

On *Anthura gracilis* (Montagu).

By

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With 12 Figures in the Text.

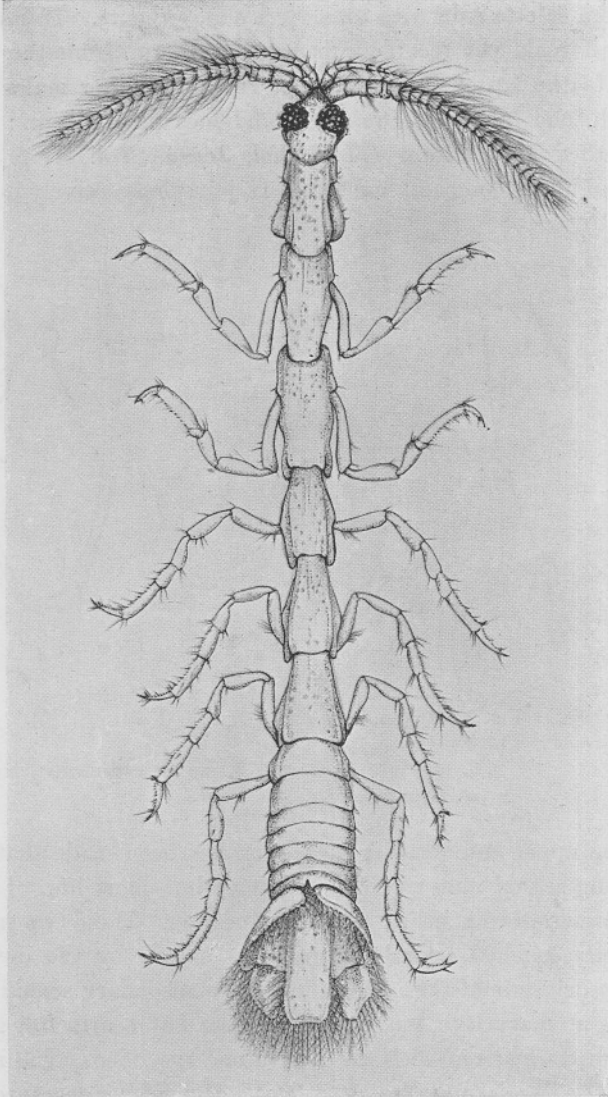
ON August 14th, 1913, a fine male specimen of *Anthura gracilis* was taken by the *Oithona*, in the young-fish trawl working at the surface at night, about six miles west of the Eddystone.

An excellent account of the female and young male has been given by Norman and Stebbing (*Trans. Zool. Soc.*, Vol. XII, p. 122), but, as far as I am aware, the adult male has never been described, and as it differs considerably in appearance from the female, I have figured it here, adding to Norman and Stebbing's description some notes made on the Plymouth specimens.

Female specimens are occasionally found in the dredgings from Plymouth Sound, but males are rarely captured.

Very little is known of the habits of the species. The females are evidently much more sedentary than the males; they are more heavily built, the body stouter, the mouth organs larger, and the first gnathopods much heavier and bigger than in the male (cf. Figs. 9 and 11). Stebbing, in his *History of Crustacea*, 1893, p. 335, makes an interesting suggestion with regard to these animals and their mode of life. In referring to the *Eisothistos vermiformis* of Haswell and its habit of living in the tube of a *Serpula* with its tail at the mouth of the tube, the uropods and telson mimicking in appearance the operculum and branchiæ of the worm, he says: "Probably the British *Anthura gracilis* may use a similar shelter, since it is undoubtedly dredged up in company with shells and stones on which the tubes of *Serpulæ* are abundant." An observation recently made by Mr. Crawshay (*Mar. Biol. Journ.*, Vol. IX, No. 3, 1912, p. 351) appears to support this suggestion, at least as far as the female is concerned. In the material trawled at forty-two fathoms he found one specimen of this species, a female, head inwards in a tube of *Sabellaria spinulosa*. He noted the position of the tail appendages lying nearly flush with the opening of the tube, and added: "Their

appearance was so deceptive to the eye that they might easily be mistaken at a rough glance for the anterior region of the original occupant of the tube." On the other hand, it must be stated that an examination

