

## XVII. NOTES ON DECAPODA IN THE INDIAN MUSEUM

### I.—THE SPECIES OF *Gennadas*.

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(Plates xiii and xiv.)

Among the vast collection of Decapods which has been made by the 'Investigator' thirteen examples of the genus *Gennadas* occur and, although the majority of these specimens have already been mentioned by Alcock,<sup>1</sup> it has now become necessary to submit them to revision. In 1901, when Alcock wrote, the characters by which the many closely-allied species of this genus were determined had not been fully appreciated and our knowledge of the extra-Atlantic forms was limited almost entirely to the wholly inadequate treatment which Spence Bate accorded them in his 'Challenger' Report.

Recently Bouvier has published a most valuable account<sup>2</sup> of the Atlantic species in which he draws attention to the importance of several characters which had previously been overlooked and, now that the 'Challenger' collections have been revised on the same lines,<sup>3</sup> the determination of the material preserved in the Indian Museum presents a task of no great difficulty.

In the following descriptive notes all the more important characters suggested by Bouvier have been employed. It seems, however, that the Oriental species of the genus form a much more homogeneous group than those found in the Atlantic and, apart from the petasma and thelycum, little can be found which is of real systematic value. Useful indications are afforded by the antennular peduncle, the antennal scale and the second maxilla, but in other respects, such as the proportions of the mandibular palp and the respective lengths of the joints of the first three

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<sup>1</sup> Alcock, *Desc. Cat. Ind. deep-sea Macrura*, 1901, p. 45.

<sup>2</sup> Bouvier, *Rés. Camp. Sci. Monaco*, fasc. xxxiii, 1908, p. 24.

<sup>3</sup> Kemp, *Proc. Zool. Soc.*, 1909, p. 718. From the list of species of *Gennadas* given at the end of this paper (p. 728) two Pacific forms, *G. clavicarpus* and *G. pasithea*, are unfortunately omitted. Preliminary descriptions of these two species, which were obtained by the 'Siboga' expedition, have been given by Dr. J. G. de Man (*Notes Leyden Mus.*; xxix, 1907, p. 144). Both are, I believe, distinct from the 'Challenger' species and from those here described, but, until figures of the petasmata and thelyca are published, it is impossible to be quite certain.

pairs of peraeopods, a considerable amount of variation is sometimes to be found.

Three of the species in the collection are regarded as new, an interesting variation in the petasma of *G. scutatus*, Bouvier, is noticed and a fresh description is given of *G. carinatus*, Smith, a remarkable form which combines in one species the characters both of *Gennadas* and of the allied genus *Benthesicymus*.

The number of specimens examined is unfortunately small and this is doubtless due to the fact that the 'Investigator' collections were made almost entirely by means of trawls fishing on the bottom. The species of *Gennadas*, as far as is at present known, are entirely pelagic in habit and their occasional appearance in bottom hauls is explained by the fact that they are sometimes caught while the net is being hauled to the surface.

All the species mentioned in this paper possess podobranchs on the first three pairs of peraeopods and are in consequence members of the genus *Gennadas*, *sensu stricto*.

The measurements given represent the total length, and were taken from the apex of the rostrum to the tip of the telson, with the animal extended as nearly as possible in a straight line.

### *Gennadas alcocki*, sp. nov.

(Plate xiii, figs. 5—8.)

St. 111.—Bay of Bengal, 12° 50' N., 90° 52' E., 1,644 fathoms. One male, 36 mm.

St. 103.—Bay of Bengal, 15° 14' N., 81° 9' E., 1,260 fathoms. One female, about 25 mm.

St. 108.—Off C. Comorin, 7° 4' N., 76° 34' 15" E., 1,043 fathoms. One male, 34 mm.

St. 309.—Near the Andaman Islands, 10° 9' N., 93° 2' 15" E., 765 fathoms. One male, 34 mm.

The rostrum is well elevated above the dorsal carina of the carapace and bears the usual small tubercle behind the dorsal tooth. The antennary and infra-antennary angles are acute and the branchiostegal spine is small but evident. The cervical and post-cervical grooves of the carapace are well marked; dorsally, the distance between them is only about one-fifth of the distance from the post-cervical groove to the hinder margin. The median carina is visible throughout the length of the carapace.

