**Editor's Note:** Loren P. Woods, Curator of Fishes, recently spent six weeks in Hawaii as a member of a marine study trip sponsored by the Shedd Aquarium and led by Mr. William P. Braker, the Aquarium's Assistant Director. Nearly two hundred varieties of fishes were collected on the trip, many of which had never before been included in the Museum's research collections. In this series of brief sketches Mr. Woods describes the different fishing techniques used by the expedition in obtaining these important specimens.

# Fish Collecting in Hawaii

THERE are about 450 species of fishes around the Hawaiian Islands living in depths to one hundred feet. Some of these fishes are abundant and conspicuous; others hide and are seldom, if ever, seen or taken by conventional fishing methods. The ancient Hawaiians knew the exact habitat and something of the habits of the many kinds of fishes living in their reefs, and had devised a number of ingenious methods for capturing them. Decoys were used to lure fishes that were especially pugnacious or curious. A variety of bag nets, dip nets, weirs, and traps were manipulated or set to intercept fishes known to move over a particular place. The use of torch lights, throw nets, nooses, spears, and poison—made by pounding a poisonous weed mixed with sand, so it would sink—procured fishes that were not easily taken by other methods. Hand fishing produced octopuses, shellfish, and spiny lobsters, while hook-and-line fishing was used for the larger offshore fishes. Another method was to block off shallow bays by building walls of coral or lava boulders. The resulting ponds could be opened to the sea at high tide, when the fish moved inshore, and then closed, trapping the fish so they could be fattened or held until needed.

Taking these methods as our precedent, we employed whatever techniques would produce the variety of fishes desired by both the Aquarium and the Museum for their collections.

### The Rocky Fill at Kewalo

The promontory enclosing Kewalo Basin, on which the U. S. Fish and Wildlife Laboratory is located, is protected by a riprap of irregular, large, cindery, lava blocks. These blocks make a shelf, just exposed at low tide and densely covered with a vine-like brown seaweed. A bizarre scorpion fish lives here, the same color as the weeds and so secure in its camouflage that it could be captured by pinching its high fin, as one would pick a butterfly off a flower. Spiny puffers were caught in a dip net by locating the hole in which they were hiding, placing the net in a strategic position and giving the fish a gentle (because of the spines) nudge with the other hand.

By far the most successful method of catching the colorful butterfly fishes, damsel fishes, tangs, and eels, as well as the blue and white polka dot boxfish, variegated wrasses and bright red and white striped squirrel fishes, is in a large wire trap. These traps are built like a quonset hut, with an opening at one end for fish to enter, and they are baited with broken china, since a dead fish bait at-

tracts too many moray eels. Many part time fishermen work similar traps in offshore waters eighty to a hundred feet deep. The traps are visited once or twice a week and to prevent their being robbed or stolen the buoys are underwater attached to an anchor rope and located by landmarks on shore. The most successful fishermen are those who are best at finding their hidden traps.

### Halona Tide Pools

The shelving projections of the rugged Halona coast area hold a great many elongated shallow splash pools above high tide level. Here live the large active rock skippers. Rock skippers are blennies with high dorsal fins, long caudal fin, and roving habits. Though more active at night, they have no hesitation about leaving the water and skipping across the brown lava rocks, even during the middle of the day when these rocks are dry and heated by the sun. Often when we approached the pools several rock skippers would emerge and flip away over the edge of the cliffs into the foaming surf ten to fifteen feet below.

We soon learned to approach carefully and to cut off their escape route to the sea by means of a one-man net with a long funnel that looks to a trapped fish like a hole through which it may escape. If, instead of making a dash for the sea, the rock skippers chose to hide in a hole in the rock or to wedge themselves under a ledge, one of us probed with coat-hanger wire to tickle them from their hiding places. Besides being fast, the fish were very clever at avoiding the nets, instantaneously seeing a crevice through which to escape or else jumping around the net. Even in the collecting bucket, they would scale the straight metal sides part way and jump out when the net cover was lifted.

### Trigger Fishes

The reef in Maunalua Bay is flat and fairly deep. In depths of twenty to thirty feet, scattered trigger fishes swim slowly around. A diver swimming after them can chase them into a hole where they lock themselves in by erecting their first dorsal spine. Then the diver can reach in, unlock the spine by depressing the second "trigger" spine and pull the fish out. Cautious divers look into the hole first before reaching in, for there might be a moray or sea urchin there.

