

## NOTES AND MEMORANDA.

1. **Hermit Crabs and Anemones, &c.**—It is often so difficult to make systematic observations on the inter-relations of animals, that a bare record of the merest fact may prove eventually to be of use. These few lines, on one or two small occurrences in the aquarium and elsewhere, are printed here, not from any intrinsic interest, but in the hope that they may be useful to some future worker.

Upon the relations existing between certain Actinians and Crustacea, observations are much needed. In a tank containing several *Pagurus Bernhardus* and *Adamsia Rondeletii* (*Sagartia parasitica*), which are habitually associated in a form of commensalism, most of the Paguri for one reason and another died, and their anemones in some cases crawled off the shell and throve independently (this has been noticed also in the case of *Adamsia palliata*). One of three specimens of *Maia squinado* living in the same tank, presently appeared bearing first one, then two, finally three *Adamsia Rondeletii* on its walking legs; one, if I remember right, was placed on the first walking leg of each side, the third on the second leg of the right side. The limbus of the anemone was in all cases firmly clasped round the leg, the edges meeting closely in the manner of *Adamsia palliata*. The anemones remained in this position for some days, but only one was left after about a month. Though the crab was not actually seen to place the anemones on his legs, there can be little doubt that such was the case, both because the anemone's power of locomotion is but small, and because of the well-known habit of *Maia* to "dress" itself with anything available. On the other hand cases are known where the anemone, whether as embryo or adult, selects its own habitat. Last summer in the aquarium a particularly fine specimen of *A. Rondeletii* was fixed on the back of a large live *Buccinum undatum*; and under the same head probably fall the *Rondeletii* on the cephalothorax of *Carcinus maenas*, instances of which are occasionally dredged in the Sound. In another tank where *Pagurus Bernhardus* with *Adamsia* were stored, when the anemones were fed the hermit-crabs were frequently observed to insert a chela into the stomatodæum of the anemone associated with another crab, and to drag out and devour the plunder. Mr. Bateson recorded some time ago in this Journal that he had noticed a prawn rob an *Anthea* in this way, and the observation has been since repeated.

Among the foes of shrimps, which seem to include nearly every animal in the sea, I am not aware that the common prawn has ever been recorded. Where a tub full of shrimps has been emptied into a tank for food, the prawns collect round the spot, and seize and devour at leisure live shrimps, despite their struggles. It would hardly be anticipated that the prawn would prove so deadly an enemy to an animal which seems almost as swift and as strong as itself. Shrimps are almost the only animals eaten alive in the tanks; very few of the creatures even attack each other.

The commonest Plymouth star-fish, *Asterias glacialis*, was observed to eat, not only the Mollusca supposed to form its chief food, but also *Asterina gibbosa* (Aquarium and Wembury Bay), *Echinus miliaris* (Aquarium), and small Crustacea such as *Porcellana platycheles* and *Portunes*, sp. (Wembury Bay); the latter were sometimes found reddened as if boiled, apparently by the action of the digestive juices. In all these cases the stomach was more or less everted round the food.

Like the oyster, *Pecten maximus*, when surprised, can punish an invader by nipping him tightly between its valves till he dies; an intrusive Conner (*Otenolabrus rupestris*) was caught in this way by the head in the aquarium, and in the morning was dead.

G. H. FOWLER.

2. **Grayling and Loch Leven Trout in Salt Water.**—Some time ago I received a consignment of the above-mentioned Salmonidæ from O. Greig, Esq., who has recently built large fish-ponds at Holdsworth, N. Devon. The fish were all young, averaging about  $4\frac{1}{2}$  inches in length; they were transported in a conical tank of the Howietown pattern, and arrived, with one exception, in a perfectly healthy condition.

One grayling and one trout were first of all taken, and, as an extreme experiment, transferred to pure salt water. They immediately darted off with great rapidity, swimming now round the tank, now with sudden zig-zag bounds after the manner of Mysidæ. If at any time they came to rest they floated quickly to the surface, owing to their bodies being unaccustomed to so dense a surrounding medium.

Their breathing can only be described as violent spitting, and a slight quiver of the body was occasionally noticeable. Both fish soon showed signs of sickening, their motions becoming slower, and their power of keeping below the surface in a normal position less. In about two hours the grayling died, but the trout, with greater tenacity to life, remained alive for four hours.