The second joint of the antennular peduncle, measured dorsally, is fully two-thirds the length of the ultimate joint. The antennal scale (fig. 7) is a little more than three times as long as wide; the outer margin is somewhat convex and terminates in a spine which extends beyond the narrow apex of the lamella.

The ultimate joint of the mandibular palp varies in length, but is, in all cases, shorter than the greatest width of the basal joint. In the second maxilla the anterior lobe of the internal

lacinia is slightly broader at the apex than at the base and is a little narrower than the adjacent lobe of the external lacinia. The apex of the endopod is narrow and bears from three to five spines on its external aspect.

In the first maxillipede the third joint of the endopod is oval and very nearly twice the length of the second; the basal joint bears five stiff spines on its inner distal margin.

The carpus of the first pair of peraeopods is shorter than the chela and is only a little more than half the length of the merus. In the second pair the chela is seven-eighths the length of the carpus and the dactylus is equal to, or shorter than, the palm. In the third pair the merus and carpus are of the same length; the chela is half, or a little more than half, the length of the carpus and the dactylus is a trifle shorter than the palm.

The sixth abdominal somite alone is dorsally carinate and all the median tubercles on the abdominal sterna with the exception of the first are blunt and inconspicuous. The apex of the telson is truncate and bears four or five pairs of plumose setae, of which the middle pair is the longest, between the stout marginal spines.

The petasma (figs. 5, 6) bears some resemblance to that of *Genadas parvus*, but, judging by the dissimilarity which exists in regard to the other characters, more especially in the antennal scale and antennular peduncle, it does not seem likely that the two forms are allied to one another in any really close manner. The outstanding lobe on the anterior aspect varies considerably in shape; it is sometimes pointed apically and reaches as far as the distal margin.

I have associated this species with the name of Lieut.-Colonel Alcock who has given a very accurate description of the thelycum (*loc. cit.*, 1901, p. 47, sub "*G. parvus*"). His account, which may be compared with fig. 8, runs as follows:—"The thelycum consists of a horizontal, subtriangular plate or tubercle, placed between the third pair of legs, followed by two transverse bars between the fourth and fifth pairs. The first of these bars is somewhat W-shaped with the posterior notch of the W filled by a tooth in the middle of the anterior border of the second bar."

The specimen which Miss Rathbun<sup>1</sup> has attributed to *Genadas parvus*, remarking that the thelycum agrees exactly with Alcock's description, is certainly quite distinct from the species here described. The true female of Spence Bate's *G. parvus*, which I have recently discovered in a collection made by Dr. J. Stanley Gardiner, is, in respect of the thelycum, wholly different both from the present species and from that figured by Miss Rathbun.

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<sup>1</sup> Rathbun, *Bull. U. S. Fish Comm. for 1903, 1906*, p. 907.

**Gennadas praecox**, sp. nov.

(Plate xiii, figs. 1—4.)

St. 320.—Off C. Comorin, 7° 23' N., 75° 44' E., 1,053 fathoms. One male, 32½ mm.

The rostral crest is much the same as in the two preceding species, but the dorsal spine is more slender. The antennary and infra-antennary angles are acute, but rather bluntly rounded at the apex; the branchiostegal spine is minute. The cervical and post-cervical grooves of the carapace are deeply cut; they approach one another very closely in the mid-dorsal line, where the distance between them is scarcely one-sixth the distance from the post-cervical groove to the hinder margin. The mid-dorsal carina runs the whole length of the carapace, but is inconspicuous posteriorly.

The second joint of the antennular peduncle, measured dorsally, is about two-thirds the length of the ultimate segment. The antennal scale (fig. 1) is three and a quarter times as long as broad; it is widest basally and its outer edge, which is nearly straight, terminates in a small spine which falls far short of the narrow apex of the lamellar portion.

