156. Taractrocera sagara, Moore.

Rare. Taken in May and August.

157. Halpe beturia, Hewitson.

Common. Generally keeps high up amongst trees.

158. Hyarotis adrastus, Cramer.

Rather common.

159. Tagiades ravi, Moore.

Rare, rests with out-spread wings, often on the underside of a leaf.

160. Tagiades khasiana, Moore.

As above; somewhat plentiful in the rains.

161. Udaspes folus, Cramer.

Rather common.

162. Coladenia tissa, Moore.

I have taken a single male specimen in February in a garden at Alipur. In the rains another brood appears, which differs from the cold weather generation in having the ground-colour of both wings umber-brown, instead of ochreous, and all the black spots and markings more prominent.

163. Hesperia galba, Fabricius.

Decidedly rare in Calcutta, but occurs throughout the year.

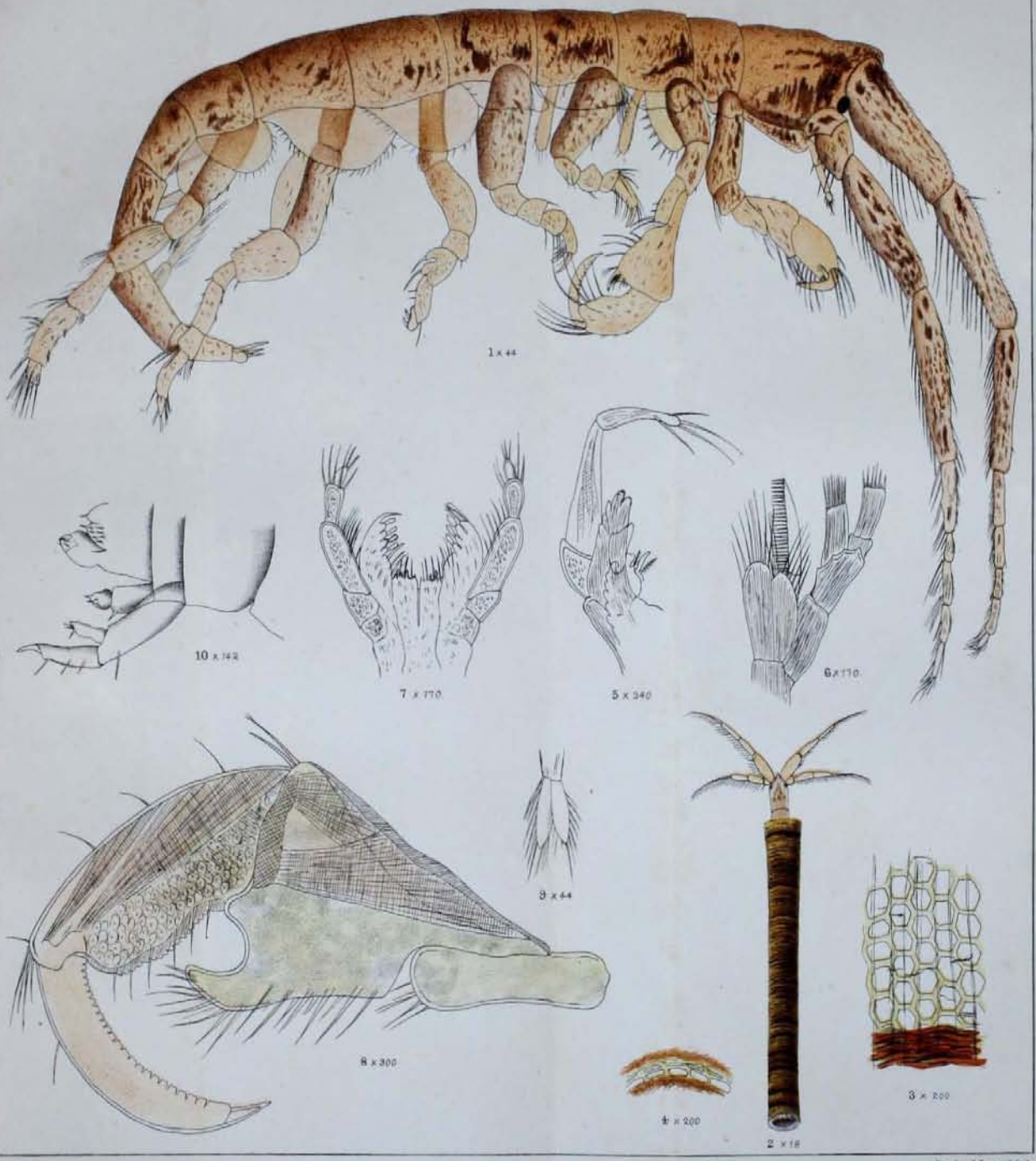
V.—*Natural History Notes from H. M.'s Indian Marine Survey Steamer 'Investigator,' Commander* Alfred Carpenter, R. N. *Commanding. No.* 1. *On the Structure and Habits of* Cyrtophium calamicola, *a new Tubicolous Amphipod from the Bay of Bengal.—By* G. M. Giles, M. B., F. R. C. S., *Surgeon-Naturalist to the Marine Survey.*