### Coconut Island

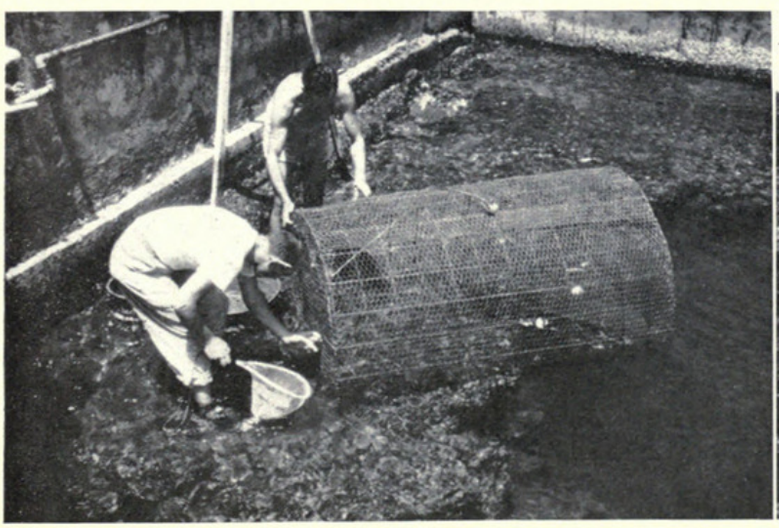
Coconut Island, on which the University of Hawaii Marine Laboratory is located, lies in Kaneohe Bay on the reef about a mile offshore. Reef fishes taken in traps for various purposes by the Laboratory collector are freed in artificial ponds. Though the ponds are relatively shallow with a mud bottom, sailfin tangs, moorish idols, sergeant-majors, and island perch flourish there. We borrowed a long seine from the Laboratory and spent the morning collecting these colorful fishes.

The Laboratory collector regularly operates traps and the majority of fish—butterflies, wrasses, file fish, lion fish, yellow tangs and unicorn fish—are kept in large square wire boxes suspended from a float in one of the lagoons. The fishes we collected that were not used for experimental purposes were transferred to the Aquarium tanks, being transported in the live well of one of the Laboratory skiffs. Those that died were preserved for the Museum collection.

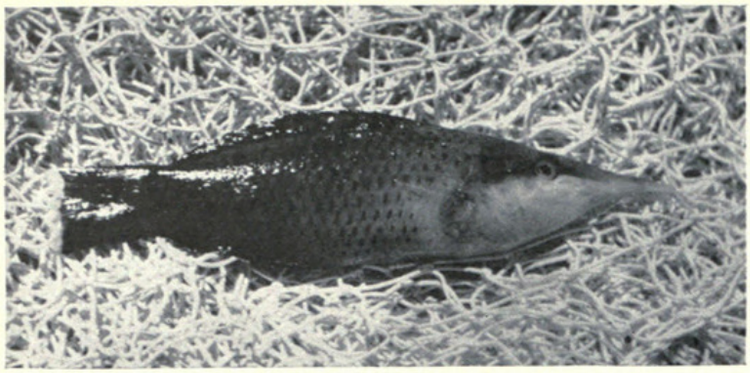
### Poisoning Tide Pools in Kahuku Point

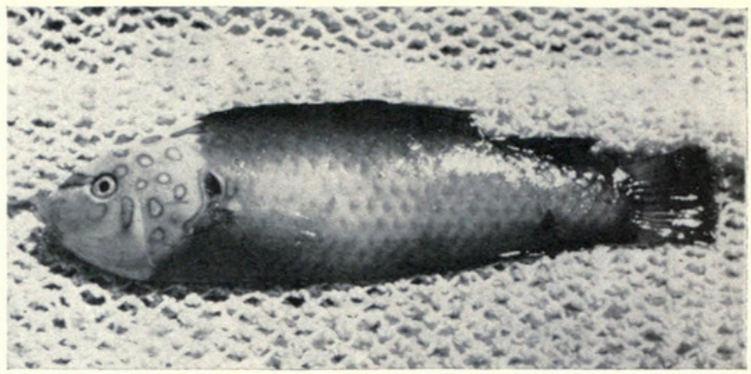
It is much easier to collect fishes if you don't need them alive. For example, the method that produces the greatest variety of fishes (often tiny secretive species that cannot be caught any other way) is to take them by means of a chemical. The chemical first produces an effect of asphyxiation, causing the fish to leave their hiding places and swim erratically. Many can be dipped up still alive, while dead ones can be found by carefully quartering back and forth among the rocks and seaweeds covering the bottom.

