spawning area may be outside the fishing grounds from where the prawns are studied. Nevertheless, the occurrence of spent prawns in the catches, though not in large numbers, may indicate that the main spawning area is contiguous with the fishing grounds.

As the smallest female found with maturing-early ovary is 51 mm it may attain this stage when it is 5 to 6 months old. Since the immature ovary takes about three months to reach the spawning stage, the species may spawn for the first time when it is 8 to 9 months old. As the life span of the species is about 14 to 15 months it is possible that it may spawn at least once again in its life, but there is no evidence to prove it.

Mating and impregnation takes place within the fishing grounds. Females alone move out to deeper waters for spawning.

Females measuring 2.5 to 2.8 cm (carapace length) are found to have 1.36×10^5 to 1.58×10^5 eggs in their ovary, each egg measuring 0.17 to 0.25 mm across (Cheung, 1963).

The breeding season according to Mohamed (1967) is December to May. The peak spawning months recorded by Kunju (1967) are December and April.

Fishery

S. indica occurs all along the coast of India, but is commercially exploited only around Bombay, the fishing lasting from October to May, with peak catches in November.

Females always numerically dominate the population, the female-male ratio being 2 : 1. The disparity between the sexes is not much apparent up to 48 mm length, but thereafter there is a striking preponderance of males over females. This is probably due to the sexually maturing and mature females moving away from the fishing grounds.

The length frequency distribution of the fishery for a single season from October 1964 to April 1965 is shown in Fig. 30.

The largest female and male encountered in Bombay measured 114 mm and 80 mm respectively, and taking into consideration the average monthly growth and the approximate age of juvenile recruits, these prawns are 14 to 15 and 9 to 10 months old respectively.

The fishing grounds of *S. indica* are close to the shore and not extending beyond 40 metre depth. *S. crassicornis* (Menon 1940), *S.hextii* (Wood-Mason & Alcock 1891), *S. choprai* and *S. pectinata* (Nataraj 1945) are also recorded from the Indian waters.

Outside India *S. indica* is of some commercial importance in Hong Kong.

ATYPOPENAEUS STENODACTYLUS (STIMPSON 1860)

Common name

Kolumbi (Marathi).

Diagnostic character

Carapace smooth without longitudinal or transverse sutures. Rostrum short, slightly surpassing the eye; epigastric tooth placed unusually far back; post-rostral carina runs almost to the posterior border of carapace. Post-ocular and cervical grooves well defined; orbito-antennal not recognisable. Eyes small, with slender spine. Scaphocerite is as long as antennular peduncle. Antennular flagella long, longer than carapace. Mandibular palp reaches base of carpocerite, basal segment 1.2 times as long as wide. Basal segment of maxillary palp narrowed distally and bears a swollen apex in proximal half. Endopodite of maxilla pointed, distally at inner angle. Endopodite of first maxilliped 4-jointed, basal joint with a large setae; exopodite subrhombic in outline. Third maxilliped pediform, extending nearly to the tip of scaphocerite (Fig.31).

First 4 pairs of legs rather short, with the merus and carpus broad and compressed; the 2nd and 3rd chelae with long and slender fingers. Last pair of legs long and slender, about 2 times as long as carapace extending beyond tip of antennal scale by dactylus. All the thoracic legs have slender compressed exopodites.

Abdomen is dorsally carinated from 2nd to 6th somites. but the carination of the 2nd and 3rd indistinct. Telson short, without lateral marginal spines.

Petasma stout, ending in 2 massive cornua directed forwards. Thelycum consists of 2 parts, a long leaf shaped median plate and a pair of slender side plates, proximal end of median plate nearly reaching middle of the base of the 4th thoracic leg.

Cardiac plate bears about 27 spines. Pterocardiac ossicle bar shaped; prezygocardiac sigmoid, pointed at both inner and outer ends; prepyloric ends in a large median tooth.

