

NOTES ON SOME SPECIES OF THE ISOPOD FAMILY  
SPHÆROMIDÆ, FROM THE SOUTH AUSTRALIAN COAST.

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PLATES III. TO X.

In presenting these notes I must acknowledge the great assistance I have had from Dr. Hansen's paper entitled "The Propagation, Structure, and Classification of the Family Sphæromidæ," in the "Quarterly Journal of Microscopic Science," n. series, vol. 49, pt. 1, 1905. Without it it would have been quite impossible for me to treat with any degree of success species of this acknowledged difficult family which have come under my notice from our coast. At the same time it will be seen that my observations do not quite agree with statements in Dr. Hansen's paper regarding the parts occupied by the developing young in some genera.

In studying the species of this family, the thing that strikes one most is their great variability—this, indeed, is the main cause of the confusion which has held sway in their classification so long; but a general statement may be made, namely, that the young of both sexes resemble each other, the deviation occurring in adult males and females; that of the young-bearing females of many genera has been shown by Dr. Hansen in the above-mentioned paper. As an instance with the males, to take the case of *Cymodoce tuberculosa*, Stebbing. In this species there are two conspicuous processes on the anterior division of the pleon which are not figured or mentioned by the author or by Mr. Whitelegge, who refers at length to the same species from New South Wales; the inference, of course, is that they were not present in the specimens examined by them, although Mr. Whitelegge speaks of his as being adult males. Another instance will be seen in the case of *Ciliccia curtispina*, Haswell, later on.

With regard to the young-bearing females, whose mouth parts and viscera have been so much altered, one fails to see how the animal recovers itself after rearing a brood, and is driven to the conclusion that the individual perishes in the effort, and is probably, in some cases at least, perhaps eaten by the brood. In the female of a species of *Cymodoce* which, as yet, I have not been able to identify, I have observed the transverse slits in the sternal plates referred to by Dr. Hansen, and have seen well-formed young emerge from under the marsupial plates; these were somewhat har-

dened. The young ready to emerge from the body through the slits are very soft, and can consequently squeeze through a small space; the slits, however, in this species are large.

The following descriptions are from the male in each case, except where otherwise stated.

Family SPHÆROMIDÆ.

Subfamily SPHÆROMINÆ.

Group HEMIBRANCHIATÆ, Hansen.

Genus *Cymodoce*, Leach.

*Cymodoce longicaudata*, n. sp.

Plate iii., figs. 1 to 11.

The body is little convex, the tendency to curl up much reduced, becoming slightly narrow towards the head.

The head is arcuate in front, and considerably longer than the first thoracic segment. The eyes are large, prominent, and wedge-shaped. There is a median rostral projection, which is rather large and terminally obtuse.

The first thoracic segment is rather shorter than those which follow, the rest are short and subequal in length. The epimera, except the ones belonging to the last segment of the thorax, project laterally, and are very conspicuous viewed from above. They are sickle-shaped backward and very acute, and are all—except the first—marked off from their respective segments by distinct sutural lines. The last segment has epimera rounded and scarcely projecting.

Four fused segments are indicated on the anterior portion of the pleon; the first terminates laterally under the side of the preceding segment; the second has an acute lateral projection, similar to those of the thoracic segments; the fourth has the median portion of the posterior margin slightly arcuate, with the usual notch on each side. The terminal segment of the pleon is dome-shaped, and has an acute lateral projection; behind this the surface is strongly depressed until the basal portion of the median posterior spine is reached. The posterior notch is bounded by two acute projections, with the median spiniform process large and reaching much beyond them; this process is dorsally carinate and very acute.

The epistome is well developed; its lateral limbs are subacute.

The rather large basal joint of the antennule has the anterior side of the distal notch scarcely produced, but on the posterior side the projection is very acute, curved, and reaches nearly to the end of the second joint, as in *Circeis*. The second joint is more than half the length of the first

to the base of notch of the first; it is distally obliquely truncated, and has below a very prominent and acute keel. The third joint is very slender, and shorter than the second, and is articulated to it in a small cavity. The slender flagellum has about 24 joints. The flagellum of the antenna has from 26-32 joints.

