

FISHES THAT TAKE ABODE WITHIN OTHER ANIMALS

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One of the most interesting subjects in the realm of nature is the association of one creature with another in varying degrees of dependence. All these relations fit into the general heading of "symbiosis" (living together). There is the association called parasitism (derived from the Greek word



COMMENSALISM

An association between a sucking fish, *Echeneis*, and a tiger shark. Part of the Bahamas group in Hall of Fishes (Hall O).

"para," meaning beside, plus "sitos," meaning food), in which one creature lives on or in another organism from which it directly gets nourishment; mutualism (from the Latin word "mutuus," meaning exchange), in which two different organisms live in association, each gaining benefit from the other; commensalism (derived from the Latin root "com-," together, plus "mensa," table), for animals eating at the same table, usually with a larger host; and inquilinism (derived from the Latin word "inquilinus," meaning dweller in another place), in which one creature lives in the abode of another without benefit to the host or even within the body of a host without injury to it. These different types of associations are found among the fishes, both with each other and with other animals.

A parasitic association exists in the case of the small South American catfish *Stegophilus insidiosus*, which is known to live in the gill cavity of its large relative, the loango, *Pseudoplatystoma coruscans*. At first the small catfishes were mistaken for the young of the loango, which it was thought were being carried in its mouth; later they were interpreted as mess-mates living on small organisms drawn into the mouth of the large fish. Later discovery attests that the catfish is a true parasite, living among the gills of its host and feeding on its lifeblood. Other species of the same family are now known to have similar habits.

AT HOME IN TENTACLES

An association of mutualism is found between several species of brilliantly colored

damsel fishes of the genus *Amphiprion*, family Pomacentridae, and the large brightly colored sea anemones. Instead of occupying a hole or cranny like the other members of the family, these damsel fishes have a living house, a house so protected that no foe dares attack them when they enter the flower-like portal of their strange abode. This living home is within the tentacles of

large sea anemones of the genera *Stoichactes* and *Discosoma*. Anemones of this kind are widely distributed in the Indo-Pacific region. Their tentacles are equipped with hundreds of deadly stinging organs that paralyze any organisms, including fishes, that come too close. How the damsel fishes escape death or injury from these myriad stinging organs remains a mystery. Some authorities believe that they must

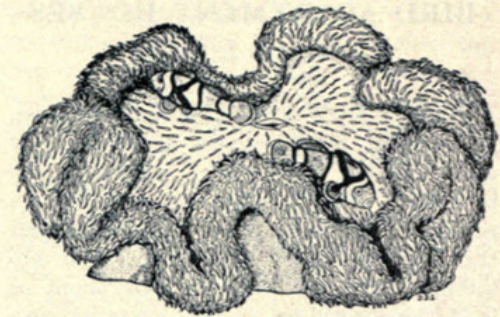
be immune to the nettle-cell venom.

All the species of *Amphiprion* inhabit sea anemones and dwell with them in mutual relation. At least six species are known to live in as many species of anemones. A male and female damsel fish usually take up residence in a sea anemone. Both parents care for the eggs usually laid near the base of their host. After hatching, the young damsel fishes rise to the surface and have a period of planktonic life, after which they descend to the bottom in search of a home for themselves. When not enough homes are available, several fishes are found in a single host. As many as seven damsel fishes, ranging in length from 10 mm. to 100 mm.



MUTUALISM

An association between the man-o'-war fish, *Nomeus*, and the Portuguese man-o'-war fish, *Physalia*. Courtesy American Museum of Natural History in New York City.



EXTREME MUTUALISM

An association between the damsel fish, *Amphiprion*, and the sea anemone, *Discosoma*. Courtesy of D. Van Nostrand Co., Inc.—from "The Ways of Fishes" by L. P. Schulz and E. M. Stern, of U. S. National Museum.

have been found in a single sea anemone. The damsel fishes recognize the species of sea anemone normally utilized and disregard others.