The day we chose for this work had a convenient low tide at eleven A.M. The place was Kahuku Point, the northern tip of Oahu. The most favorable circumstance was a rare lack of wind, so the surge was minimal. The resulting collecting operation was a complete success, yielding about eighty species for the Museum, including unusual morays, smaller yellow macaroni-shaped eels, as



Left: *Emptying quonset-shaped wire fish trap on the ledge at Kewalo Basin.* Right: *Using bag nets to catch rock skippers in splash pools on shelves above the high tide line off the Halona coast. Water for these pools is splashed in by the breaking surf in the background. The bag net prevents the agile rock skippers from escaping to another pool or into the sea.* Opposite page: *A biologist from the State of Hawaii Fish and Game Department prepares to leave the* Makua *to make underwater photographs in artificial reefs eighty to ninety feet below the surface. Note the boxed waterproof camera on deck at right.*





Above left: *A bird wrasse. The long beak is used for probing into branched coral in search of tiny crabs.*

Right: *Head of a parrot fish. The irregular, beak-like teeth are used to bite off bits of coral, which are then ground up by throat teeth. Such feeding habits by many kinds of animals are an important factor in wearing down reefs and producing coral sand.*

Above: *A rare deep water wrasse. This species was first described in 1958, and this is only the fourth known specimen to be collected. The head is gold with blue spots. These specialized wrasses have four chisel-shaped teeth that are not for biting but point straight forward.*

well as a variety of burrowing eels, gobies, blennies, and wrasses.

### Coral Fishes

On the reef several kinds of small fishes stay close to the dendritic corals, pressing close in the forks of the branches whenever danger threatens. They feel so safe here that a diver may lift the coral head, swim some distance with it and then hand it out of the water and into a tub before shaking the fishes out. The most abundant is a black damsel fish, the size and shape of a quarter with a white spot on the sides. There are also lemon-yellow tangs, red, brown and green scorpion fishes and their peculiar relatives, the velvety caracanthid, a chubby, snub-nosed fish covered with tiny bright red spots.

On the shallow reef flats, where the water is only two to three feet deep, the small fishes that habitually seek shelter in the coral can be caught by surrounding the coral cluster with a net. To find a cluster where fishes were numerous, the Chinese fisherman helping us filled a soft drink bottle with clear oil and water. Through the perforated cork of the bottle he shook a fine oil spray on the water, clearing the surface as though a large glass had been spread. After surrounding the coral with the net, the coral was broken up and discarded. The net was then pulled up with the fishes in the bag.

### The "Makua"

The Fish and Game Department of the State of Hawaii is working to improve fishing for both anglers and commercial fishermen. One part of this program is the construction, out of old car bodies, of artificial reefs on the extensive, relatively barren sand flats that occupy most of the offshore area between the living coral and the drop-off into deep water. In addition to building the reefs the program includes stocking them with snappers from the mainland and a colorful grouper from Tahiti and Samoa. The principal groups of predatory fishes around Hawaii are the pelagic tuna-like fishes, the pompano-jack family, and the large reef-dwelling morays. The introduced snappers and groupers fit into an unoccupied niche of bottom area too deep for morays and jacks.

The Department's key piece of equipment is the sixty-five foot motor vessel, the *Makua*. We joined the Department's staff on a two-day cruise, the main purpose of which was to go down eighty or ninety feet in aqualungs to try to find young of the introduced species in order to determine their success in spawning after being transported to this relatively colder environment. Small groupers were found, but no snappers. We profited by catching a variety of fishes that were saved alive in the wells of the *Makua* or placed in the freezer and on our return preserved for the Museum collection.

### Beyond the Reef

In addition to using more unorthodox methods of catching fish, we spent plenty of time angling over sandy bottom for purple-banded goat fishes and over reefs for the beautiful pink and black striped wrasse called "Hilu." On one occasion we went far beyond the reef in a fourteen-foot skiff with a five horsepower outboard motor. With four men on board, plus a live well full of fish and water, there was little freeboard, and the swells were ten to fifteen feet high. All was well, however, until the wind blew stronger and the waves began to break. We shipped gallons of water. There was nothing to do but bail while we carefully worked our way back into the lee of Mokapu Peninsula. In addition to being soaking wet and worried about how far we might have to swim, it was past lunch time, but no one felt much like eating because of the bouncing. Our elderly Chinese fisherman shook his head when we reached the relative safety of the lee and remarked that he had not thought we would make it. His fifty years of experience on Kaneohe Bay plus a smooth-purring outboard brought both fish and fishermen back to port that day.



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