On Discoarachne brevipes Hoek, a Pycnogonid from South Africa[1]).

By

Leon J. Cole.

With Plate 13.

Through the kindness of Dr. W. F. Purcell of the South African Museum I received some time ago 11 specimens of *Pycnogonida* for identification. These proved all to belong to one species, *Discoarachne brevipes* Hoek, described from a single specimen, a female, collected during the cruise of the Challenger[2]); and curiously enough, they were taken at the same place as that specimen, namely, at Sea Point (Table Bay), near Cape Town. It is not stated at what depth the Challenger specimen was taken[3]), but Hoek says, "This species with its short legs and highly concentrated body, is a true littoral form", and the label with the specimens from Dr. Purcell states that they were found "On seaweed between tide-marks". The latter were collected in July, 1899; the former in November, 1873. So far as I know no record has been made of this species, which forms the type of a new genus, since the time of its first description, and for this reason it seemed that a further description, and especially a description of the male, which differs considerably in some points from the female, was desirable.

1) Work from the Zoological Laboratory of the University of Michigan, Jacob Reighard, director.

2) Hoek, P. P. C., Report on the Pycnogonida, dredged by H. M. S. Challenger during the years 1873—76, in: Challenger Rep., Zool., V. 3, 1881, p. 74—76, tab. 7, figs. 8—12.

3) In a synoptic table, p. 29, it is given as "Shore".

Of the 11 specimens mentioned 6 are females, 3 are males, and 2, whose sex is undeterminable, are immature though of nearly full size.

In the description of the female there is little to be added to the excellent description given by HOEK, except that, as might be expected, there is some variation to be found in the number of spines on the various joints of the legs. Another more important variation is in the matter of the first pair of appendages (the so-called "mandibles", "antennae", or "chelifori"), which HOEK found to be entirely wanting. This is the case in 4 of the females which I have examined, but in the other 2 they are represented by rudiments (Plate 13, Fig. 1 *I*), which is also the case in two of the three males and in one of the immature specimens. None of these females is as large as that of the Challenger collection, the measurements of the largest averaging only about 80% of those given in that report. That they are mature, however, is evidenced by the fact that they contain full sized ovarian eggs. The genital openings are not placed exactly "ventrally near the distal extremity of the second joint of the leg" as HOEK supposed, but are oval openings situated about in the middle of the joint, just posterior to the mid-ventral line. At the distal end of the same joint of each of the 4 pairs of legs there is situated ventro-laterally on the anterior side of the leg a small circular opening from which a duct can be seen leading inward and dorsally. There have never, to my knowledge, been glands described as occurring in this position, but it is possible that they correspond in function to the glands occurring in the 4. joint of the leg in the males of some genera, which are supposed to secrete the cement that holds the eggs together in masses.

The males (Fig. 2) are noticeably smaller than the females, but in general a description of the latter would apply to the former, the most marked difference being found in the ovigerous legs. The description given of this appendage in the female is as follows: "The first joint of the ovigerous leg is very small, the second and third are a little longer, the fourth and fifth are the longest, the sixth is short again, the seventh, eighth, ninth, and tenth are about the same length, and gradually diminish sligtly in breadth. The first five joints are nearly smooth, towards the distal extremity the sixth shows some short and not very strong spines, whereas the four following joints are furnished in the same place with much stronger and slightly curved spines. Towards the end of the tenth joint there are a considerable number of these spines, while a claw and true denticulate

spines are totally wanting." Although HOEK gives a good figure of the last 5 joints of the ovigerous leg of the female, I have introduced one here (Fig. 3) to facilitate comparison with the corresponding part in the male (Fig. 4). To and including the 7. joint the description for the female applies equally well to the male, except that in the male what few short spines there are mostly point backwards, whereas in the female they stick nearly straight out, pointing slightly ahead if anything; and the 7. joint has at its distal extremity a large number of long, stout, and mostly recurved spines (Fig. 4, 7). The 8. joint instead of being continuous with the 7., comes off from the side of it at an angle. The 9. and 10. follow in line with the 8., and all three are much smaller than the corresponding joints in the female. The 8., like the 7., is armed at its distal end with strong spines which, however, are not recurved, and there are also a few on the 9. The 10. joint is very short and at its apex has two short spines which are so arranged that they somewhat resemble chelæ. Plainly all these differences are secondary adaptations in the male to hold the egg-masses upon the legs, and I am not aware that just such a device has been found elsewhere, though in some Pycnogonids (*Pallene* e. g.) the same result is obtained by a knob on the distal end of the 5. joint, which usually bears backwardly projecting spines. This also occurs only in the male.

Upon the ovigerous legs of one of the males were several closely crowded masses of eggs as shown in Fig. 2. Eight of these more or less rounded masses could be counted, the eggs composing which were in the later cleavage stages; but when these were removed the remains of two other masses were found, one on the basal portion of each of the ovigerous legs. These latter were shapeless masses consisting largely of the matrix or cement which holds the eggs together, and in which a few unhatched eggs were still embedded. But the larger number of the eggs were hatched and the small "pantapod-larvae" (Fig. 5) were hanging to the remains of the mass by the strong chelæ of their first pair of appendages (Fig. 5). That there were two sets of eggs in so widely different stages of development would seem to show conclusively that the male had taken eggs from a second female while still carrying eggs he had received from another. The 8 masses of eggs in the same stage of development suggests that they may correspond to the 8 genital openings of the female, those from each pore remaining in a separate ball. The way in which these are attached to the ovigerous leg is shown in Fig. 6, which represents one of the masses.