(With Plate I.)

[Received 6th March;—Read 1st April, 1885.]

The little organism I am about to describe is one of the numerous objects that are found in the surface-net about the Palmyras shoal and mouth of the Dhamra river on the Orissa Coast. To this, or, at any rate, to such situations, it appears to be confined, for it was not met with either in the deep water of the Bay of Bengal, or in the clear blue shallow water about the Cheduba archipelago.

Shortly after commencing surface-net work in the above locality, I noticed amongst the hauls a body moving with tolerable activity, in appearance much like a morsel of drift wood. It swam about the tube in which it had been placed for observation in a nearly upright posture, sometimes upwards, sometimes obliquely across it, at others allowing itself to sink to the bottom. On closer examination, the four antennæ of a minute crustacean were seen protruding from one end;



G.M.G. del.

Parker & Coward lith.
West, Newman & Co. chromo.

CYRTOPHIUM CALAMICOLA.

and it was by the vigorous strokes of these appendages that the little creature was enabled to propel itself with its dwelling through the water. On placing it under a moderate power it was seen to be an Amphipodous crustacean; and it was very curious to observe the cautious way in which first the tips of the antennæ, then the head, and finally the body as far back as the 2nd thoracic somite would be protracted from the stick-like tube, the animal drawing itself back again on the least alarm; further out than this, it appeared disinclined to venture. In order to quiet its movements somewhat, a minute drop of alcohol was added to the water in the cell—a very useful device when it is wished to quiet, without killing, an organism, for after a few vigorous kicks the animal becomes quiet and sluggish, and remains so for some time, until the effects of the dose have worn off;—the moment it felt the touch of the spirit, the little crustacean rushed completely out of its tube, but as quickly dived in again head first. It was noticeable also that, when alive and at ease, it would frequently turn itself inside its tube, and protrude its head from the opposite extremity.

The tubes vary in size from 5—10 mm. long. by 0·5—1 mm. wide, and are nearly cylindrical.

Further examination shewed the Amphipod to belong to the Subdivision Domicola—Family Corophiidæ—Genus *Cyrtophium*.

To the generic characteristics—as adopted by Haswell from Spence Bate in his Catalogue of Australian *Malacostraca*, the only book available to me on board,—our species corresponds very well, but it differs in the antennæ being slightly longer than the antennules and, as well as the posterior abdominal appendages, unprovided with any distinctly curved spines; the latter, however, are furnished with straight spines, which in the natural flexed position of the abdomen are directed forwards, and thus serve equally well for fixation; the spines, moreover, figured for certain species are but very slightly curved. Neither does the relative length of antennæ and antennules afford very trustworthy generic characters: in some of my largest individuals, the antennæ were slightly the shorter, and the number of joints in the flagella of both pairs of appendages presented all variations from three to six. Our species does not, however, appear to be specifically identical with either of the four described by Haswell as known in Australia, or with any in Spence Bate's 'Catalogue of Amphipoda in the British Museum,' which I have since consulted.

From its habit, to be described further on, of making use of a piece of grass or reed as the basis for the construction of its tube, the species may be provisionally named :—

CYRTOPHIUM CALAMICOLA, n. sp.

Length 3—5 mm.

Colour a golden brown plentifully mottled with deep chocolate coloured blotches.

Head subquadrate with a slight beak-like prominence in the middle line. Antennules hairy, as long as the head and the first five segments of the thorax together; their peduncles subequally three-jointed, flagellum (in largest specimens) consisting of six joints, the last joint claw-shaped; length of flagellum to peduncle as 3 : 8. Antennæ hairy, generally equal to the antennules in length; the peduncle four-jointed, coxocerite very short, fourth joint slightly longer than the third; number of flagellar joints equal to that of the superior antennæ; length of flagellum to peduncle as 5 : 12. The number of joints in flagella of both superior and inferior antennæ varies considerably: I have met with instances of 3, 4, 5, 6; the joints appear to be always equal.

