

Depth Trolling Off Tonga

Encouraging results from depth trolling trials in Tongan waters are reported below by the Fisheries Officer to the South Pacific Commission.

By H. VAN PEL

UNTIL recently it had long been assumed that the deep parts of the oceans were poor in fish. Now, however, different views are beginning to prevail. Indications to the contrary have indeed been given by the Kon-Tiki expedition, the various "bathyscaphe" explorations, the observations of Japanese longline fishermen and the work of Pacific Oceanic Fishery Investigations, to name only a very few.

The oceanic depths are not as poor in fish as one might think, but they are deeper and therefore more difficult to catch than in shallower regions. The transparency of the water away from the shores may also be a hindering factor. There are still many things in the depths of which we know nothing, especially from the commercial fishing angle. For these reasons I do not wish to commit myself on the subject, beyond saying that in my opinion there must be great quantities of fish deep down along the Equator. This much I can substantiate

The author displays one of the fish caught during the depth trolling trials.



from my experience of various methods of line fishing.

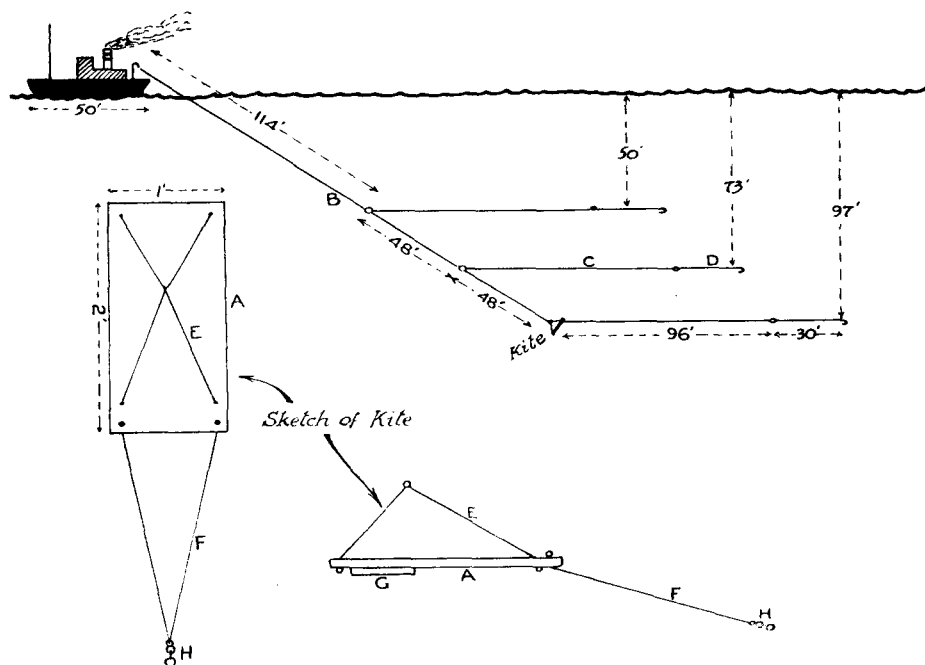
In the South Pacific there is practically only one method applicable to

large-scale fishing: the longline. However, its application is very difficult. It requires extremely hard work; it necessitates the use of fresh bait with the attendant difficulties of supply; while finally, the gear itself is expensive. These are the reasons I have been looking for something simpler. I felt it should be possible to troll deep down under the surface.

Depth Trolling Experiment

During an investigatory visit to the Kingdom of Tonga I had the opportunity to prepare some depth trolling equipment in collaboration with Mr. Mackenzie, the Fisheries Officer. We made a paravane and a depth kite to take our trolling line down. Both gave good fishing, although the best results were obtained with the kite, which went deeper (see sketch). The angle made by the line with the water surface was 30° for the kite, and only 20° for the paravane.