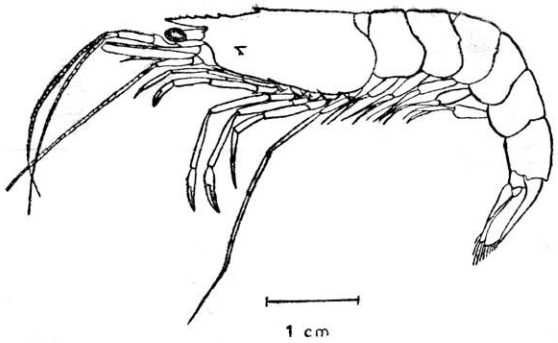

Fig. 31. *Atypopenaeus stenodactylus* (Stimpson)
Female (After Kubo 1936)

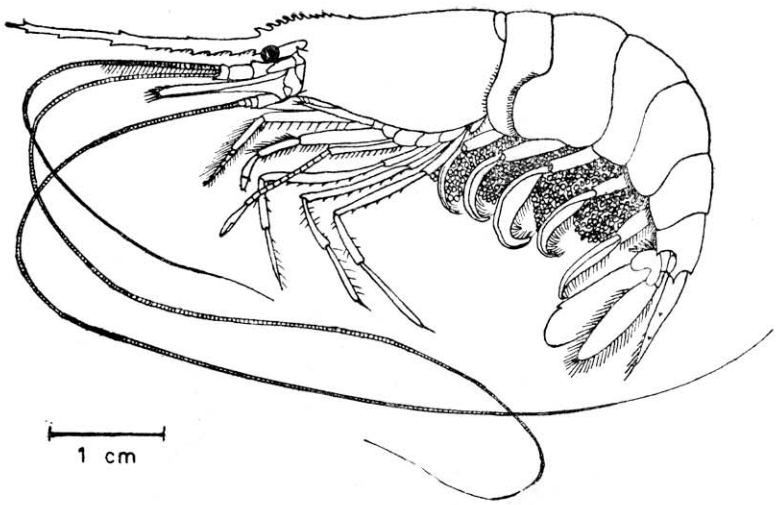

Fig. 32. *Hippolysmata ensirostris* Kemp. Berried female.

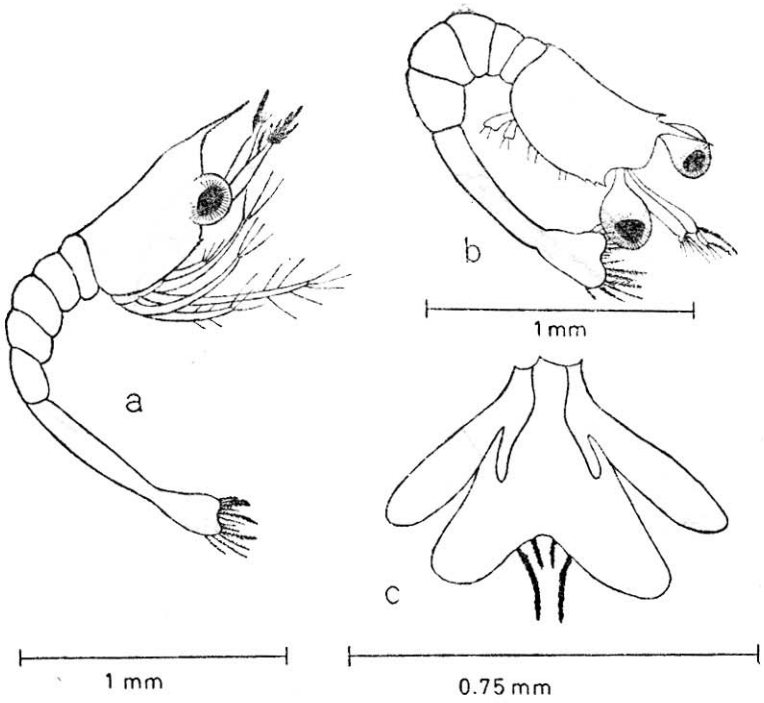

Fig. 33. Early larval stages of *Hippolysmata ensirostris* a, Zoea I; b. Zoea II; c, uropod of Zoea III. (After Bensam and Kartha 1966)

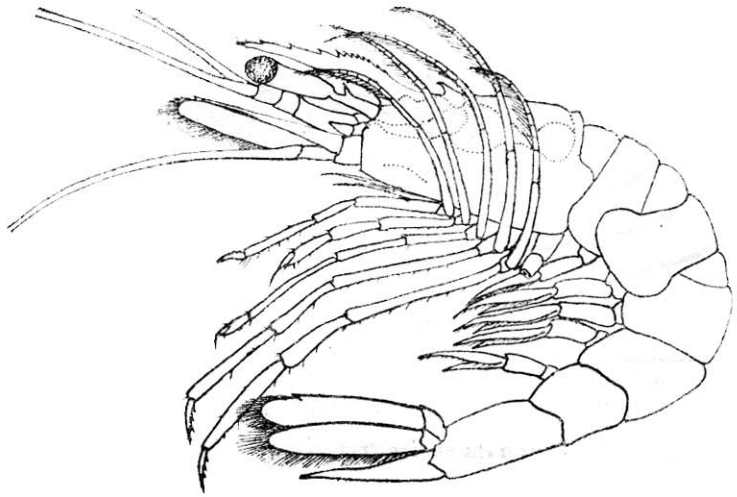

Fig. 34. Late larva of *Hippolysmata ensirostris* (After Kemp 1916)

The characteristic feature of the genus is the presence of pleurobranchia on the 2nd thoracic somite, which is unique in Penaeidae. The genus has only very few species and *A. stenodactylus* is the only one recorded from India.