Thorax. 4th, 5th, and 6th somites of nearly equal length and longer than those before and behind them; 1st the shortest of all. Coxal plates increase in size from before backwards; those of the gnathopoda very small, and, with those of the two following appendages, not long enough to overlap; the posterior three considerably larger, imbricate. 2nd pair of appendages, or anterior gnathopoda, considerably less robust than the posterior; propodite long, ovate; dactylopodite as long as the propodite, its concave border very finely serrate; carpopodite triangular, its articulation with the meropodite so oblique as to coincide nearly with the long axis of the appendage. 3rd pair of appendages, or posterior gnathopoda, very large; dactylopodite as long as the propodite, provided with a peculiar serrature of square, chisel-edged teeth; propodite long, ovate; carpopodite triangular, its postero-inferior angle produced into a strong tooth with a smaller, less acute tooth close to the posterior border of its articulation with the propodite; articulation of carpopodite with meropodite as in the 1st gnathopod. 4th and 5th pairs of appendages alike in form, with claw-shaped dactylopodite; the latter is, however, much the more robust. 6th pair of appendages differing a good deal from the others; the posterior border of their dactylopodite provided with two curious short finger-like processes. 7th and 8th pairs of appendages alike in general form, the 7th slightly smaller than the 8th, their basipodites having the posterior border strengthened by a lamellar buttress-like expansion; dactylopodite rounded and provided with a large tuft of hairs; both these appendages are habitually kept extended backwards in the long axis of the body.

Abdomen. Anterior three appendages of the usual swimmeret type;

anterior the largest, the 3rd the smallest; 4th with the rami unequal, the internal ramus two-jointed, projecting backwards and inwards behind the telson like a pair of horns; 5th smaller than the fourth, with internal ramus rudimentary; 6th rudimentary, bud-shaped, with a few very short, straight, backwardly directed, appressed spines. Telson short, blunt, conical, and armed, at the extremity of the dorsal surface, with spines similar to those on the last abdominal appendages.

The *tube* inhabited by this little creature is a very curious structure. It is, as a rule, considerably longer than the body of the animal it shelters, being more than capable of completely protecting it, when the antennæ, extended in front of the body, are drawn within. It is of a deep golden brown colour, and, on closer examination, is seen to be closely, but irregularly, banded with zones of darker and lighter tint, varying from a fine golden yellow, through a warm brown, to black. When some of this material is teazed out, it is seen to consist of coarse, nearly opaque, fibres uniformly stained throughout, and showing no structure, consisting, indeed, to all appearance, of a hardened secretion. For some time I was in considerable doubt as to the method of its manufacture. At first I had jumped to the conclusion that it was a worm tube that had been appropriated by the *Cyrtophium*, much in the same way that a hermit-crab fits itself with the shell of a dead mollusc. One day, however, I surprised one of the amphipods, in my live trough, evidently in the act of repairing its premises. The animal had completely withdrawn himself into the tube and was keeping it slowly but continuously revolving round him. The specimen was luckily a small one and hence the tube was transparent enough for me to see that the crustacean kept stationary, while the tube revolved. The transparency, however, was not sufficient to enable the exact method of deposition of the fibre to be made out. Shortly after this, a specimen was met with in which about half the tube only was covered with the opaque fibrous material and the other half transparent. On placing this beneath the microscope, I was surprised to find that the transparent portion was a very complex structure consisting of a layer of hexagonal thick-walled cells with an outer layer of long quadrilateral cells; the whole presenting an appearance which left one in no doubt as to its vegetable nature. Moreover, the structure was not that of an alga, and appeared most probably referable to that of some grass or reed. The greater part of this vegetable membrane was coated on both sides with the peculiar opaque fibrous material above described. Pieces of grass such as would serve for this purpose are taken commonly enough in the surface-net in the turbid waters at a river's mouth and are, no doubt, common at the bottom for some considerable distance beyond; indeed, I

