

## BIOLOGICAL OBSERVATIONS ON AND INSTANCES OF COMMENSALISM OF AN OPHIOID FISH WITH ECHINODERMS OF THE ANDAMAN ISLANDS.

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“The term Commensalism”, as has been rightly remarked by Alcock,<sup>1</sup> “has been used with a certain amount of laxity to cover everything from the almost chance occurrence to the fixed and constant association for mutual benefit” that subsists among animals. The case of a *Carapus* (= *Fierasfer*), an eel-like Ophioid fish (Fig. 1) or of any other non-parasitic fish or animal lodging inside or living in close association with echinoderms or other animals is one in which the former seeks convenient shelter, protection, or transport, etc., by the latter. Such a partnership is one-sided, the lodger alone being benefited, and the association is tolerated by the host concerned, to whom no apparent service nor, as is the case in parasitism, any definite harm is done. Such associations of various kinds of young and adult fishes with fishes, sponges, corals, coelenterates, fresh-water mussels, pearl-oysters, tunicates, echinoderms, ascidians, etc., are more or less common phenomena, and the intimate association of different species of *Carapus* with holothurians of the genera *Holothuria*, *Stichopus*, etc., is well known in the warmer seas. But the cases of *Carapus* living inside a sea-urchin or in close association with a star-fish (Asteroid)<sup>2</sup> are not so common.

Bleeker<sup>3</sup> reported *Carapus brandesii* (Bleek.) and *Carapus lumbrioides* (Bleek.) from the stomachal cavity of a sea-urchin, *Culcita discoidea* Agas. Doleschall<sup>4</sup> found *Carapus gracilis* (Bleek.) in the same species of echinoid. Sarasin and Sarasin<sup>5</sup> reported cases of external association of an unnamed fish and an echinoid. Such associations of fishes with star-fishes are still rarer. Recently a case of *Carapus sagamianus* and a star-fish, *Nardoa semiregularis* var. *japonica* von Martens has been reported by Yosii<sup>6</sup> from Japan.

While working at Port Blair, Andaman Islands, in 1930, in connection with the shell-fisheries I had occasion to collect large numbers of holothurians and echinoids which abound at varying depths on the rocky ledges round about the islands. During the course of my work on board the Japanese shell-fishing boats, between March and May

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<sup>1</sup> Alcock, A. W.—“Zoological Gleanings from the Royal Indian Marine Survey Ship ‘Investigator’”, *Scientific Memoirs by Medical Officers of the Army of India*, XII, pp. 35-76, 1901.

<sup>2</sup> It is often misleading to refer to an echinoid as a *star-fish* or a “zeestern”, as most authors have done; the asteroids alone are the *star-fishes*.

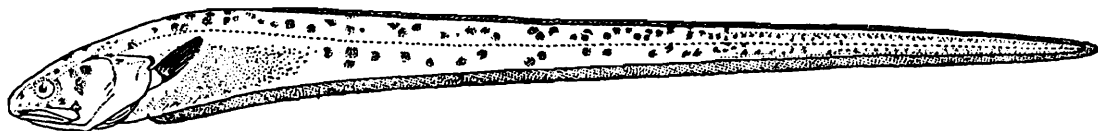
<sup>3</sup> Bleeker, P.—“Iets over Visschen levende in Zeesterren, en over eene nieuwe soort van *Oxybeles*.” *Natur. Tijds. Neder. Ind.*, VII, pp. 162-163, 1854.

<sup>4</sup> Doleschall, C. L.—“On *Oxybeles gracilis* Bleek.” *Natur. Tijds. Neder. Ind.*, XV, pp. 163-168, 1858.

<sup>5</sup> Sarasin, C. F. and Sarasin, P. B.—“Über einen Lederigel aus dem Hafen von Trincomalie (Ceylon) und seinen Giftapparat.” *Zool. Anz.* (9), pp. 80-82, 1886.

<sup>6</sup> Yosii, N.—“Note on a *Carapus* in a star-fish.” *Annot. Zool. Japon.*, II, No. 4, pp. 339-340, I fig., 1928.

I dissected a series of these animals and found not only a few specimens of *Carapus homei* Rich. of different sizes in the cloaca and inside the intestinal canal of *Actinopyga ? mauritiana* (Quoy & Gaimard), a species of holothurian, but also a specimen of the same fish in the body-cavity of a fairly large echinoid, *Culcita discoidea* Agas., captured off



TEXT-FIG. 1.—*Carapus homei* Rich. from the body-cavity of *Culcita discoidea* Agas.,  $\times ca 1\frac{1}{2}$ .

the coasts of the Cinque Islands at a depth varying from four to eight fathoms. Quite a number of interesting crabs and other crustaceans etc. were also found by me in the cloaca of the holothurians. A report on these crabs has recently been published by Dr. B. Chopra,<sup>1</sup> and in this note I propose to record my observations on the habits of the commensal fish *Carapus homei* in respect of the hosts.

