

FISH COLLECTING ON COASTS OF GUIANAS AND BRAZIL

By LOREN P. WOODS
CURATOR OF FISHES

RECENTLY the author participated for the fifth time in an exploratory fishing cruise of the motor vessel *Oregon* of the United States Fish and Wildlife Service. Three of the previous cruises were in the Gulf of Mexico and one in the western Caribbean. Each resulted in large collections of fishes from offshore deep waters. Many of the species collected were not previously represented in our collection and have provided valuable research materials for our staff and for several ichthyologists in other institutions as well as for graduate students training to become ichthyologists.

On the fifth voyage, in November, 1957, the *Oregon* explored the South American



FISHING GROUNDS

Each spot on the map represents a trawling station on the recent cruise to the Guianas and Brazil of the motor vessel "Oregon."

continental shelf along the coasts of the Guianas and Brazil from off the mouth of the Orinoco River to the mouth of the Amazon. Over this vast distance an otter trawl with an opening 40 feet wide and 6 feet high was dragged at 5-fathom depth-intervals (see map) in depths ranging from 10 to 400 fathoms and from 20 miles off shore to the edge of the continental shelf, 50 to 75 miles from shore.

The fauna of the shelf of this section of South America had never been explored beyond a depth of 20 fathoms, and we made many noteworthy discoveries. In fact, only about one-third of the fish species collected were recorded as living along the coasts of the Guianas or Brazil while the remaining two-thirds were either extensions of range from the West Indian-Caribbean area or are undescribed species.

CURRENTS AND WINDS

The main equatorial current moves westward across the Atlantic just south of the equator and divides on approaching Cabo de São Roque, the easternmost projection of South America. One branch turns south to form the Brazil current and the other stronger branch, the Guiana current, flows northwest along the coasts of Brazil and the

Guianas where it combines with the north equatorial current and enters the Caribbean through deep channels between the islands of the Lesser Antilles. The Guiana current, moving past Brazil and the Guianas at a rate of more than 50 miles in 24 hours, is one of the strongest ocean currents around South America. Its waters and the life it contains are more affected by the outpourings of great rivers than those of any other ocean current in the world.

This region also lies in the path of the trade winds that blow strongly from the east and northeast and result in long even swells moving in a southwesterly direction. The mingling of trade-wind swells with waves accompanying the equatorial current results in very choppy seas that make difficult working conditions and at times uncomfortable sailing conditions. We did not get beyond the trade-wind belt into the region of equatorial calms, although usually the trade winds do not blow south of French Guiana. These fresh northeast winds tempered the sun's heat so that, although we were near the equator, the temperature was seldom above 90 degrees and dropped to 80 degrees at night.

The surface waters appeared to be relatively sterile if compared with waters over the shelf in the Caribbean or Central American coasts of the Pacific. Only one small school of small tunalike fishes was observed. There were very few flying fishes, Portuguese man-o'-war, porpoises, or birds. Only an occasional tern, jaeger, or petrel was seen. Boobies and tropic birds frequently seen in the Caribbean do not live on these coasts. Dr. Robert Cushman Murphy, Research Associate in Oceanic Birds at the American Museum of Natural History in New York, who has written about the sea birds of South America, has stressed the importance of vast areas of the sea made turbid by the tre-

can. He gives as explanation that "in this turbid water there are either no schooling fish in numbers sufficient to support a population of pelicans, or else the water itself is so opaque that the pelicans are unable to see their prey."

FRESH WATER ON SEA SURFACE

Most authors in describing conditions in this area have mentioned the low-lying muddy coasts, the extensive patches of silty and stained fresh water, the mangrove swamps, the estuarine and inshore fauna. Our work was carried on far enough offshore so these turbid-water conditions were encountered on only two occasions. November is at the end of the low-water stage

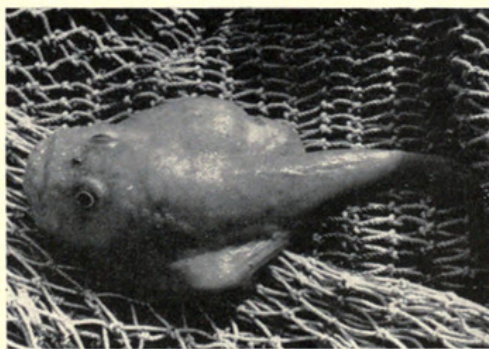


GOOD CATCH

A pelagic (open seas) lancet fish is displayed by Harvey R. Bullis, Jr., Chief of Gulf Fisheries Exploration and Gear Research aboard the "Oregon."

of the rivers or at the beginning of the rising waters so their volume apparently was not sufficient to overcome the waters of the Guiana current.