Distribution

India, Bay of Bima (de Man, 1911), Seto Island, Sea of Japan (Kubo, 1949), Hong Kong (Cheung, 1960).

Biology and life history

Growth:- Yasuda (1956) observed its grwoth to some extent in the Seto Inland Sea of Japan. The prawn occurs in the marginal region of the sea close to the shore. The period of appearance of the young prawns is very long from July to January. Those that appear first grow continuously and rapidly to adult size, and then grow at a much reduced rate until the next spawning season. The young prawns appearing in the fishing grounds late in the season do not grow for a limited period and thereafter grow very rapidly before spawning. The life span of the species is less than one year and two or more generations appear in the catches.

Reproduction:- Spawning season in the Seto Inland Sea of Japan is from the last of June to July (Yasuda, 1956). No information is available from Indian waters.

Fishery

Although this species occurs along both the coasts in India it supports a small fishery only off Bombay where it is caught almost throughout the year with peak landings in November-December (Kunju, 1965).

A minor fishery of this has been reported from Kii Channel of the Seto Inland Sea of Japan, where it accounts for 8.6% of the catches (Yasuda, 1956). The genus contains only a small number of species of which one *A. formosus* is abundant in Queensland (Racek, 1959).

HIPPOLYSMATA ENSIROSTRIS KEMP 1914

Common name

Kolumbi (Marathi).

Diagnostic characters

Carapace a little less than half length of abdomen, excluding telson; pterygostomian spine as large as antennal; rostrum always longer than carapace, with 11-16 dorsal teeth, of which 7-12 are on the elevated crest; inferior margin armed with 7-16 teeth; carapace bluntly carinate mid-dorsally in its anterior half and bears 1 or 2 minute spinules behind basal crest of rostrum (Fig. 32).

Antennular peduncle hardly reaches to 2/3 length of antennal scale, the latter variable in form and usually more than thrice as long as broad; flagellum about twice the length of the entire animal.

Mandible without incisor process or palp. Third maxilliped falls short of apex of antennal scale.

Carpus of 1st peraeiopod a little shorter than chela; dactylus scarcely 2/3 length of palm; merus of 2nd peraeiopod indistinctly divided into 7-11 segments, while the carpus is composed of 12-17; palm of chela shorter than last carpal segment. Last 3 pairs of legs have a variable number of spines on the ventral side of merus. Fifth pair of legs extends to 2/3 or 3/4 length of antennal scale; dactylus with a few spinules posteriorly.

Epipods short and rudimentary at base of first 4 pairs of peraeiopods and concealed from view by downward growth of pleurobranchs.

Sixth abdominal somite is ¼ longer than 5th. Telson about twice the length of 6th somite, has 2 pairs of dorsal spinules. It extends beyond distal end of uropods; there are no terminal spinules.

The species is remarkable for its wide range of variation in the diagnostic characters, specially the rostral armature, proportional

length of legs and number of segments in the carpus of the 2nd pair. The structure of the rostrum and the telson and the rudimentary condition of the epipods are peculiar to the species.

Distribution

India, Ceylon and Burma and Sumatra (Kemp, 1914).

Biology and Life history

Eggs and larvae:- Kemp (1916) describes its late larva and postlarva from the Orissa coast. Recently Bensam and Kartha (1965) gave an account of the incubating egg and early larval stages from material collected from the inshore areas of Cannanore in Kerala.

The early developing eggs are roughly spherical in shape with an average diametere of 0.427 mm whereas the late one are slightly elongated and pyriform with diameter of 0.69 mm along the long axis.

Zoea I (Fig. 33) is orange red in colour in the thoracic region, losing the coloration frequently and regaining it. It is 2.15 mm long with a 0.22 mm long rostrum. On the antero-lateral margin of the carapace are three minute teeth. Eyes are sessile and telson broad with spines. Cephalic appendages are well developed.

Zoea II (Fig. 33) has well developed stalked eyes and an additional spine on either side of the central notch of telson.