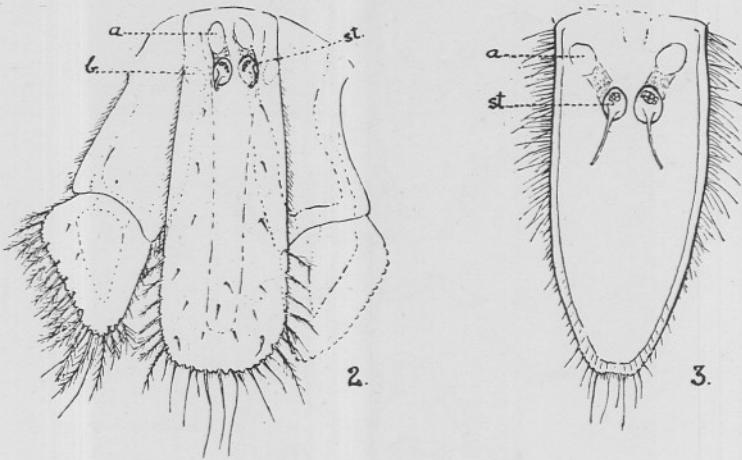


Anthura gracilis. FIG. 1.—♂, dorsal view. Eddystone specimen, $\times 17$.

of several hundred tubes of *Sabellaria spinulosa* dredged in Plymouth Sound did not yield a single *Anthura*. The female specimens collected by the Laboratory have been generally found after the dredgings have been

left standing for some time; as the water becomes foul the animals crawl out of the crevices and holes in which they have been hidden.

The males are very active. Mr. Clark, the naturalist on board the *Oithona*, says of the Eddystone specimen that when caught it darted about from side to side with quick jerky movements. This specimen is the largest male yet recorded, measuring 10 mm. from the tip of the rostrum to the tip of the telson. Of the three other males caught at Plymouth, one taken off Drake's Island measured 8 mm.; the other two recorded by Garstang (*Mar. Biol. Journ.*, Vol. II, p. 123) were 4 mm. and 5 mm. long and had 9 and 12 joints respectively in the flagel-



Anthura gracilis. FIG. 2.—Telson, ♀, × 42.

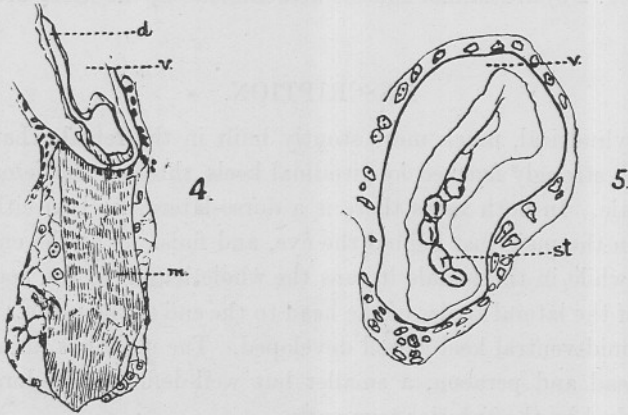
Cyathura carinata. FIG. 3.—Telson, ♀, × 42.

a, muscle attachment; *b*, muscle attachment, inner uropod;
st, statocyst.

lum of the upper antenna. A suggestion has been made that the male on reaching sexual maturity has an active but short life. I think the note just referred to helps to solve this question. These two small males had already reached sexual maturity, as shown by the development of the sensory setæ of the upper antennæ (a secondary sexual character appearing at maturity), but that they were not nearly full grown can be seen on comparison with the Eddystone specimen. The number of joints in the flagella increases with age. The Eddystone specimen—10 mm. in length—had 20 joints developed in the flagellum of the upper antenna, thus showing that the period of sexual maturity and activity had extended over a length of time sufficient to allow for several moults and the consequent considerable increase in growth.

A very interesting point in this species is the presence of statocysts in both male and female. I am indebted to Dr. Calman for drawing my attention to the question of the existence of these organs in the Anthuridæ; to Dr. A. Thienemann for sending me some of the actual specimens referred to in his paper (*Zool. Anz.*, Vol. XXVI, pp. 406-410); and to Dr. Allen for his kindness in sectioning specimens of both *Cyathura carinata* and *Anthura gracilis*.

The species, of which the statocysts are so fully described by Thienemann, proved to be *Cyathura carinata* (Norman and Stebbing, *Trans. Zool. Soc.*, Vol. XII, p. 124) as suggested by Gurney (*Trans. Norfolk*



Anthura gracilis. FIG. 4.—Horizontal section, upper part of statocyst on the right side, showing duct, $\times 100$.

FIG. 5.—Horizontal section, lower part of statocyst on the left side, showing the crystalline bodies of the statolith, $\times 435$.
d, duct; m, muscle; st, statolith; v, vesicle.