In the right mandible the spine row is well developed, consisting of 7-8 coarsely pectinate spines; a small tubercle faintly toothed lies between these and the molar tubercle, which is well developed; the incisory plate is distally entire. The left mandible has a secondary plate divided into three teeth. The first two joints of the palp are subequal in length.

The maxillæ and maxillipeds are of the usual type. The lobes of the palp of the maxillipeds are long, with their setæ well developed.

The first gnathopods are robust, the basis subequal in length to the two following joints, taken together, the fourth, fifth, and sixth joints are posteriorly spined. The dactylus is rather long, robust, and two-clawed. The legs following the first pair are sparsely spined; the pads, so much in evidence in other species of this family, are here represented by soft plumose setæ.

The sternal filaments of the male are rather long. The *appendix masculina* is longer than the ramus which bears it, and is very slender. The exopods of the third, fourth, and fifth pleopods have each a division; a few distal setæ are on the exopods of the fourth pleopods.

The uropods are long and slender; the peduncle has a small spine below the insertion of the outer ramus; the outer ramus is narrow lanceolate, and reaches beyond the inner ramus; the inner ramus is also narrow, carinate below, with the inner margin slightly curved, reaching beyond the terminal spine of the pleon. The margins of the uropods and pleon are sparingly clothed with very short hairs.

The female does not differ from the male in any noteworthy respect, except, of course, when bearing young; then the mouth parts and viscera are modified in the usual way. In what appears to be an old female there are no ova or young, but there are the remains of marsupial plates; the viscera seem to have disappeared, as the sternites are sunken in or wanting; the pleopods, however, are intact.

#### *Cymodoce tuberculosa*, Stebbing.

Plate iii., figs. 12 to 15.

The epistome has two projecting teeth transversely placed on the anterior portion, similar to the rostral teeth, and inclined to be bifid.

There are five teeth on the anterior border of the first peduncular joint of the antennule, with a sixth smaller outermost.

The posterior notch of the pleon is wide and deep.

The male has two prominent posterior projections on the anterior portion of the pleon.

The internal ramus of the uropod has three terminal teeth, one larger above, two below. The external ramus is shorter and narrower, with two terminal teeth.

The body is minutely pubescent, but the hairs are coarser on the pleon and uropods.

The female of this species has not been identified.

*Cymodoce hamata*, n. sp.

Plate iv., figs. 1 to 11.

Body moderately convex, covered with a furry tomentum, which entangles much foreign matter, with longer scattered hairs. It is conspicuously contracted at the seventh thoracic segment.

The head is evenly rounded and anteriorly very obtuse, with two very obscure median projections. The eyes are prominent and subcircular.

The first segment of the thorax is about as long as any two together of those which follow; these are narrow, prominent, and scarcely differ in length. The epimera slightly project outwards; their lower outline, taken together, is very irregular, the individual apices being more or less obtuse; that of the seventh segment is much shorter than the rest.

The sides of the anterior part of the pleon project downwards, much in contrast to that of the seventh thoracic segment, but the antero-lateral angle is subacute; this portion of the pleon bears one small tubercle each side of the median line, whilst the posterior portion has also two tubercles, which are more or less spiniform, and situated on a dome, which is granular; between these two tubercles is a longitudinal depression. The posterior notch is wide, with a strong median process, which projects beyond the sides, is obtuse, and slightly turned up or tuberculate at its end.

The basal antennular joint is large, about twice as long as broad, with the distal notch shallow. There is a small keel on the underside of the second joint. The flagellum has 11 joints.

The flagellum of the antenna has 16 joints.

The epistome is slightly lobulate, the upper lip externally convex.

The maxillipeds have the plate of the second joint shorter than the joint itself, with the distal spines well deve-



loped, several of them strongly pectinate; the coupling spine is rather near the end. The lobes of the palp are long.