Zoea III (Fig. 33) has well developed uropods.

The late larva described by Kemp (1916) is so advanced in structure that it may not be the next stage to Zoea III of Bensam and Kartha (loc. cit.). The intermediate stages are not known. The late larva (Fig. 34) has a short rostrum bearing dorsal teeth. Carapace, grooved on either side of the mid-dorsal line, is large and procurved. Eye is exceedingly long , eye-stalk having two segments, the proximal one bearing a conspicuous spine. Antenna and antennules are well developed. Third maxilliped and all the peraeiopods except the last bear very long exoposites.

The post larva is 14 mm long. Rostrum is short, not reaching the tip of antennal scale. Peraeiopods are well developed. Apex of telson is comparatively broad with a pair of long spines.

Fishery

The species has some fishery values only in India along the coasts of Gujarat, Maharashtra, Andhra and West Bengal. *H. vittata* and *H. punctata* are two other species seldom encountered in the prawn landings.

PALAEMON STYLIFERUS MILNE EDWARDS 1840

Common name

Ambad (Marathi), Ghora chingri (Bengali).

Diagnostic characters:-

Rostrum long, reaching beyond apex of antennal scale by a distance varying from 1/3 to 3/5 of its length; proximal portion strongly elevated dorsally forming a prominent basal crest which bears 5 to 7 teeth; slender in front of the crest and upturned; usually unarmed for the greater of its length, but near the tip as a rule, provided with 1 to 3 small widely separated teeth; lower margin with 6 to 10 teeth (Fig. 35).

Antennal spine small and inconspicuous and the branchiostegal much larger, above which is a finely cut groove.

The greatest breadth of the cornea about equal to the length of the eye-stalk. A small ocellus visible partly jointed to the cornea.

Basal segement of antennular peduncle with a small spine on the lower surface. Outer border sinous in front of the short spine representing the lateral process, and terminates in a tooth which extends but little beyond the level of the protruding setose antero-external margin of the segment. The second segment, measured mid-dorsally is a little more than half the length of the third. Total length of the shorter branch of outer antennular flagellum is about equal to that of peduncle.

Antennal scale broad and 3 times as long as wide; the rather sharply rounded distal end of lamella extending much further beyond the spine at the outer margin.

Mandibular palp 3 segmented; third maxilllipeds reaching about to the end of antennal peduncle; the antepenultimate segment less expanded distally than in *P. tenuipes* and the exopod reaching to its anterior quarter.

First peraeiopods reach almost to the end of antennal scale. The merus and carpus about equal; chela barely 3/5 the length of carpus. Second peraeiopods vary considerably in length. In large specimens they may extend beyond the tip of the scale by the whole of the chela; carpus and a small portion of the merus; in some, they may reach only by a small fraction of the finger length. Ischium, merus, carpus and pal decreases successively in length in most individuals, but in very large males the carpus sometimes equal to, or a little longer than the merus; carpus always shorter than chela.

Last 3 pairs of legs slender and usually bear short setae on the posterior margin of the ischium, merus and propodus. Dactylus of 3rd legs less than half of the length of propodus and that of 5th legs from 1/3 to 1/4 the length of propodus.

Abdomen smoothly rounded above in small example, but in those of large size, sometimes a blunt and inconspicuous dorsal ridge extending from the middle of 3rd somite to the end of the 6th. Sixth somite, dorsally less than half the length of carapce.

Telson reaches to about 3/4 the length of outer uropod; it bears 2 pairs of minute spinules in its distal half. The apex in large specimens is simply pointed, without trace of lateral spinules; in smaller, but still adult specimens 2 pairs of very small spinules may be found not reaching the tip. Outer uropod is narrow, about 3 times as long as broad.

Specimens from the west coast of India as a rule have the rostrum markedly longer than those from the Bay of Bengal. Young prawns are with shorter rostrum.

Distribution

India, East Pakistan (Ahmed, 1957); Burma (Henderson, 1893); Borneo (Nobili, 1903).

Biology and Life history

Food and feeding:- Crustaceans (*Acetes sp*., penaeid and palaemonid postlarvae, megalopa larvae of crabs, copepods and mysids) and fish larvae constitute about 32% of the stomach contents of 352 prawns examined from the estuaries of West Bengal (Kunju, 1956). Sand grains are present in more than half the number of prawns and 38.6% of the food is made up of unidentified debris. About one-fourth of these prawns are with empty stomachs. Pillay (1954) stated that the species feeds on microbenthic vegetation and organic detritus in the confined brackishwater *bheris* of West Bengal.