Nat. Soc., Vol. VIII, p. 433). I have figured the telson of both species for comparison.

It will be seen that the general structure of the statocysts is exactly the same in both genera, but the details naturally vary a little. It is impossible to see these organs in specimens preserved in the usual way. Dr. Thienemann, in reply to a question as to whether they were to be observed in the living animal, said: "So viel ich weiss, waren die Organe am Lebenden *nicht* zu sehen; dagegen waren Sie sehr deutlich bei Aufhellung mit Nelkenöl, Kreosot oder Zylol." Dr. Thienemann adds the interesting note that in two species of another genus of the *Anthuridæ* examined by him, viz. *Calathura brachiata* Stimps, and *C. norvegica* G. O. Sars, in Bergen Museum, no statocysts were found.

Each statocyst consists of an oval vesicle, lying embedded in the

tissue of the anterior part of the telson, nearer the dorsal surface. A very fine tube or duct communicating with the exterior rises from the upper surface of the vesicle, on the side away from the median line (Fig. 4 *d*), while at the bottom of the vesicle, towards the median line, the crystalline bodies of the statolith can be seen (Fig. 5 *st*). A strong muscle is attached to the anterior wall of each statocyst; much stronger in *Anthura* than in *Cyathura*; it appears to be attached at its anterior end to the chitin of the telson. This attachment looks like a coloured oval body, and is as noticeable as the statocyst itself, seen *in situ* (Fig. 2 *a*), but an examination of the sections shows its construction. The two dotted bodies (Fig. 2 *b*) are similar muscle attachments in the inner uropods.

DESCRIPTION.

Body cylindrical, much more stoutly built in the female than in the male, with strongly marked longitudinal keels, three in the female, four in the male. In both sexes there is a dorso-lateral keel on either side, starting in the male just behind the eye, and finishing at the end of the peraeon, while in the female it runs the whole length of the body, from the tips of the lateral angles of the head to the end of the pleon. In both, also, the mid-ventral keel is well developed. The male has, in addition, on the head and peraeon, a smaller but well-defined mid-dorsal keel, most marked on the anterior segments.

Pleon. In the female the first five segments are coalesced and equal in length to the last peraeon-segment, in the male these segments are distinct and equal in length to the two last segments of the peraeon.

Head in the female almost square, with a short rostrum and with the anterior lateral angles also produced and projecting a little further forward than the rostrum. In the male the shape is quite different, the front of the head from the eyes tapering gradually downwards to a strong obtuse rostrum (Fig. 1).

Eyes black, very prominent in the male, and of great size, occupying nearly half the surface of the head and almost meeting dorsally; ommatidia very large, distinct from each other, corneal facets convex, the whole eye resembling a blackberry. In the female the eyes are much smaller, round in shape, and flat, not prominent.

Upper Antennae in the female shorter than the lower antennae. The first joint of the peduncle is equal in length to the second and third taken together; flagellum two-jointed, consisting of one long joint without setae, and a minute terminal joint carrying a cluster of eight to ten setae

of varying lengths, and three long sensory filaments. In the male the long flagellum reaches to the posterior margin of the second peraeon-segment, and consists of twenty joints in the Eddystone specimen (Fig. 1), the first joint short, the second constricted proximally and expanded distally. All the joints except the first are fringed with very long, delicate, outstanding setae, giving a brush-like effect to the antenna. The smaller male from Drake's Island had sixteen joints in the flagellum.

Lower Antennae. The second joint of the peduncle is greatly expanded distally; the third very small; fourth rather longer; the fifth equal in length to the third; flagellum in the female four-jointed, the terminal joint furnished with a thick cluster of long setae. The flagellum in the male is six-jointed, the first joint as long as the others taken together.



Anthura gracilis. FIG. 6.—Abnormal maxillipeds, ♂, Drake's Island specimen, $\times 75$.
FIG. 7.—Maxilliped, ♂, Eddystone specimen, $\times 75$.
FIG. 8.—Maxilliped, ♀, 10.5 mm., $\times 75$.