It has been observed by many naturalists that a *Carapus* takes shelter in the cloacal chamber of various kinds of holothurians where it "spends most of its time"<sup>2</sup> and comes out at times to feed and again retires to shelter. Anderson<sup>3</sup> who made some observations on living specimens of the fish and its host in the Cocos Islands, hinted that the fish enters the holothurians by inserting the tail first, while recent authors like Kyle<sup>4</sup> and others state that the fish inserts either the tail or the head first into the cloacal chamber. My observations in the field corroborate the latter view, but they are at variance with the prevailing idea that the fish takes shelter and rests exclusively in the cloacal chamber.

On dissecting a series of common holothurians of the Andaman waters of the genus *Actinopyga* I found living specimens of *Carapus homei* in the cloaca, as also in different parts of the alimentary canal of the host, either resting quietly or wriggling sluggishly upwards or downwards by the movements of the head or the tail. This indicates clearly that the fish not only spends most of its time within the cloaca of the holothurian, but can also pass further along the entire looping of the intestinal canal of its host. Occasionally the fish even enters the respiratory tree of the holothurian, as is clearly evident from a specimen found in the Andamans by Dr. S. B. Setna; the fish was lodged in the lower portion of the respiratory tree of a living specimen. Dr. Setna preserved the specimen *in situ* and brought it back for the collection of the Zoological Survey of India. The fish is about 140 mm. long, rather tightly rammed into the respiratory stem, through the thin membrane of which it is visible.

I kept several specimens of holothurians in buckets of fresh seawater and in one instance found two specimens of *Carapus homei*

<sup>1</sup> Chopra, B.—"On some Decapod Crustacea found in the cloaca of Holothurians." *Rec. Ind. Mus.*, XXXIII, pp. 303-324, pl. vii, 1931.

<sup>2</sup> Borradaile, L. A.—"The Animal its Environment", London, 1923.

<sup>3</sup> Anderson, A. J.—"A few Remarks concerning a Parasitic Fish found in the Holothuria of the Cocos Islands." *Natur. Tijd. Neder. Ind.*, XX, pp. 253-256, 1859.

<sup>4</sup> Kyle, H. M.—"The Biology of Fishes", London, 1926.

suddenly darting out, one after the other, through the anal opening of a fairly large sea-cucumber. Coming out of their shelter, they swam rather sluggishly over and around the holothurians and occasionally rested quietly on the back of the one or the other. The holothurians did not show any definite signs of irritation or uneasiness except for slowly and imperceptibly changing their shape and the contour of the body. After some time, however, the fishes became more active than before and started pecking from time to time at different parts and more often at both the anterior and posterior extremities of the different trepangs and eventually one of the two inserted its tail into the anal aperture of one of the holothurians, other than its original host. The fish glided backwards and inwards rather quickly into the cloacal chamber, and kept only the portion of its head and neck outside for a short while, finally disappearing completely inside the host. The latter remained as unconcerned as before. The second fish continued its usual pastime, *viz.*, swimming, resting and occasionally pecking at different parts of the trepangs, but did not enter into any.

The trepang containing the first fish was removed into a separate bucket of sea-water and the two buckets were left over night on the open deck of the fishing boat. Early next morning the second fish was found to have disappeared and the first one that had entered its host on the previous day came out several hours later, presumably through the anal opening. Turning my attention to the contents of the second bucket, I found that one of the holothurians had discharged its visceral contents; and a specimen of *Carapus homei* was swimming freely. To ascertain whether that was the second fish of the previous day or a third one, I dissected all the holothurians I had in the second bucket, but did not find a single fish in any of them. This showed definitely that the fish before me was the second one of my collection which had entered into one of the holothurians apparently sometime during the previous night. Whether the fish had entered the trepang which had just thrown out its visceral contents was difficult to ascertain.

On removing the upper half of a large specimen of a sea-urchin, *Culcita discoidea* Agas., a specimen of *Carapus homei*, about 68 mm. long, was found wriggling in the fluid of the body-cavity. It was apparent that the fish had entered the intestinal canal of the echinoid through the mouth. While cutting the shell, the alimentary canal of the sea-urchin got damaged and, presumably, the fish was thus liberated into the body-cavity of the echinoid. There is no other possibility of a fish entering the body-cavity of an echinoid, unless it pierces through the membrane of the alimentary canal, which seems very unlikely. I kept this specimen in the body-fluid of its host for about half an hour and ultimately it was transferred to a basin of sea-water, where it lived for nearly three hours. I dissected quite a large number of sea-urchins but did not find any more fishes.

All the specimens of *Carapus homei* referred to in the above note are preserved in the collection of the Zoological Survey of India, Indian Museum, Calcutta.