The legs are of the usual type, and spiniform.

In the first and second pleopods the exopods are areolate, or apparently covered with scale-like markings. The *appendix masculina* is thick and concave, or semi-cylindrical for its whole length. The exopods of pleopods three, four, and five have divisions; that of the fifth has two lobes on the distal end, and two, at the inner side on the angle of the proximal division.

The uropods have a short inner ramus, the end of which is subacute, and projects backwards, it does not nearly reach the notch. The external ramus is long, cylindrical, curved, and ends in a recurved hook, with two or more less curved.

In a female, whose mouth parts are modified in the usual way, the size is the same as that of the male; the more posterior segments of the thorax are very short. The posterior notch of the pleon is roofed over by a process which projects far behind, and is turned up at the end and bifid. The uropods are weaker than in the male, the inner rami more acute, the outer more hooked.

In an unmodified female which I have figured the external rami of the uropods are very strongly hooked, there being three other curved spines on each. The inner ramus is very acute. The legs are rather slenderer than in the male.

In both sexes the limbs are dotted with black spots.

South Australian coast, found in sponges.

Genus *Cilicæa*, Leach.

*Cilicæa curtispina*, Haswell.

Plate iv., figs. 12 to 17; and plate v., figs. 1 to 8.

The body is strongly convex, smooth, with areolate markings; glabrous, with one or two lateral tubercles on each side of the sixth and seventh segments of the thorax. Obscure tubercles are also indicated on the posterior margins of more of the segments in some males.

The head is evenly rounded anteriorly, the margin being slightly thickened; it is narrower than the first segment of the thorax, and more than twice as long. The rostral portion is broad and distally truncated, meeting the anterior part of the epistome by a transverse sutural line.

The segments of the thorax are short, and do not differ much in length. The epimera are nearly vertical in direction, somewhat sculptured, and at their junctions, with their respective segments, are raised, forming an interrupted longitudinal ridge, which also is marked on the first seg-

ment; the individual plates approach gradually to the quadrate shape behind; that of the first segment projects behind and before to an equal degree, and is deeper than the others; that of the seventh is not so deep as the others. The plates, being slightly excavate, show ridges on the free margins.

The sides of the anterior portion of the pleon show three faint lines crowded together, marking coalesced segments; this portion is deeper than the epimera of the thorax, and its anterior border carries a small tooth-like projection, usually hidden by the last plate of the thorax. Posteriorly there is a large median projection, which is vertically compressed, and far exceeds the end of the pleon; its end is obtuse and rounded. The posterior portion of the pleon bears a conical tubercle on each side of the median projection of the anterior part, with two or three small granules above each, and its antero-lateral parts have oblique ridges extending to the insertions of the uropods. The posterior notch is vertically excavated, moderately deep, its roof projecting behind very slightly, and there is only the faintest indication of three teeth on this.

The first joint of the antennular peduncle is about three times longer than broad; its distal end has two projections, the posterior one projecting outwards, the anterior upwards. The second joint, which reaches out to the level of the anterior end of the eye, is about one-third the length of the first, and is distally bifid and ridged above and below; the third joint, which is considerably narrower, is cylindrical, and is articulated under the bifid projection of the second. The flagellum has 15 or 16 joints.

The antenna has the last two joints of the peduncle subequal in length; the flagellum is not much longer than the peduncle, and consists of 18 short joints.

The mandibles are massive, without dark tips to the incisory plates, and with no distinct division into incisory plates and molars, and there are no secondary plates or spine rows. The palp is rather feeble.

The spines on the outer branch of the first maxillæ are dark.

The second maxillæ are narrow, all the lobes reaching the same distance.

In the maxillipeds the distal end of the plate of the second joint is sparingly setose; the lobes of the palp are long.

The legs are rather slender.

In the first gnathopods the ischium is shorter than the basis; the merus, carpus, and propodus are spined in the

usual manner, and together they are subequal in length to the ischium.