Growth:- The growth rate appears to be about 3 mm a month during the period of its life in the estuaries in West Bengal (Kunju, 1956).

Movement:- The species is predominantly marine, but is capable of tolerating very low salinities and rarely freshwater conditions (Kemp, 1917a).

Reproduction:- The species migrates seaward from the estuaries at the end of the period of egg-carriage and liberates the young in the sea. The breeding period is long, extending from October to July, with the peak period from April to July. Kemp's (1917a) observation that the species ascends estuaries for breeding is not supported by evidence. Rai (1933) indicate that the species breeds in Bombay in the month of September.

The eggs carried by berried females vary from 1600 to 3800 depending on the size of the prawns. The eggs are carried on non-plumose setae of all but the fifth pleopods. The presence of these setae may be taken as a certain indication that eggs are about to be laid or that young have been hatched, while their absence marks the end of the breeding season. The size of the smallest egg-bearing female is 68 mm and that of the largest is 86 mm in length.

The number of females is always greater than that of males in all the size classes, the overall ratio being 56:44 (Kunju, 1956).

Fishery

The dominant size groups at Port Canning in West Bengal, where the fishery was observed fell under the 45 to 66 mm length range, which formed about 75% of the catches.

Along Maharashtra coast this specimens formed less than 1% of the prawn landings in 1959-1963, the magnitude of the catches being sizable from June to September.

PALAEMON TENUIPES HENDERSON 1893

Common name

Ambad (Marathi).

Diagnostic characters

Rostrum variable in length, extending beyond the apex of antennal scale by 1/5 to nearly its length. Basal crest well elevated with 5 to 7 teeth, the formost one not reaching the end of antennular peduncle. In front of basal crest the rostrum trends downwards, but before reaching the end of antennular peduncle is reflected strongly upwards and is continued almost in a straight line from this point to the apex. On the dorsal edge, near the tip there is a single tooth. The lower margin is provided with 2 to 6 teeth (Fig. 36).

Antennal and branchiostegal spines about equal in length; the latter placed on the extreme frontal margin of the carapace, and not a little distance behind it as in some other species of the genus.

Second segment of antennular peduncle measured dorsally is much less than the length of the third. Short ramus of the outer antennular flagellum reaches barely to the apex of the antennular scale. Basal portion of inner flagellum swollen; antennal scale rather strongly narrowed anteriorly; its length about 3 1/3 of its greatest breadth.

Mandibular palp 3 segmented; third segment scarcely longer than the second. Anterior lobe of epipod of first maxilliped not pointed. The antepenultimate segment of third maxilliped considerably expanded distally.

First peraeiopod reaches a little beyond apex of antennal scale; the carpus about 1½ times the length of chela. Second peracipod reaches beyond antennal scale by at least the length of chela; merus longer than carpus; carpus is distinctly shorter than palm and less than half the length of finger; plam strongly swollen, and fingers straight with conspicuously inturned tips. Last three legs of extraordinary length and slenderness and usually found broken in preserved material. The extreme length of these legs is mainly due to the lengthening of the propodus and dactylus; the carpus in all cases short. Third legs at least 2/3 the entire length of the animal; fourth and fifth pairs much longer considerably exceeding the total length. Dactylus in these legs twice the length of propodus.

Abdomen not dorsally carinated. Pleura of 5th somite narrowed and drawn out posteriorly. Sixth somite dorsally measured, is a trifle more than half the length of carapace. Pleopods exceptionally long, the first pair about 1½ times the length of carapace.

Telson reaches only a little beyond the middle of outer uropod and sometimes bears a pair of small spinules near the distal end. The apex bears a single pair of lateral spinules which extend considerably beyond the rounded median prominance. Outer uropod long and narrow.

In specimens 15-30 mm long the rostrum is very much shorter than in adults, not reaching beyond the middle of the last segment of the antennualr peduncle. The last two pairs of peraeiopods are not used for progression and probably they have taken on a sensory function.

Other species of the genus rarely occurring in India are *P. belindae*, *P. debilis*, *P. sewelli* and *P. semmelinkii* all belonging to the subgenus *Palaemon* (Holthuis, 1950).