The ultimate joint of the mandibular palp is about as long as the greatest width of the penultimate joint. In the second maxilla (fig. 4) the anterior lobe of the internal lacinia is strongly constricted behind the apex and is a trifle narrower than the adjacent and similarly-constricted lobe of the external lacinia. In the latter lacinia the anterior lobe is fully one and a half times the width of the posterior. The third joint of the endopod of the first maxillipede is fully twice the length of the second; the fourth is extremely minute. Two stiff curved spines are situated on the inner distal margin of the joint.

The carpus of the first pair of pereopods is about the same length as the chela and is two-thirds as long as the merus. In the second pair the chela is three-quarters the length of the carpus and the dactylus is shorter than the palm. The carpus of the third pair is about equal in length to the merus; the chela is only a little more than half the length of the carpus and the dactylus is fully as long as the palm.

The median spines on the abdominal sterna are blunt and inconspicuous; the sixth somite alone is dorsally carinate. The telson is squarely truncate at the apex and is furnished with spines and setae as in *G. alcocki*.

The petasma (figs. 2, 3) is most peculiar and utterly unlike that of any species hitherto described. In what appears to be its natural position each of the two halves is roughly triangular in shape and is provided with two long and narrow processes, one on its distal and inferior aspect and one, curved and directed inwards, which arises close to the superior inner margin. In place of the numerous small pleats, which are usually found near the line of connection of the right and left halves, there is, in this instance, a

single large fold involving nearly one-third of the whole plate. When this fold is opened out the structure presents the appearance shown in fig. 3.

***Gennadas sordidus*, sp. nov.**

(Plate xiv, figs. 1—3.)

St. 193.—North of the Laccadive Islands,  $15^{\circ} 11' N.$ ,  $72^{\circ} 28' 45'' E.$ , 931 fathoms. One male, about 20 mm.

St. 194.—Off the Laccadive Islands,  $13^{\circ} 47' N.$ ,  $72^{\circ} 3' 45'' E.$ , 891 fathoms. One male, 24 mm.

St. 198.—North-east of Ceylon,  $8^{\circ} 55' N.$ ,  $81^{\circ} 17' 30'' E.$ , 764 fathoms. One male,  $18\frac{1}{2}$  mm.

The rostral crest does not differ appreciably from that of the preceding species. The antennary and infra-antennary angles are acute, the former being bluntly rounded and the latter sharp; the branchiostegal spine is very small. The distance between the cervical and post-cervical grooves, measured dorsally, is less than one-fifth the distance from the post-cervical groove to the hinder margin of the carapace. The mid-dorsal carina is inconspicuous behind the latter groove.

The second joint of the antennular peduncle is very short; measured dorsally, it is less than half the length of the ultimate joint. The antennal scale is widest at the base; it is three times as long as wide and the outer margin terminates in a very small spine which does not extend as far forwards as the lamellar portion.

The ultimate joint of the mandibular palp is shorter than the greatest width of the basal joint. In the second maxilla (fig. 3) the anterior lobe of the internal lacinia is short, not wider at the apex than at the base, and is little, if at all, narrower than the adjacent lobe of the external lacinia. In the latter lacinia the anterior lobe is about one and a half times as broad as the posterior. The endopod is furnished with three curved spines near the narrow apex.

The third joint of the endopod of the first maxillipede is about one and a half times the length of the second and the basal joint bears two or three stiff spines on the inner distal margin.

In the first pereopods the chela, which is about as long as the carpus, is about two-thirds the length of the merus. The chela of the second pair is two-thirds the length of the carpus and the dactylus is equal to, or a trifle shorter than, the palm. In the third pair the carpus and merus are exactly the same length; the dactylus is as long as the palm, the whole chela being about half the length of the carpus.

The median spines on the abdominal sterna are not prominent; the sixth somite alone is dorsally carinate. The apex of the telson has much the same form as in *G. alcocki*.

The petasma (figs. 1, 2) is a rather complicated structure and is of much the same type as that of *G. parvus*, to which *G. sordidus*

is evidently very closely allied. The most distinctive character which it possesses is the spoon-shaped portion which is directed forwards from the middle of the distal margin of each lobe.

**Gennadas scutatus, Bouvier.**

(Plate xiii, figs. 9, 10.)