In the second gnathopods the basis and ischium are subequal in length, the merus a little longer than the carpus, the propodus longer than the carpus. The spines on this limb and three following pairs are mostly replaced by furry pads.

The first pleopod has the inner margin of the endopod folded at right angles to the other part, as shown in the figure. In the second pleopod the *appendix masculina* reaches farther than the fringe of the endopod, and there is also a less pronounced fold on the inner margin. The proximal end of the *appendix* is bent down quite to the base of the peduncle, as is seen in *C. latreillii*. The exopod of the third pleopods has a division; its endopod has some curious minute crowded teeth on the inner margin; its external distal angle is abrupt. The exopod of the fifth pleopods has six denticulate lobes, four of which are on the distal division.

The two sternal filaments are long.

The uropods have the internal ramus much reduced; the outer ramus is strong, rounded externally, flattened internally, curved, and slightly bifid at the end, projecting well beyond the dorsal process.

The female differs considerably from the male; in it the anterior portion of the pleon has two short median longitudinal ridges, but no large projection. The posterior portion has, besides the two large conical projections, two small tubercles a short distance above each. The posterior notch is deeper than in the male, and has a roofing projection more or less tridentate at its apex.

The inner ramus of the uropod is bifid at its apex; the outer ramus also is bifid, with an external projection, and an inferior keel terminating abruptly short of the bifid end. The inner uropod is channelled to receive part of the outer one when folded.

Sometimes none of the ambulatory legs are padded.

In the specimen examined the marsupial plates were well developed and overlapping; the mouth parts were modified, although the external appearance of the mandibles closely resembled those of the male.

A young female, which I take to be a variety of this species, has the following distinctions:—The posterior segments of the thorax are narrower, and all are more or less provided with small tubercles arranged transversely. The two ridges on the anterior part of the pleon are more converging behind. There are more small tubercles above the

larger projections on the posterior portion. There is a large tubercle above the uropods. The posterior prolongation which roofs the notch is strongly tridentate, and a small median tubercle is just above it. The ridge formed by the upper parts of the epimera of the thorax is more pronounced. There is a conical tubercle on the underside of the peduncle of the uropod.

A common species.

Group EUBRANCHIATÆ, Hansen.

Genus *Dynamene*, Leach.

*Dynamene ramuscula*, n. sp.

Plate v., figs. 9 to 20.

The body is strongly convex, rather narrow, covered sparsely with long, harsh hairs, which are more numerous on the pleon and uropods.

The head is a little longer than the first segment of the thorax, convex, and rather abruptly declivous anteriorly.

The first segment of the thorax is declivous anteriorly, and is longer than either of the four which follow, but not so long as the sixth, which bears two posteriorly projecting processes, which reach nearly as far as the end of the pleon; each of these processes has a slightly sinuous shape and a small branch near the end, which projects downwards. The apices of the epimera are nearly in the same curve, and are without distinct sutural lines marking them off from their respective segments. The seventh segment of the thorax is short, and its small epimera fall short of the preceding ones. The anterior portion of the pleon is only distinctly indicated at the sides, where its anterior angles are nearly right angles. The posterior portion of the pleon is convex, rough, and hairy, having five tubercles; one large median is obscurely cleft apically, two lateral on each side, the more anterior pair larger and nearer the middle; there is also a low tubercle just above the insertion of each uropod. Behind the median tubercle the surface descends abruptly to the posterior notch, which is situated on a conical projection, is a circular foramen with the inferior slit quite closed for its whole length underneath, and showing a very slight median projection behind at the extremity.

The eyes are subcircular.

The antennular peduncle is rather long, projecting distinctly beyond the eyes when raised; the notch on the first joint, which holds the second, is not deep, and inferiorly there is a small projection. The second joint is rather more than half the length of the first, and projects obtusely beyond

the articulation of the third joint; it has also an inferior keel-like projection. The third joint is a little curved; the flagellum consists of about 8 joints, which are longer than those usually met with in other species.