In describing their approach to one of the mouths of the Amazon, usually the Para River, many travelers have mentioned the discolored (brown or greenish-brown) water and the fact that the open sea is quite fresh a long distance from the shore. On the *Oregon* we encountered some discolored water about 40 miles offshore of French Guiana. This water tasted slightly brackish. However, the water near the bottom in 25 to 40 fathoms was certainly undiluted sea-water because the fresh water, being lighter, floats on top of the salt. The fishes trawled on the bottom here were all typical sea-fishes with one exception. This exception was a small banjo-catfish, *Aspredo*, that is widely distributed in the rivers of the Guianas and northern Brazil, including the



QUEER SPECIMEN

A deep-water angler-fish named *Chaunax*. It is pink. It fills its gill pouches with water and blows itself up. The contrasting fleshy "bait" between its eyes is used to lure other fishes on which it preys.

mendous discharge of the numerous rivers of this section of coast as a limiting factor in the distribution of such birds as the peli-

Amazon. Although *Aspredo* is known to live in river mouths, it apparently has never been collected in offshore waters before.

ABUNDANCE OF FISHES

Fishes were abundant everywhere but in the deeper waters, 200 to 400 fathoms, and in the shallower waters about 10 to 20 fathoms they were more abundant than in the intermediate depths. One of the constant difficulties in trawling in a new region is to find a bottom sufficiently free from ridges and valleys or from rocky or coral reefs that the trawl may be dragged several miles without being torn.

There are no coral reefs near the shore where conditions of silt and fresh waters combine to make conditions unfavorable for coral, but offshore where the shelf waters are still relatively shallow yet beyond the range of these two limiting factors there are patches of coral reef and patches of gorgonians and sponges flourishing in the clear, warm, saline Guiana current. Fishes trawled here were typical coral-reef fishes such as wrasses, tangs, demoiselles, parrotfishes, and butterfly fishes. There were also many invertebrates of kinds usually associated with corals.

In the middle depths, by far the most extensive type of bottom was fine sand. Here were snappers, grunts, goatfish, several kinds of small sea-basses, lizard fish, sea robins, scorpion fishes, eels, and many more kinds. In these areas beds of shrimp were discovered, often in quantity sufficient for commercial fishing.

As might be expected in the shallowest areas (10 to 25 fathoms) nearer shore the bottom was often of mud although even here some rock outcrops were encountered off French Guiana. Even here as offshore the bottom was predominately sandy. In these relatively shallow waters we caught five or six kinds of sea catfishes as well as the *Aspredo* mentioned above, and as many kinds of drum fishes and grunts. Sea cats and drum fish are abundant much nearer shore, and a large part of the local commercial catch is made up of these species.

WEIRD SOUNDS

Often when a netful of fish was dumped in a heap on the deck a variety of clicks, staccato popping, rasping, grunting, and groaning would be heard emanating from the catfish and drums in the pile. Some of the catfish produce sounds by rasping their pectoral fins. The drum fish make noise both by grinding broad crushing tooth-plates located in their throats and by vibrating their swim bladders giving a rapid, sharp, penetrating purr.

In deep waters near the edge of the shelf (200 to 300 fathoms) the fish fauna was practically identical with the fauna of similar depths in the Caribbean Sea and Gulf of Mexico. Here are several kinds of grena-

diers, hake, whiting, armored sea-robins, pelican flounders, other flatfish, and beds of deep-water red shrimp. Some kinds of these red shrimp were almost twice the size of the pink or brown commercial shrimp, and shrimp gumbo or shrimp salad was often on the menu next day.