The rest of the fish were put into water only slightly salt, and

were treated with care, the density being allowed to increase very gradually. For some days it was found that whenever the hydrometer registered  $15^{\circ}$ , the fish showed signs of distress. On the fresh water tap being alone allowed to run the majority revived, but four died even with this amount of salinity. The snow storm of March 10th occurred at this juncture, and for four days our fresh-water supply was entirely cut off. I aërated the water and only introduced small jets of salt water at intervals, but the mortality became seriously high, and the renewal of the water-supply left me with only three fish, all trout. The trout have all along proved more hardy than the grayling.

The fish commenced to feed first of all on small earthworms, but by soaking marine worms in fresh water previous to feeding, I have managed gradually to accustom them to a sea-animal diet.

The remaining trout were successfully kept alive while the water was increased in density. They are now in ordinary sea water of  $26^{\circ}$  sp. gr., and still they appear to be perfectly healthy, and are feeding well. The gradual transition from fresh water into salt has occupied just fifteen days. If they continue to thrive it will be instructive to observe their development, although we can scarcely hope that they will propagate their species.—DIRECTOR.

3. **Eels and Sticklebacks in Sea Water.**—Three eels and quite a number of sticklebacks, caught in the brackish water at the mouth of the Cattewater, are now thriving perfectly amongst the marine animals in the large exhibition tanks of the Aquarium.—DIRECTOR.

4. **Phoronis at Plymouth.**—Since *Phoronis* is not usually considered to be at all common on the British coasts, it may be useful to record the fact of its occurrence in Plymouth Sound. *Actinotrocha*, the larva of *Phoronis*, has been frequently taken here by means of the surface net (see Mr. Bourne's report, this Journal, N.S., vol. i, 1889, p. 9), but the adult animal was not observed until October last. While looking over some stones dredged near the Duke Rock, I was struck by the appearance of a number of delicate, membranous, sand-covered tubes, attached in crevices of some of the stones, and slightly projecting from the general surface. Upon placing these stones in a vessel of sea-water, the inhabitants of the tubes extruded the anterior portions of their bodies and displayed each the beautiful lophophore characteristic of *Phoronis*. The number of tentacles slightly exceeded sixty, and the lophophore was in all cases hippocrepian in form; there were no young individuals. The species was *Phoronis hippocrepia*, Str. Wright.

About the same time, Mr. Rupert Vallentin informed me that he

had found *Phoronis* in abundance at Falmouth, and kindly sent me several specimens. Mr. Vallentin's specimens closely agree with those taken at Plymouth and are undoubtedly of the same species.

Thus, *Phoronis hippocrepiæ* has been taken at the following parts of the British coast:—Ilfracombe (Strethill Wright), Tenby (Dyster), Sheerness (Shrubsole, species?), Millport (Kölliker), Falmouth (Vallentin), and at Plymouth. If *P. ovalis* is an immature condition of the same species, then the Firth of Forth must be added to this list.

The larva *Actinotrocha* is recorded from Plymouth (G. C. Bourne), Cromarty Firth (J. T. Cunningham), Arran (Herdman, Carpenter, and Claparède), Portobello (Spencer Cobbold), in and off the Firth of Forth (McIntosh).—WALTER GARSTANG.

5. **Oyster Culture in the River Yealm.**—With regard to the observations on oyster culture in the river Yealm, to which reference has been made in a previous number of the Journal, a report has been furnished by Dr. G. H. Fowler to Lord Revelstoke, who had generously placed the river at the disposal of the Association, and had provided a stock of parent oysters. As a result of these experiments it appeared that (1) as regards food, the river is well adapted for the production of a fat and well-flavoured oyster; (2) that the purity and salinity of the water are also favourable; (3) that a large part of the present bottom and sides of the river are unusually well-fitted for oyster farming, and a good deal of ground, at present unfit for the purpose, could be brought into cultivation without great trouble; (4) that the considerable movement of the water in ebb and flow is a less favourable factor in the problem, but is not so extensive as to nullify the other advantages of the river for oyster farming.

6. **Ray's Bream.**—On March 28th Mr. Dunn, of Mevagissey, sent to the Laboratory a specimen of Ray's bream, *Brama Raiti*, Bl. Schn. It was 50·4 c.m. in length and in a quite fresh uninjured condition. Mr. Dunn stated that it was seen swimming at the surface of the water off the beach at Portseathoe near Falmouth, and was captured with a gaff. This fish is rarely taken, and its normal habits are not well known. The occasional specimens which have been taken have been thrown up on the shore after storms, or found in an exhausted condition in shallow water. It has occurred on various parts of the British and Irish coasts. The last specimen found on the south coast was captured on June 12th, 1875, near Penzance, and is recorded by Mr. Cornish in the *Zoologist* for that year.—J. T. C.