The antennal flagellum has 11 joints.

The maxillipeds are of the usual type, the lobes of the palp rather long, the distal setæ rather short, the last joint is subequal in length to the penultimate, apart from the projecting lobe of that joint.

The second gnathopods and the last pereopods are subequal in length, and are longer and slenderer than the rest of the legs; the last pair bears irregularly disposed long hairs, as also do the others in a less degree; the spines are poorly developed.

The first pleopod has the endopod much broader than long. The second pleopod is without *appendix masculina*, and in both pairs the fringes of the exopods are very long. In the third pleopods the endopod is much larger than the exopod; the exopod is without division, and its fringe is long. The third pleopods as a whole are larger than the others, including the peduncle.

The external ramus of the uropods is straight and lanceolate, much narrower and longer than the inner ramus, and terminally subacute. The inner ramus is obtuse, and slightly curved outwards.

The female is narrow-ovate in shape, the posterior part of the body being conspicuously narrowed; the legs are much shorter and slenderer than in the male; there are no processes on the sixth segment of the thorax, the posterior notch is an inverted triangular-shaped foramen, almost closed behind. The uropods are subcylindrical and small; the posterior part of the pleon has a low median tubercle.

There are well-developed marsupial plates, and the young, most of which were well advanced in the specimen observed—I counted 50 in somewhat varying degrees of development—occupied the whole of the body cavity, and were seen close beneath the marsupial plates, as well as away back near the dorsum; the body seemed to be reduced to a shell, the viscera having apparently disappeared. The mouth parts were highly modified. A second female had eggs scarcely more advanced than a round or slightly elongated shape would suggest; these showed to be directly under the marsupial plates, and also to occupy the body, as in the other female.

Length of parent, about 5 mm.; that of the largest young, about 1 mm.

Gulf St. Vincent, found on sponges. Three specimens only.



Genus *Amphoroidea*, M. Edw.

*Amphoroidea angustata*, n. sp.

Plate vi., figs. 1 to 10.

The body is narrow, smooth, moderately convex, with the epimera not distinctly marked off from their respective segments, and are almost vertical in direction. The head is moderately depressed, and is longer than the first segment of the thorax; there is a slight excavation of the margin on each side of a small rostral process. The eyes are rather small and slightly prominent. The first segment of the thorax is rather shorter than the rest, which are subequal in length. The posterior margins of the fourth, fifth, sixth, and seventh project slightly behind in an increasing degree serially. The anterior portion of the pleon shows the median portion of a first segment; the second forms the whole of the lateral portions; the others are obscure. The posterior portion is dome-shaped, tapering behind, with an obtuse rounded end, having a very faint insinuation, representing a notch, scarcely visible from above.

The basal joints of the antennules are expanded into broad sub-lamellar ovate plates, projecting in front of the head, with their inner margins diverging. The second joints are slightly expanded. The third joints much narrower, and short. The flagellum has 7 joints, the two terminal ones very minute.

The antennæ have their third and fourth peduncular joints rather more expanded than usual. The flagellum has 11 joints.

The epistome is large, quite like that in *A. australis*, Dana.

The maxillipeds have the joints of the palp with small lobes sparingly setose.

The legs are in a single series, and—except the first gnathopods—subequal; they are all hairy, and almost devoid of spines. The basal joints are short.

The first gnathopods are somewhat twisted, the basis and ischium are subequal in length, the merus is strong and much broader than long, the carpus is insignificant, the propodus is compressed—being flattened on the inner side—to a narrow posterior edge, which, besides the hairs, has two pectinate spines; the inner surface of the joint also bears short hairs, which are not numerous. The dactylus is strong with a terminal curved claw, and in place of the secondary claw there are three strong teeth close together, followed by a short series of very short teeth inwardly. The dactylus moves at right angles to the plane surface of the propodus.

The second gnathopods are scarcely twisted, and are a little longer than the following legs.