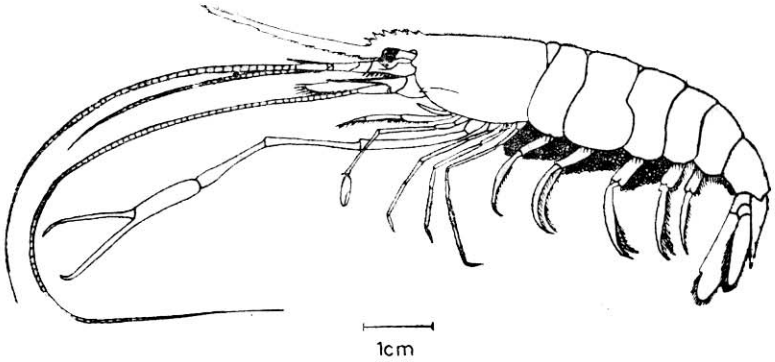

Fig. 35. *Palaemon styliferus* Milne Edwards. Berried female (After Kemp 1917 a).

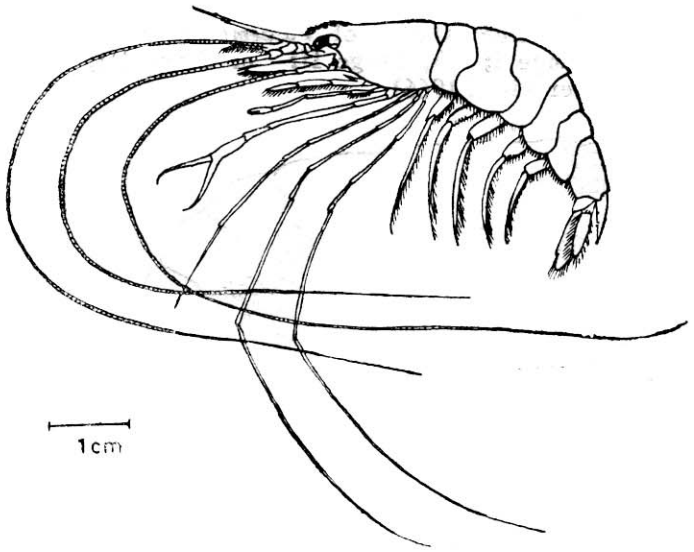

Fig 36 *Palaemon tenuipes* Henderson. Female (After Kemp 1917a)

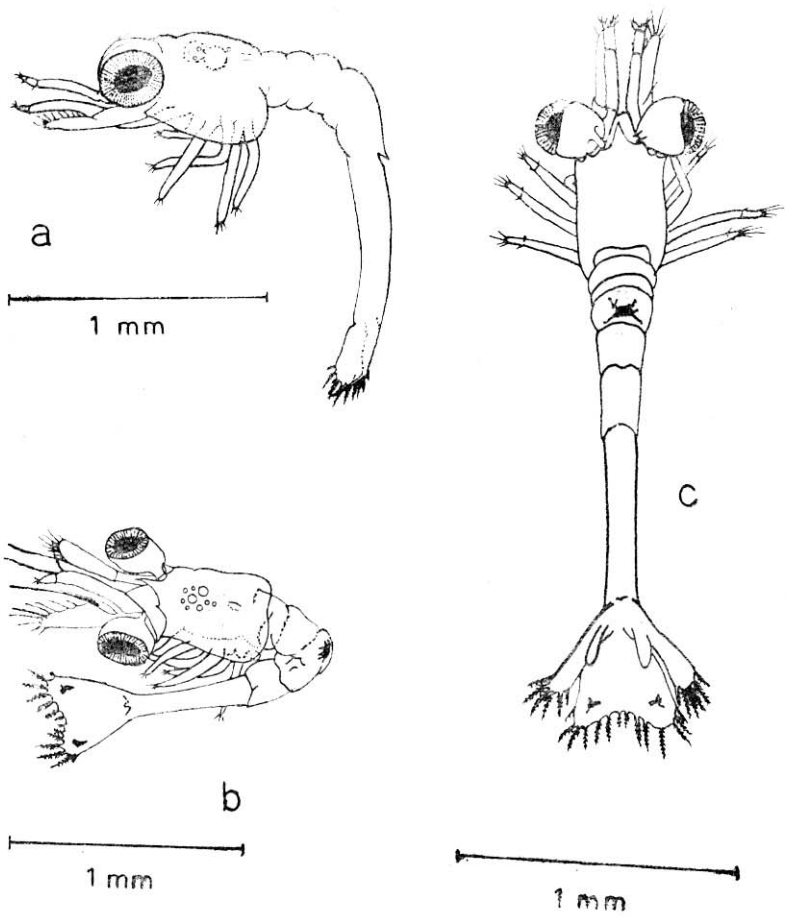

Fig. 37. Early larval stages of ***Palaemon tenuipes.*** a, Stage I; b, Stage II; c. Stage III; (After Pillai 1966)