*Gennadas scutatus*, Bouvier, *Rés. Camp. Sci. Monaco*, xxxiii, 1908, p. 42, pl. viii.

*Gennadas scutatus*, Kemp, *Proc. Zool. Soc.*, 1909, p. 727, pl. lxxv, fig. 2.

St. 108.—Off C. Comorin, 7° 4' N., 76° 34' 15" E., 1,043 fathoms. One male, about 29 mm.

St. 109.—Off C. Comorin, 7° 1' N., 78° 21' E., 738 fathoms. One male, broken.

With the exception of the petasma, these specimens agree closely with the example obtained by the 'Challenger' in the N. Pacific (Kemp, *loc. cit.*). They differ from Bouvier's description and figures in the following particulars:—

The ultimate joint of the mandibular palp is fully as long as the width of the basal joint. In the second maxilla (fig. 9) the anterior lobe of the internal lacinia, though not wider at the apex than at the base, is widely separated from the posterior lobe and is narrower than the adjacent lobe of the external lacinia. The third joint of the endopod of the second maxillipede is a trifle wider than in Bouvier's figure. The chelae of the third pair of peraeopods are longer; in one specimen they are three-fifths the length of the carpus, while in the other they are a trifle shorter, but still considerably more than half the length of the carpus.

The petasmata of the two specimens are as nearly as possible identical and, considering the great uniformity of outline which these structures usually present, show a considerable amount of divergence from the type. The principal points of difference, as will be seen by comparing fig. 10 with Bouvier's text-figure,<sup>1</sup> concern the development of the large median distal lobe. This is truncate and furnished with a small pointed process on the outward side in the type, while in the present specimens it is sharply pointed and the small process is entirely absent.

*Gennadas scutatus* is now known from the Atlantic (Bouvier), from the Pacific ('Challenger') and from the two localities mentioned above. When more extensive collections have been made, it will be possible to determine whether, in these widely distant localities, there really exist distinct races of this species, differing from one another in the form of the petasma, or whether there is in this respect merely an exceptionally large range of variation.

<sup>1</sup> Bouvier, *Bull. Mus. Océanog, Monaco*, No. 80, 1906, p. 11, fig. 13.

**Gennadas bouvieri, Kemp.**

*Gennadas bouvieri*, Kemp, *Proc. Zool. Soc.*, 1909, p. 726, pl. lxxiv, figs. 1—4; pl. lxxv, figs. 6 and 7.

St. 198.—North-east of Ceylon, 8° 55' N., 81° 17' 30" E., 764 fathoms. One female, about 25 mm.

This specimen agrees closely with the description of the type. The only important difference lies in the proportional length of the joints of the third pair of peraeopods, where the merus is only very slightly shorter than the carpus. Except for the fact that no spermatophores are inserted, the thelycum is practically identical with that figured in 1909 (pl. lxxv, fig. 6).

*G. bouvieri* was found by the 'Challenger' west of Manila and north of New Guinea.

**Gennadas carinatus (Smith).**

(Plate xiv, figs. 4—9.)

*Benthescymus?* *carinatus*, Smith, *Rep. U. S. Fish Comm. for 1882, 1884*, p. 396, pl. x, figs. 6 and 7.

*Gennadas carinatus*, Alcock, *Desc. Cat. Ind. Macrura*, 1901, p. 46.

*Gennadas carinatus?*, McGilchrist, *Ann. Mag. Nat. Hist.*, March, 1905, p. 236.

St. 128.—Off C. Comorin, 6° 58' N., 77° 26' 50" E., 902 fathoms. One male, 130 mm.

St. 306.—Off Travancore, 9° 20' N., 75° 24' E., 930 fathoms. One female, 148 mm.

This large species is of great interest and, although the two specimens in the Indian Museum have already been recorded by Alcock and McGilchrist, a fresh description drawn up on the lines of Bouvier's recent work may be found useful.

I have followed Alcock in placing the species in the genus *Gennadas*, though, in point of fact, it is almost exactly intermediate in character between that genus and *Benthescymus*. In habit, however, the two genera appear to be quite distinct, for *Gennadas*, as far as at present known, is entirely pelagic, whereas *Benthescymus* lives on the bottom. Now in *carinatus* the joints of several of the appendages are greatly flattened and expanded and closely resemble those of the former genus, and this modification, which is doubtless correlated with a free-swimming existence, has induced me to retain the species in its present position.