The pleopods are rather narrow. The first pair has the endopod much smaller than the exopod, and is about twice as long as broad; the inner margin is straight and slightly thickened; the outer insinuate, with a small turned-up point near the proximal end. There is a "shelf," on which rests the inner margin of the exopod. The exopod is broadly-ovate. Areolate structure is well marked.

The second pleopods have an elongate endopod nearly twice as long as the exopod. The *appendix masculina* is as long as the lamina; on the lamina is a faint "shelf" on which the appendix rests. The exopod is narrow-ovate, with a much longer fringe than that of the endopod.

The third pleopods are shorter than the second; in them the exopod is shorter and narrower than the endopod, and has a nearly straight inner margin, and is without division.

The fourth pleopods have both rami branchial.

The exopod of the fifth pleopods has two lobes at the distal end, and two on the inner margin, one above the other, a short distance; a division is not plain; the external margin is almost devoid of setules.

The uropods are broadly lamellar, ovate, the inner rami projecting beyond the end of the pleon, the outer projecting a little beyond the inner. The outer ramus is a little smaller than the inner.

Gulf St. Vincent, shallow water. One male specimen and two immature.

*Amphoroidella*, new sub-genus of *Amphoroidea*.

*Amphoroidella elliptica*, n. sp.

Plate vi., figs. 11 to 18.

The body is ovate, convex in both directions above, concave beneath, covered with a kind of skin that can easily be scraped off, the "skin" thrown into a median dorsal fold or thickening, rendering each segment of the thorax apparently tuberculate in the larger specimens. First and second joints of the antennules, segments of the thorax, anterior and posterior divisions of the pleon, with the uropods, much expanded, so that only the head and extremity of the pleon are not concerned in the outline.

Head short, somewhat depressed; anteriorly there is an insinuation each side of a small rostral projection not more developed than is usual.

The lateral expansions of the first thoracic segments approach those of the second joints of the antennules; there is,

however, a much wider gap between these than between any of the other side expansions, the ends of the two uropods excepted. The margins of all the expansions have a dense membrane-like fringe, with projecting hairs. The head and all the segments of the thorax do not differ much in length. The epimera of all except the first are separated by distinct sutures from their respective segments, and project nearly in the same curve as the segments.

The anterior portion of the pleon is short, marked with the usual lines, which do not extend on to the lateral plates, showing probably that only the more anterior segment bears the expansion. The posterior portion of the pleon is convex, and has anteriorly a median low convexity; it tapers quickly to a narrow rounded end, which is without notch, being only channelled below in the faintest manner; the sides and ends are thin.

The third joint of the antennule is of the usual size, the flagellum short, with 8 or 9 joints.

The epistome is arcuate and very distinct, without an anterior prolongation. The upper lip is large.

In the mandibles the molar is much reduced; on the left mandible the spine row and secondary plate are not distinctly differentiated; in the right the spines also are coalesced. The incisory plates of both are well developed and dentate. In the male the mandibles are normal.

The maxillipeds have the lobes of the joints of the palp short, especially that of the penultimate, which is subequal in length to the last. The setæ are rather scanty.

The legs are in a simple series, and all are similar—except the first gnathopods—and do not differ much in size. The carpus of each, except the first, has an insinuation on one side; all are nearly spineless. The dactyli are short, but the principal claw is rather long and acute.

The endopod of the first pleopods is much longer than broad; it has a ridge, or shelf, on which the inner margin of the exopod lies. The exopod of the third pleopod is ovate, and is without division; the endopod is much longer than broad. In the male the rami of the fourth pleopods are very thin, but both are well marked with branchial folds. The exopod of the fifth pleopods has a division and two lobes on the distal portion, and two at the inner distal angle of the proximal part opposite each other on each side. There are no small setæ on the external margin of this ramus.

In the uropods the peduncle and endopod are fused, and the exopod occupies a notch in the side. The end of the endopod slightly exceeds the end of the pleon.