BIOLOGY

Wanted: Poisonous Fish

A unique "fishing expedition" has begun a hunt for venomous and poisonous fish. A whole new arsenal of drugs may be squeezed out of deadly fish chemicals.

By RALPH SEGMAN

A YOUNG AUSTRIAN zoologist was skin-diving about 200 yards off the Port of St. Angelo, near Naples. At a depth of 18 feet, he observed a weever fish reclining on the sea bed with a cover of mud half drawn over itself.

The diver carefully poked the fish, which for a moment appeared undisturbed. Suddenly, it wriggled away snake-like through the sand and quickly turned, facing the diver, its venomous needle-point fins vibrating aggressively. Before the man was able to get away, the weever darted at him, striking his face mask, then his jaw.

The pain soon started and grew in intensity, and the diver was barely able to reach the shore. By the time a physician arrived, the victim was begging to be killed. Morphine was no help. The upper part of the man's body was swollen and each breath and swallow produced a stab of pain. Ten days after the attack the man left the hospital fully recovered, fortunate indeed that the fish had not delivered a lethal dose of venom.

Drugs From Fish

The weever and 300 or more other venomous and poisonous fish in the world's waters can hardly be listed among man's better friends. Some day they may be. They soon may be meticulously bred and raised to produce useful medicines.

These fish represent a sizable potential source of new drugs that, until now, almost nobody has done anything about. And even now, while many researchers are busily screening thousands of chemicals and antibiotic broths, a few scientists have just begun to investigate the medical possibilities in marine animals.

Foremost in the new field is Dr. Bruce W. Halstead, director of the World Life Research Institute near Colton, Calif. The 39-year-old physician-zoologist organized the Institute less than a year ago for the single purpose of screening and investigating poisons and venoms, especially of marine animals.

"It is a rather small organization despite its imposing name," said Dr. Halstead, the Institute's only scientist at present. He hopes its meager resources will some day be enhanced enough, through outside help, to provide for another four or five scientists.

Why is Dr. Halstead willing to embark alone and unsupported on his ambitious "fishing expedition?" Primarily, it is because he is confident that the investigations will bring meaningful results.

Curare, the lethal concoction in which some South American Indians dipped their arrows when they wished to paralyze their foes or game, is a classic example of a useful poison. Introduced to the medical profession in the 1930's, it is injected in minute amounts as a muscle relaxant in surgery and in treating polio and lockjaw victims.

Belladonna, a plant that poisoned the Roman armies under Mark Antony, contains chemicals for relaxing stomach spasms and dilating pupils. A hemorrhage-controlling drug is extracted from ergot, a villainous fungus responsible for several medieval epidemics, one of which killed 40,000 Europeans.

Some reports already exist on marine venoms, which are injected through stings, and poisons, which are present in the flesh. A University of Pennsylvania group under Dr. L. V. Heilbrunn has a sea cucumber poison under evaluation for cancer therapy. The substance has antimitotic properties; that is, it blocks some of the processes in cell division.

Puffer poison, lethal in six out of ten people who eat the fish, contains chemicals exhibiting a number of beneficial effects in humans when used in strictly controlled amounts. This poison can slow down the heart beat, inhibit blood clotting, and interfere with cell division. The Japanese have treated some diseases with puffer poison. They have used it to relieve pain and muscle spasms and to ease the last agonizing days for cancer victims. However, it is not regarded as a proven drug by Dr. Halstead, who wants it to be properly and scientifically evaluated.

Fish and Physiology

Other scientists have reported that toadfish venom may be of value in diabetes; that sting ray venom inhibits the heart beat; and that stonefish and weever fish venoms, which destroy some blood components, may be useful in the laboratory.

There is not much more information available than that cited in the foregoing examples. Generally, about all that is known about marine poisons and venoms is the names of the fish they come from and the clinical symptoms they produce in humans. Their chemistry and pharmacology are almost completely unknown.

Dr. Halstead has a recently published book, "Dangerous Marine Animals," describing more than 140 venomous and poisonous fish. No antidote has been developed for human victims. Only in the case of sea snake venom is there a treatment resembling an antidote; it was developed for the krait, a land snake. Because of this lack of knowledge, Dr. Halstead states:

"In viewing the field of marine biotoxicology one is awed by the enormity of the potential, the existing scientific ignorance, and relative neglect that has been displayed toward the subject. In his never-ending quest for life-sustaining substances man must continue to look toward the sea."