Alcock has, indeed, suggested that it might be best to regard *Gennadas* as a subgenus of *Benthescymus*, but from a practical point of view this cannot be recommended. It must be remembered that it is only in the present case that any difficulty arises in allocating the species to one or other genus.

Although the two specimens, on which the following account is based, are very macerated, all the appendages are represented with the exception of the last three pairs of peraeopods.

The rostral crest (fig. 4) is elevated well above the dorsal carina of the carapace and differs from that of all other known species of *Gennadas* in having the superior margin, between the apex and the small dorsal tooth, strongly convex. This margin also appears to lack the usual fringe of setae which occurs in the other species. The antennary angle of the carapace is rectangular, but the infra-antennary, as in Bouvier's *Gennadas alicei*, is entirely absent. The branchiostegal spine is prominent. The cervical and post-cervical grooves are rather strongly marked. Dorsally they are widely separate, the distance between them being at least one half the distance from the post-cervical groove to the posterior margin. The mid-dorsal carina extends the whole length of the carapace but is blunt posteriorly.

The eyes are large and appear to have been deeply pigmented in life; the conical process on the dorsal surface of the stalk is quite unusually small.

The second joint of the antennular peduncle is, measured dorsally, fully as long as the ultimate segment and is articulated to it by its entire margin and not merely by the inferior edge as in other species of the genus. The dilated portion at the base of the upper flagellum is as long as the two proximal joints of the peduncle. The antennal scale is unfortunately incomplete in every case. It was evidently little more than twice as long as wide and the very broad apex of the lamella appears to have extended far beyond the spine which forms the termination of the convex outer margin.

The ultimate joint of the mandibular palp (fig. 5) is longer than the greatest width of the basal joint. In the second maxilla (fig. 6) the anterior lobe of the internal lacinia is not wider at the truncate apex than at the base, and is not so broad as the adjacent lobe of the external lacinia. The endopod has almost exactly the same form as in *Benthesicymus* and bears from ten to fourteen curved spines on its external aspect near the apex.

In the first maxillipede (fig. 7) the exopod is provided with a terminal lash as in typical *Benthesicymus* and the third joint of the endopod is about twice the length of the second. The merus of the second maxillipede (fig. 8) is twice as long as wide and its anterior prolongation (the part which extends forward beyond the insertion of the carpus) is less than one-fifth the entire length of the segment. The dactylus is provided with a single apical spine.

In the first pair of peraeopods the carpus, which is about the same length as the chela, is two-thirds the length of the merus. In the second pair the carpus is as long as, or a little shorter than, the merus, the chela is only a trifle more than half the length of the carpus and the dactylus is about as long as the palm.



The rudimentary exopods, mentioned by Smith, are visible only in the case of the female specimen.

The merus of the second maxillipedes and the ischium and merus of the third maxillipedes and first three pairs of peraeopods are greatly expanded as in typical *Gennadas*.

The third, fourth, fifth and sixth abdominal somites are dorsally carinate. The telson is much longer than in other species of *Gennadas*, being only a little shorter than the outer uropod. It bears four pairs of lateral spines in its distal third and is sharply pointed apically.

The petasma (fig. 9) consists of a pair of simple leaves, as in *Benthescymus*.

The thelycum has been well described by McGilchrist in the following words: "Between the bases of the fourth pair of legs a prominent central papilla stands. Towards this papilla a hairy process passes inwards and backwards from the base of each of the third pair of legs and from the base of each of the fourth pair of legs a tongue-shaped process projects inwards and backwards posterior to the papilla. The papilla thus stands in the centre between the tips of these four processes."

Apart from the type, only the two specimens mentioned above are known. Smith's example, which was found off the east coast of the United States,  $39^{\circ} 44' 30''$  N.,  $71^{\circ} 4'$  W., in 1,022 fathoms, measures only 74 mm. in length and is thus only about half the size of those from the Arabian Sea.