BRING FOOD TO HOST

Extensive series of experiments with these damsel fishes and sea anemones were carried out at the Silliman Institute in the Philippines. For observation an anemone of the type frequented by damsel fishes, specimens of *Amphiprion* of the right species, and other small fishes of similar sizes were placed in an aquarium with shrimps and other tidbits. A marked difference in the behavior of the damsel fishes and that of the other fishes was observed. The latter seized a fragment of food and scurried away to some nook to eat it in safety. Upon devouring one morsel they returned for more. On the other hand, the damsel fishes darted upon the food, seized a mouthful, and dropped it among the tentacles of the sea anemone. They returned for other bits, which in turn were quickly placed in storage. When the food was exhausted, the damsel fishes entered the charmed circle of stinging tentacles and feasted at their leisure. Thus, the sea anemone and damsel fishes were both abundantly fed.

The shrimps and other small fishes wandering too close to the tentacles were promptly killed, but when a damsel fish darted among the tentacles they curled away from the dauntless tenant. Damsel fishes are feeble swimmers, never venturing more than a short distance from their home and fleeing to the safety and seclusion of the tentacles when alarmed. Sometimes the damsel fishes bite off a mouthful of tentacles or feed upon the mucus or buds of the tentacles. Dutch investigators at Batavia, Java, found that the damsel fishes help the sea anemones by carrying away rejected food and waste matters, by circulating water, and by rubbing over ailing parts of the anemone.

Another curious association of mutualism is found between the Portuguese man-o'-war, a floating jelly-fish of the genus *Physalia*, and the beautiful man-o'-war fish of the

genus *Nomeus*. The man-o'-war fish, a few inches long, seeks shelter among the deadly tentacles of the *Physalia*, which, like the sea anemone, possesses hundreds of deadly stinging organs, called nematocysts, by means of which it paralyzes its victims. These beautiful fishes are similar in color to the jelly-fish, with cross bars of purplish color. The man-o'-war fish is thought to possess some immunity to the poisonous organs, and in return for this protection probably lures other fishes to destruction.

ADHESIVE HITCHHIKERS

The relation of commensalism is found between the remoras or sucking fishes, of the family Echeneidae, and the sharks. The sucking fishes are remarkable for the possession of an oval adhesive disc placed on the broad flat upper surface of the head. With these discs the sucking fishes attach themselves to the bodies of sharks, mantas, barracudas, swordfishes, whales, turtles, or even to bottoms of ships. In this way they are not only protected from their enemies but also are transported to new feeding grounds. Once among a shoal of fishes they soon detach themselves and swim actively about in pursuit of prey, seeking a fresh anchorage when their appetites have been satisfied. When the host is feeding on some other animal, the sucking fishes may obtain some of the fragments floating in the water. The young of these fishes are known to take refuge frequently in the mouth and gill chamber of their host. It seems the sharks pay little or no attention to the young hitchhikers and so far no remains of sucking fishes have been found in their stomachs. Remoras are shown in their regular association with sharks in the Museum's underwater Bahama group (Hall O).

An association of inquilinism is found between the young squirrel hake (a relative of the cod fish), *Urophycis chuss*, about 2 to 6 inches in length, and the giant scallop, *Pecten magellanicus*. The young squirrel hake seeks shelter within the shell of the scallop. The sea snail, *Liparis lineatus*, a tadpole-like fish with a sucking disc, takes refuge in the shell of the large scallop, *Pecten tenuicostatus*. In the West Indies a little cardinal fish, *Astrapogon stellatus*, has a curious association with a large sea snail, a conch, *Strombus gigas*. The cardinal fish seeks shelter and safety in the mantle cavity of its large host. These fishes are generally found with their snail hosts in waters from two to five meters in depth. Another example is a goby, a little fish whose pelvic fins are modified into a funnel-shaped disc, that often lives within the shells of oysters, other bivalves, conches, and sponges. These associations show a one-sided benefit with no apparent benefit to the host.