And, in some preliminary looking, man has indeed seen fascinating things.

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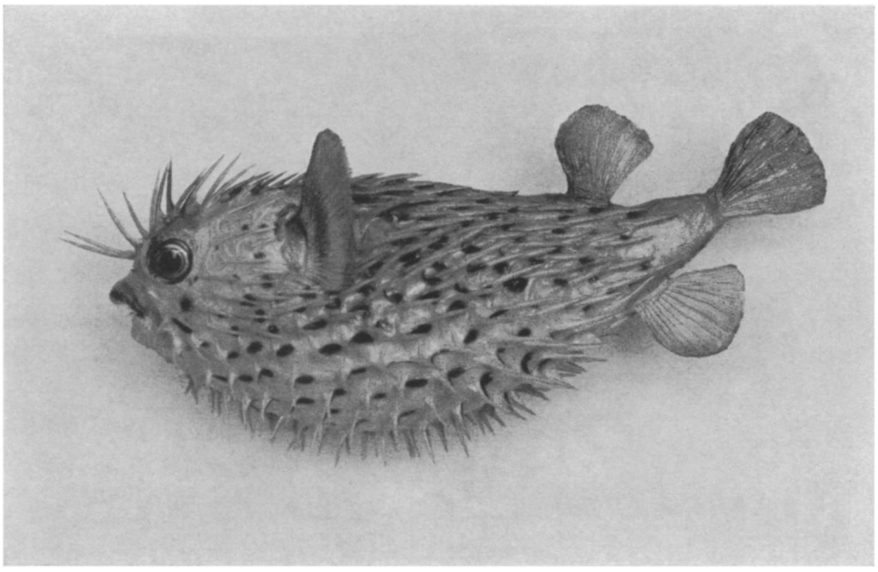

***DEADLY PORCUPINE FISH**—This round prickly ocean clown, which habitually inflates itself to a ridiculous size, is far from laughable. Containing the second most violent poison known, it is one of 90 or so species of the deadly puffer-like fish.*

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Some species of sea snake possess venom reputed to be 50 times more potent than that of the king cobra. Fortunately, most sea snakes, which inhabit coastal waters of the Pacific and Indian Oceans, have a poorly developed venom apparatus and are docile in nature.

Puffer-like fish have an amusing characteristic of inflating themselves to ridiculous size and making a grinding racket with their teeth as they gulp air or water. Not so amusing is puffer poison. It is thought to be the second most violent biotoxin known, exceeded only by the toxin of the bacterium that causes botulism.

As deadly as it is, the puffer commands the highest prices in Japan as a food fish. The fugu, as it is called, is prepared in special restaurants by licensed puffer chefs trained to discard the poisonous organs. The only way of inactivating the poison when the organs are not removed is by cooking the meat in a strong solution of sodium bicarbonate, a treatment that can ruin the fish for consumption in a restaurant.

Most jellyfish produce stings varying in intensity from hardly noticeable to quite irritating. However, one species known as the sea wasp is the most venomous sea animal known. Sea wasp venom can destroy a man in three to eight minutes.

Variable Poisons

One of the great mysteries concerning poison fish is that a particular species may be perfectly edible in one area and deadly in another. Or a type of fish a person has eaten hundreds of times may suddenly turn violently poisonous, as happened recently in a small Japanese town on Minamata Bay. Many of the townfolk subsisted on fish they caught in the bay.

In 1953, a strange nerve illness began affecting the people, and by 1956 it had become an epidemic. One-third of the people stricken died. Dogs, cats, pigs and crows eating the fish also died. No one is certain how the fish became poisonous. There is some conjecture that the blame may be leveled at a nearby fertilizer plant that discharged wastes into the bay. Or it might have come about through a slight change in the eating habits of one species of bay inhabitant. Becoming poison bearers, perhaps because of a chemical change in their bodies, they might have been eaten by other fish, which were eaten by still others, until most of the bay life turned poisonous.

The entire subject of poisonous and venomous marine life is one to be investigated now and in the future by medical researchers. And the subject must be considered more than just a public health problem. As Dr. Halstead points out:

"There is an ever-increasing amount of scientific evidence that these noxious organisms and their poisons may serve as sources of the life-giving antibiotics, anti-cancer, and other indispensable therapeutic agents of tomorrow."