have dredged a specimen of a grass in excellent preservation many miles from land in nearly 200 fathoms. It is evident therefore that our *Cyrtophium* would experience no want of building materials in the moderate depths which he inhabits. Subsequent examinations, both by teazing and section, have shewn that this structure is the rule, *viz.*, a vegetable tube covered inside and out with hardened secretion. In some few of the tubes, however, no trace of vegetable structure could be detected ; and it is probable that the animal is quite capable of constructing a protection for itself without the aid of such a basis. Haswell, indeed, following Spence Bate (*op. cit.*), appears to take this power as an accepted fact, for he includes the genus *Cyrtophium* in a section named '*Nidifica*' defined as "Having the power of secreting a substance, that, like a web, binds together the material of which the nest is composed, or one of a more membranous character." It appears to me, too, that the intricate peculiarities of the form of the limbs tends to corroborate this view. The peculiar teeth of the dactylopodite of the second gnathopod are clearly suited only for cutting, and the organ would be admirably adapted for trimming a piece of grass to suit its purpose, or for severing the thread of secretion ; it is to be noticed that they are quite different from those of the anterior gnathopod, the serratures of which are simple like those of a saw. Again, the distal joint of the 6th thoracic appendages is admirably adapted for guiding a thread, but is so shaped as to be nearly useless either for ordinary progression or for manipulating the food. I have not been able to satisfy myself as to the position of the gland which would be necessary for the production of such a secretion. Cement-glands have been described in the gnathopodal propodites, and glands of a probably different nature also in more or fewer of the bases of the thoracic limbs. Glands are observable in both these situations in this species. The posterior part of the huge propodal joint of the 2nd gnathopod is filled with a collection of rounded nucleate cells which, so far as can be seen through the chitinous cuticle, appears essentially of a glandular character, and from its volume I am strongly inclined to believe is the organ concerned in the production of the membrane-forming secretion.

All attempts at keeping the animal in captivity failed. Even when kept in a large bulk of water aerated by means of a pressure-apparatus, specimens soon died, whether they were turned out of their tubes or allowed to retain them. This could hardly have been for want of oxygen, for a fish, exceeding the *Cyrtophium* many hundred times in bulk, was kept alive in the same apparatus for over five days under precisely the same circumstances. It is probable that the clearness of the water indispensable for observation had something to do with this.

EXPLANATION OF PLATE I.

Fig. 1. *Cyrtophium calamicola*, n. sp., drawn to scale, × 44.
2. The same in its tube, in the act of swimming, × 18.
3. Portion of an unfinished tube showing a vegetable membrane lined at one end with opaque silk-like fibres, × 200 (about).
4. Small portion of a transverse section of a tube, × 200 (about).
5. A mandible, × 340.
6. 1st and 2nd maxillæ, × 170.
7. Maxillipedes, × 170.
8. Subchela of third thoracic appendages, showing the peculiar teeth of the dactylopodite and the glandular body in the propodite, × 300 (about).
9. One of the anterior abdominal appendages, × 44.
10. The three terminal abdominal appendages, with telson, from above, × 142.

VI.—*Notes on Japanese Land and Freshwater Molluscs.—By* O. F. VON MÖLLENDORFF, PH. D. *Communicated by the* NATURAL HISTORY SECRETARY.

[Received April 3rd;—Read May 6th, 1885.]

The following notes are based chiefly on a collection made by Dr. John Anderson during the year 1884 and sent by him to Deputy Surgeon General Hungerford and myself for classification. I take this opportunity to publish some new species formerly discovered by Messrs. Hungerford and Eastlake, and to give some corrections to my former paper on Japanese *Clausilia* published in this Journal (Vol. LI, Pt. II, 1882).

1. NANINA JAPONICA, n. sp.

Testa depresso-globosa, semiobtecte perforata, acute carinata, superne striis curvatis transversis costuliformibus distantibus sculpta, subtus laevigata, nitida, tenuis, subpellucida, flavescens; anfr. 6 *fere plani, ultimus non descendens, basi inflatus, apertura obliqua, lunaris, peristoma rectum, acutum, margine columellari ad perforationem reflexo.*

Diam. $11\frac{1}{2}$, *alt.* $6\frac{1}{2}$ *mill.*

HAB. Specimen unicum ad Sengoku legit cl. Dr. Anderson.

The first *Nanina* known from Japan; I am not sure about its subgenus, which can hardly be ascertained without examining the animal. The nearest relation is apparently my *N. eastlakeana* from Fuchow in China (Jahrb. d. Mal. Ges. 1882, 371), which is somewhat larger and flatter. I think both species should be classed with *N. indica*, Pfr., which G. Nevill (Handl. Moll. Ind. Mus, 1878, 27) has under "subgenus doubtful," whilst Pfeiffer considers it to be a carinate *Macrochlamys*.

Another *Nanina* (*Macrochlamys?*, *Hemiplecta?*) at least 24 mill.