In the deep waters on the slope of the shelf (400 fathoms) typical bathypelagic and benthal fishes were caught. Several kinds of these—scorpion fishes, boar fish, dorys—are red with very large eyes or merely pink without the large eyes as is the angler fish, *Chaunax* (see illustration). Most of the abyssal fishes are very dark brown or black with an endless variety of luminous organs arranged in patterns over their heads and bodies. Also caught in these deep waters were viper fish 12 inches long with teeth an inch long curving over the tops of their heads, lantern fishes, hatchet fish, and a great many kinds with large mouths and weak fins—kinds that have no common names. Many of these were small, about

6 inches long, but some such as the deep-water chimaera were nearly 30 inches long. The black, velvety, blue-eyed deep-water sharks were also quite small, seldom over a foot long. Because of their small, weak teeth they feed on soft and sluggish invertebrates found on the bottom rather than actively pursue other fishes, as do the larger pelagic and inshore sharks.

The packed collection, which was left aboard the *Oregon* to be shipped upon arrival at its home port of Pascagoula, Mississippi, did not arrive at the Museum until after the beginning of the new year. It has taken two people nearly two weeks to unpack and sort the collection into jars so that the specimens may be studied. When these studies are finally completed the fishes will become part of the Museum's steadily growing reference collection of fishes. One more unknown region of the oceans has been at least superficially explored and something of its potentiality as a food source is known.

Books

THE SEVEN CAVES. By Carleton S. Coon. Alfred A. Knopf, Inc., New York. 338 pages, photographs, line drawings, maps. \$5.75.

THE TESTIMONY OF THE SPADE. By Geoffrey Bibby. Alfred A. Knopf, Inc., New York. 414 pages, plates, line drawings, maps. \$6.75.

The increasing number of excellent popular books on archaeology is most heartening to those of us who are asked to recommend books on this subject. The two recent publications reviewed here are first-class references, well-written documents, and dramatic and exciting reading.

The Seven Caves, by Carleton S. Coon, is an account of the author's search for the origins of the Old Stone Age cultures in caves in northern Africa, the Middle East, and Afghanistan. The lay-reader is fortunate in having this account because it was written before the long scientific reports have been issued and it is therefore relatively fresh. The photographs are excellent, but the maps, for one not well acquainted with the area, are difficult to interpret.

Dr. Coon's first caves were dug in 1939 and the last one in 1955. The war years naturally interrupted his labors, which otherwise would have terminated some five or six years earlier. The reader will find his interest aroused from the outset, for Dr. Coon, in facile and witty style, presents his story in narrative form. His explanations as to why people dig in caves are convincingly personal and lack any psycho-analytical motivations.

The excavations were sometimes exciting and rewarding but more frequently were monotonous, tiring, dangerous, and disappointing. The significance of the many finds (over 150,000 pieces) is carefully presented albeit in a technical manner. Therefore, many sections have to be read with care. But the reader will be rewarded because all the parts of this gigantic jigsaw puzzle are related to the Stone Age cultures of the Far East, the Middle East, and Europe. In short, one finds that the earliest horizons in Europe are merely the later developments of cultures that originated many thousands of years earlier in the Middle East or perhaps the Far East. One of the radiocarbon dates—43,000 years ago—is the oldest date found at a site occupied by human beings.

Dr. Coon and his associates were searching for the place of origin of a man fully evolved and equipped with a complete Upper Paleolithic toolkit that would enable him to live in the cold, moist, cloudy climate of Ice Age Europe. The story of the success he achieved and of his theories about the origins of Neanderthal man, climate changes, and migration routes of our prehistoric ancestors will answer many questions for Dr. Coon's readers and will point out many that cannot yet be answered.

The Testimony of the Spade is utterly different and yet equally rewarding and illuminating. Dr. Bibby, an English archaeologist, has made full use of his knowledge of many languages in creating the saga of the life and the inhabitants of Europe from 15,000 B.C. to about A.D. 800. The sweep of events, the breadth of scope, the enormous mass of detail that make up this story remind one of a great tapestry depicting

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