As has been mentioned above the ovigerous legs in the female of *Discoarachne* are even larger than in the male and the question naturally arises, What can be their function in the female that they should persist and be so well developed? HOEK[1]) says in regard to this: "As the functions of the ovigerous legs are twofold, one being to bear the eggs, a function only accomplished by the male [an exception is given to this, a case of a female of *Nymphon brevicaudatum* MIERS, which had an egg-mass on its ovigerous leg], the other to serve as an organ of feeling, also, in all probability, of seizing food, and as the latter of these functions is almost identical with that of the other cephalic appendages, they are wanting in the females only of those genera which have also lost their other cephalic appendages." If the ovigerous legs are used for feeling and for grasping food as here supposed, it is hard to understand why they should be absent in those forms that, having lost either one or both pairs of their other cephalic appendages (*Pycnogonidae*, *Phoxichilidiidae*), would seem to need them most. Besides, it is not well known of what the food of Pycnogonids consists, and references to this subject are rare in the literature. MORGAN[2]) observes as follows regarding the food: "No solid extraneous matter was ever seen in the tract of either larvæ or adults of Sea-Spiders, so that the food is probably obtained by sucking the juices of other animals . . . . and probably from the hydroids, amongst which they live." If the cephalic appendages function as HOEK believes, we may reasonably expect to find some difference in the feeding habits of those forms in which they are well developed and those wanting all or part of them. From observations which I have myself made, and from comparing the figures of others, it seems possible that the ovigerous legs of the female may have another function, to help in the transfer of the eggs to the male in those cases in which they are formed into round balls. In *Pycnogonum*, *Phoxichilidium*, *Anoplodactylus*, and related genera, in which the ovigerous legs are absent, the eggs are often, if not always, in irregular rounded masses (*Anoplodactylus lentus*), cake-like masses (*Pycnogonum*), or in loose balls. How the eggs are transferred in *Anoplodactylus lentus*, where it is a very simple process, I have described

1) HOEK, P. P. C., l. c. p. 15.

2) MORGAN, T. H., A contribution to the embryology and phylogeny of the Pycnogonids, in: Stud. biol. Lab. Johns Hopkins Univ., V. 5, No. 1, 1891, p. 38.

in another paper[1]). No description of this process has ever been given for a form in which the female is provided with ovigerous legs, and it is possible that in these cases it is a more complicated process in which these appendages may take part. All of this emphasizes the need of more observations on the habits of these interesting animals by those who have opportunity. Most of the physiological actions that have been incidentally attributed to them by writers upon the group have been from their structural peculiarities, and not from direct observation or experiments.

Of the immature specimens that accompany this lot I have little to say. In size they are nearly as large as the males, which they resemble in general. The eyes, however, are without pigment and the ovigerous legs are only partially developed. They might be compared respectively to what Morgan[2]) has described as the ninth and tenth stages in the development of *Tanystylum orbiculare* Wilson. In the first of these (Fig 7) the ovigerous legs are short and no joints can be distinguished; in the second (Fig. 8) they are about twice as long and 8 of the final 10 joints can be indistinctly made out. No hint is yet given as to whether these would have developed into the longer appendages of the female, or into the modified ovigerous legs of the male.

For convenience in systematic reference I append by itself the following brief

Description of the male.

General appearance similar to that of the female; somewhat smaller and more slender; chelifori represented by rudiments or wanting. Ovigerous legs 10-jointed; joints 1—6 as in female, except that scattered spines mostly point backwards; 7. joint rounded at distal end and furnished with numerous long, mostly recurved spines; 8. joint much smaller than 7., coming off from the side of the 7. at an angle, its distal end bulged and beset with long spines; 9. joint slightly longer and of smaller diameter than 8., with a few long spines at distal end; 10. joint very small, two short spines at tip somewhat resembling chelæ.

Zoological Laboratory, University of Michigan,
Ann Arbor, Mich., U. S. A., April 17, 1901.

1) Cole, L. J., Notes on the habits of Pycnogonids, in: Biol. Bulletin, V. 2, 1901, pp. 195—207.

2) Morgan, T. H., l. c. pp. 44—45, tab. 6, figs. XIX and XXI.

Explanation of Figures.

Plate 13.

Discoarachne brevipes Hoek.

Fig. 1. Anterior portion of female, dorsal view. *I* chelifori, *II* palpi, *IV* and *V* first and second walking legs. 27 : 1.

Fig. 2. Ventral aspect of adult male showing egg-masses upon ovigerous legs. 15 : 1.

Fig. 3. Last 5 joints of right ovigerous leg of female. 107 : 1.

Fig. 4. Last 5 joints of right ovigerous legs of male. 107 : 1.

Fig. 5. The newly-hatched "pantopod-larva". 143 : 1.

Fig. 6. One of the egg-masses. 15 : 1.

Fig 7. Anterior portion of an immature specimen from below, showing the small ovigerous legs (*III*) in which joints are not yet distinguishable. 40 : 1.

Fig. 8. A slightly older specimen in which joints can be distinguished in the ovigerous legs. 40 : 1.

Fig. 1.

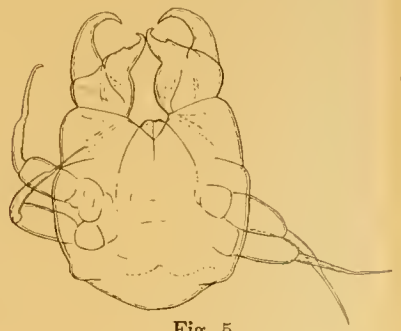

Fig. 5.

Fig. 2.

Fig. 3.

Fig. 6.

Fig. 4.

Fig. 7.

Fig. 8.

Verlag von Gustav Fischer in Jena.