Among the strangest of all relations is that found between the pearlfishes, *Carapus*, a small eel-shaped fish a few inches in length, and the sea cucumbers of the genus *Holo-*

thuria, a relative of the starfish and the sea urchin. The pearlfish spends most of its time in the cloaca and the alimentary canal of the sea cucumber, sometimes entering the loop of the intestinal canal and occasionally the respiratory tree. By wiggling its body, the pearlfish enters its host either head or tail first. Sea cucumbers living in deeper waters may contain as many as seven pearlfishes. Often the same fish seeks shelter within the mantle cavity of the pearl oyster, an association that sometimes proves fatal to the pearlfish, for it occasionally becomes imprisoned by the oyster and its body sealed up in layers of mother-of-pearl. Pearlfishes are also found to seek shelter within large specimens of sea urchins and starfishes. This association seems to be a one-sided affair; the pearlfish receives shelter from the sea cucumber and apparently gives no benefit in return.

APRIL LECTURE TOURS, DAILY EXCEPT SUNDAY

Tours of exhibits, under the guidance of staff lecturers, are conducted every afternoon at 2 o'clock, except Sundays and certain holidays. On Mondays, Tuesdays, Thursdays, and Saturdays, general tours are given covering all departments. Special subjects are offered on Wednesdays and Fridays. A schedule of these follows:

Wed., April 4—Nature Magic: Disappearing Acts and Deceptive Devices (*Harriet Smith*).

Fri., April 6—The Story of the Dunes. Illustrated introduction in Meeting Room (*Marie Svoboda*).

Wed., April 11—Animals in Art (*Jane Sharpe*).

Fri., April 13—Gilding the Lily: Make-up and Related Ornamentation by Primitive Peoples. Illustrated introduction in Meeting Room (*Harriet Smith*).

Wed., April 18—Killers: Animal, Vegetable, and Mineral (*Anne Stromquist*).

Fri., April 20—Sights and Sounds of Spring: Flowers, Birds, Frogs, etc. Illustrated introduction in Meeting Room (*Miriam Wood*).

Wed., April 25—Natural History Facts and Fallacies (*Lorain Farmer*).

Fri., April 27—Animal Pets of Other Countries. Illustrated introduction in Meeting Room (*June Buchwald*).

Official Visitor from Japan

Hiroto Honda, secretary general of the Science Council of Japan and Japan Academy, visited the Department of Anthropology in March. Mr. Honda was sent to this country to make a study of various scientific institutions in the United States and to find out how much integration there is between the sciences and daily life.

Books

(All books reviewed in the BULLETIN are available in The Book Shop of the Museum. Mail orders accompanied by remittance including an allowance for postage are promptly filled.)

THE FRESH-WATER ALGAE OF THE UNITED STATES. Second Edition. By Gilbert M. Smith. McGraw-Hill, New York, 1950. viii+720 pages, 559 text figures. Price \$10.

Perhaps nothing has given greater impetus to the study of fresh-water algae of this country than the original issue of this book in 1933. Now an enlarged and considerably revised edition has appeared. Some general information has been added to the three introductory chapters. Many more genera have been introduced as the author has considered the published reports of them to be reliable. The conspicuous difference between the two editions, as pointed out in the preface, is the omission here of descriptions of species in the smaller genera. This may be in the interest of saving space, but it seems to me that the result is the omission of a great deal of information about the algae that is henceforth available to the student only when he consults the first edition. With only the genera treated in detail, the new edition will be found useful primarily as a textbook for the classroom, containing a larger quantity of information than is to be found in the same author's *Cryptogamic Botany*, Volume I (1938).

The various groups of algae are here treated as divisions of the plant kingdom rather than as classes, as they were in the first edition. The key to genera has been enlarged, and many references have been added to the bibliography. The illustrations are excellent.

The text is well printed except for a number of pages (in the copy made available to me by the publishers) in the Division Chlorophyta. Certain errors in spelling (like *Chlorotylum cataractum* instead of *C. cataractarum*) have been carried over from the first edition; others (like *Phorphyrosiphon* instead of *Porphyrosiphon*) are here first introduced. Dr. Smith has included many generic names published since 1935 without benefit of Latin descriptions. Since these names are illegitimate according to the international rules of nomenclature, it seems to me unfair that the unsuspecting beginning student should be initiated into a new field of science in terminology condemned by the International Botanical Congresses.

FRANCIS DROUET
Curator of Cryptogamic Botany



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Bulletin 22(4), 6–7.

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