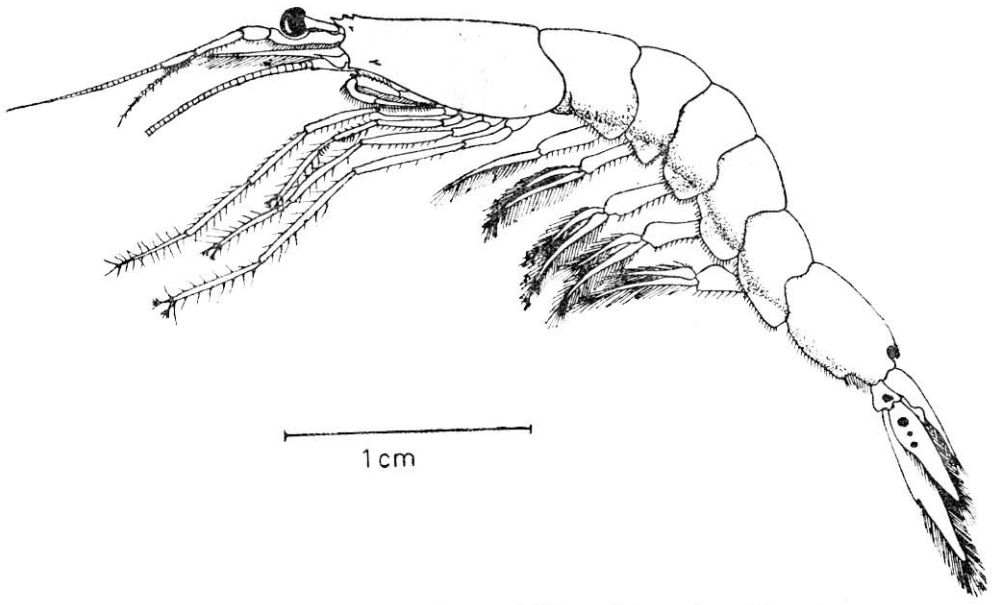

Fig 38. *Acetes indicus* Milne Edwards. Female.

Distribution

India, East Pakistan (Ahmed 1957, Qureshi, 1956), Burma (Henderson, 1893).

Biology and Life history

Eggs and larvae:- The embryonic development and three early larvae were described by Pillai (1966) from material collected from Cannanore in Kerala.

The egg is more or less oval in shape having an average size of 0.52 mm x 0.40 mm. The yolk in the unfertilised egg is granular with very small globules. The central mass in the fertilised egg is dense appearing darker than the peripheral area. The embryonic development was followed by the author till the first larva hatched out on the 14th day after fertilisation. Temperature of the sea water medium was 25.5^0 C.

Larva-stage I (Fig. 37a). Average size was 2.04 mm. the carapace having a small pterygostomian spine, the small rostrum being hidden in between the optic vesicles; eyes bluish black, sessile and prominent. Traces of yolk granules and vacuoles are present.

Larva-stage II (Fig. 37b). First moulting after hatching occurred on the next day. The larva measured about 2.21 mm. There are brownish pigments on the eye stalk. Rostrum is pointed and more conspicuous than in the first stage. Eyes are stalked and prominent. Supraorbital and pterygostomian spines are present. Dentition of the mandibles is assymmetrical. First two pairs of peraeiopds are well developed and functional. Telson is not yet differentiated from the last abdominal segment.

Larva-stage III (Fig. 37c). The second stage larva moulted on the 4th day after hatching into the third stage. It is 2.45 to 2.53 mm in length. Pink chromatophores are noticed on the posterior region of the carapace. Rostrum is prominent with a single tooth on its dorsal margin. Rudiments of last two pairs of peraeiopods have developed. Telson is differentiated from the last abdominal segment; uropods are developed well.

The larva did not undergo any further development in the laboratory.

Fishery

The species is found all along the Indian coast. It constitutes a minor fishery in the estuarine and foreshore areas of West Bengal and Orissa. It is caught in enormous quantities in Bombay and forms a minor fishery in Gujarat (Ramamurthy 1963). In 1959-1963 period in Maharashtra it formed 32.56% of the prawn landings, about half the annual catch having been accorded in April and May. Several factors such as the forced duration of the tidal currents, the extent of rainfall over the adjoining land mass, the annual cycle of upwelling in the coastal waters and the depth wise distribution of the fishing grounds seem to influence the success or failure of the fishery.