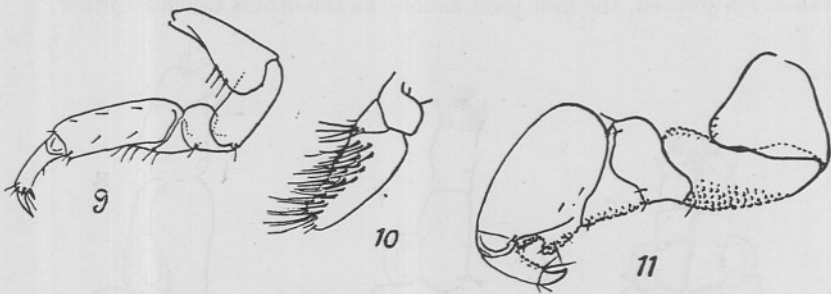
Mouth organs as described by Norman and Stebbing. They are larger in the female than in the male. The mandibles have a three-jointed palp; the falcate process terminates in three blunt teeth, the thin blade below with five serrations, the serrations more acute in the males examined than in the females.

Maxillipeds. Palp one-jointed (Figs. 7 and 8) tipped with a row of four stiff slightly curved setae. In Fig. 6 the maxillipeds of another male are figured, showing an abnormality in that a second and very distinct joint is developed. The specimen was perfectly normal in all other particulars, but it serves to illustrate the danger of describing species from one or two solitary specimens.

Gnathopod 1. In the male the first and second joints are subequal, both produced distally on the upper side over the succeeding joint; third joint produced on the under side. The fifth joint or hand narrowly pyriform, widest proximally, tapering to the insertion of the finger, rounded above, and turned at a different angle to the rest of the appen-

dage; palm covered on the under surface with long stout setae; finger carrying one small spine and a few setae distally; nail strong, curved.

In the female (Fig. 11) the gnathopod is much larger and stouter than in the male. The first joint is as broad as long, distally expanded; second joint slightly longer, furnished on both margins with a pectinate scale-like armature. This armature is also found on the anterior margins of the fourth, fifth, and sixth joints. The hand as described by Norman and Stebbing is pyriform, upper portion well rounded, palm with a well-developed process projecting forward near the base; inset on the under surface near the finger is a cluster of stout setae similar to those of the male.



Anthura gracilis. FIG. 9.—First Gnathopod, upper surface, ♂, Eddystone specimen, × 42.
 FIG. 10.—First Gnathopod, under surface, ♂, Eddystone specimen, × 42.
 FIG. 11.—First Gnathopod, upper surface, ♀, × 42.

Gnathopod 2 and *Peraeopod 1* alike in construction in both sexes. The first joint is longer than the second; third half the length of the first, strongly lobed posteriorly; fourth very small, triangular; fifth as long as the first, nearly parallel-sided, front margin finely pectinate, the microscopic spines arranged in semicircles giving the effect of overlapping pectinate scales down the whole length of the margin; two strong spines inset at the insertion of the finger. Finger long, finely pectinate, carrying one strong spine and some setae at the base of the nail, and two or three small spines proximally. Scattered over all the appendages are many mobile sensory hairs, each hair consisting of a shaft and a fine flagellum. These hairs are most numerous on the palm.

Peraeopods 2, 3, 4, and 5 alike in construction, a little shorter and stouter in the female. The first joint is slightly longer than the second; third and fourth shorter, subequal in length; fifth about the length of the first; finger two-thirds the length of the fifth. The first three joints are constricted proximally, the third lobed posteriorly. In all

the peraeopods the anterior margins of the fourth and fifth joints are pectinate, the spines in the female being longer and more setiform in character; the finger also bears some small spines: two stout spines are inset together at the anterior distal angle of these joints, and a long plumose sensory hair at the posterior angle of the fourth joint. In the male the third joint of the fifth peraeopod is provided with two long sensory plumose hairs as long as the succeeding joint.

Pleopods 1 in both male and female, with the outer rami greatly expanded, forming a kind of operculum, reaching in the female to the extremity of the fifth segment of the pleon, in the male considerably



Anthura gracilis. FIG. 12.—Second pleopod, ♂, × 42.

beyond the end of the pleon. The modified second pleopod of the male is figured (Fig. 12).

Telson and *uropods* as described by Norman and Stebbing, so constructed "as to resemble nearly a cylinder, with one side (the dorsal) cut obliquely away. The telson has the apex truncated, and is of the same length as the inner branch of uropods. Outer branches of uropods nearly meeting at their bases dorsally, broadly lanceolate, curved, rather longer than the first joint of the inner branch."

Colour, yellowish white, with markings of a brownish pigment in the form of cloudy patches. The colour varies considerably, probably with the nature of the ground on which the animal lives, some specimens—as the Eddystone one—having only a few small dotted patches on the head and peraeon, others again being nearly covered with the brown tint.