ACETES INDICUS MILNE EDWARDS 1830

Common name

Jawla (Marathi).

Distinguishing characters

Eye longer than in other species and a little more than one-third length of carapace, stalk slender. Basal segement of antennular peduncle of female about the same length as that of the two distal segments combined; in males the 2nd segment more slender than in females; ultimate segment always elongated, much longer than the first (Fig. 38).

Outer antennular flagellum of male bears a single large clasping spine, with finely serrate inner margin; on the segment opposite the tip of the spine there is a group of 5-7 close-set spinules.

Third maxilliped reaches a little beyond tip of 3rd peraeiopod, and in female, much beyond end of antennular peduncle. Ultimate segment not divided into sub-segments. Basal segments of 3rd maxilliped and all peraeiopods proportionately stouter than in other species.

Basis of 3rd peraeiopod with a large tooth on the inner margin close to the insertion of ischium, a character not found in other species.

Third thoracic sternite of female very deeply channelled longitudinally, the channel being continued backwards on to the anterior portion of the 4th sternite. The anterior margin of the 3rd sternite is deeply sunk and almost transverse. Behind inner angles of coxae of the 3rd legs there is, on either side, a conspicuous tubercle.

Between the bases of the 1st pleopods in both the sexes, there is a large procurved tooth.

Outer lobe of each half of petasma more or less crescentic in shape with the antero-external border strongly thickened; proximal end of the internal lobe truncated, much expanded externally and bearing a small process at its inner angle. The surface of the distal portion has a sort of honey-combed appearance, due to the presence of numerous small pits, each of which contains a modified hooklet.

Telson reaches well beyond the middle of inner uropod and is rather sharply pointed at the apex. Ciliated and non-ciliated portions of external borders of outer uropods are separated by a prominent tooth.

The genus *Acetes* is characterised by the absence of the last two pairs of peraeiopods. In distinguishing the species the most important indications are those derived from adult males. Form of the petasma is a most reliable and satisfactory guide, while good characters are also to be obtained from the sexual modifications of the external flagellum of the antennule. Males possess an elongated antennal peduncle (except in *A. erythraeus*). The red spots on the tail, the so-called "tail-organ" (Okhada, 1928) are not of specific value but they are of generic importance (Nataraj, 1947; Kemp, 1916). They are in two pairs, one pair on each side found in all the species. Their function is not known, but Okada (1928) believes them to be photogenic. The degree of curvature of the tip of the clasping spine on the outer antennular flagellum is of specific importance.

Other species recorded from the coasts of India are *A. erythraeus* Nobili, *A. japonicus* Kishinouye, *A. serrulatus* var. *johni*, *A. sibogae* Hansen and *A. cochinensis* Rao (in press).

Distribution

India ; Gulf of Siam (Kemp, 1917b).

It is quite common all along the coasts of India and is commercially exploited from the estuaries and onshore areas of West Bengal, coasts of Madras (Jones, 1965) and the northern section of the west coast.

Biology and Life history

Eggs and larvae:- Larval development of an allied species, *A. erythraeus* was described by Menon (1933). The characters set forth in genital area of the adult female and the uropod of the adult individuals in their description and figures resemble those of *A. indicus*. The larvae were collected from the inshore areas of Madras coast.

Movements:- The species of *Acetes* are usually found gregariously swimming in great numbers in midwater or near the surface. They occur near the shore region in the open sea and are frequently common is estuaries and backwaters. They are often found where the water is of low salinity and occasionally in places where it is quite fresh, but penetrate little, if at all, beyond the reach of tidal influence.

Reproduction:- The breeding season of some allied species, viz., *A. serrulatus* and *A. erythraeus* recorded from the Travancore coast (Nataraj, 1947) is from January to April, as seen from the presence of mature gonads. This is further supported by the plankton collections of April to July containing large numbers of *Acetes* larvae (Menon, 1933). During the breeding season the adults appear in large shoals in coastal waters drifting with the current along with mysids, Alima larvae of *squilla* and fish fry. During these months they are invariably found in the stomach contents of different fishes such as *Lactarius*, horse mackerels and *Trichiurus*.

Fishery

The species is common all along the coast of India and is commercially exploited from the estuaries, on shore areas of West Bengal, Coasts of Madras (Jones,1965) and the northern section of the west coast. In 1959-1963 along the Maharashtra coast it formed about 19% of the prawn landings, the fishery starting from January and lasting up to May.