The mainline (B) was of $\frac{1}{4}$ -inch steel wire, 222 feet long. Of the total length, 210 feet were paid out, only 12 feet remaining in the boat during fishing operations. The mainline was cut 114 feet from the boat and a swivel inserted. The same operation was repeated 48 feet further on, and at the end of the



last 48-foot section, the line was attached to the depth kite (A).

The wooden depth kite was 2 feet long, 1 foot wide and $\frac{1}{4}$ -inch thick. It was fitted with bridles (E) and a strap (F) made of $\frac{1}{4}$ -inch cotton line. The intersection of the right and left bridles was on a perpendicular to the long axis of the kite, one third of its length from the lower end. A 4 lb. lead plate (G) was attached to the lower end in order to stabilize the kite.

A trolling line, which also served as a "tail" for the depth kite, was connected to a swivel (H) on the strap. At various times lines were also attached to the two swivels on the mainline. These lines were all 126 feet long, of which 96 feet were $\frac{1}{4}$ -inch cotton line (C), followed by a swivel and 30 feet of $\frac{1}{4}$ -inch wire (D) equipped with a large fish-hook.

The paravane (not illustrated) was made of a 3-inch steel tube, 3 feet long, and equipped with a keel. I will not give a full description of it here, as results were not as good with it as with the kite (though it gave better fishing than the surface lines).

The kite exerted a 150 lb. drag; the paravane a 60 lb. drag. Trolling was undertaken in depths of 2,000, 1,000, 300, 200 and 50 fathoms. The fishery research boat of the Kingdom of Tonga was used.

No difficulty was experienced in making turns while trolling; a 180° turn could be effected in five minutes.

During actual fishing experiments, we were trolling one depthline with the kite and, in addition, five surface lines. The ratio of catches was 3 to 1; in other words, one depth line was catching as much as 15 surface lines would have.

We also tried putting branch lines on the mainline swivels with good results.

Fresh mullet 10 inches long were used for bait on the first day. Salted mullet were used the second day, with equally good results. Having finished our supply of mullet bait, we then used belly strips from tuna, which also proved excellent. I feel that bait does not need to be as carefully chosen for depth as for surface trolling.

Optimum Trolling Speed

Trial runs were made at speeds of 4, 5, 6 and 7 knots. The optimum speed proved to be 6 knots. At 4 knots, few fish were caught. At 5 knots, the catches were improving, but sharks had a chance to take the fish off the hook. At 6 knots very good results were obtained, and the sharks did not cause any trouble. At 7 knots fewer catches were made, but the results were still good. These observations apply when fishing with hooks from 50 to 97 feet under the surface.

Best results were also given by surface trolling at a speed of 6 knots.

Fishing took place only during day-

light hours. It is possible that deep trolling can also be undertaken successfully at night. My past experience with surface trolling at night, however, has always been negative.

The catches included various species of tuna, Spanish mackerel, barracuda, dolphin, kingfish and "kutu" (*Aprion virescens* Valenciennes).

A motor boat can troll two sets of depth lines, one to starboard, the other to port. Assuming that each set comprises 3 lines, the whole is equivalent to fishing with 90 surface trolling lines. The number of lines on each rig can be increased if the mainline is lengthened.

One of the drawbacks of this type of gear was that, at the beginning, we could not see when a fish was hooked on the depth line. It was first thought that by hooking a spring scale on the boat and attaching the mainline to it, we would

overcome this. However, while this system worked well with a smooth sea, a moderate breeze made the scale-hand move around too much.

We finally came to the conclusion that the steel mainline and kite should not be taken up while fishing. Instead, each line would have to be rigged on a ring, enabling it to be pulled up the mainline by a separate pull cord. Unfortunately, time was lacking to carry out such an experiment.

This deep trolling method offers many possibilities; it is even possible to mechanize it. I feel sure that the deeper one trolls, the better the results will be. Many people in the Pacific have probably experimented with some kind of depth trolling gear, and it would be appreciated if any observations and comments were forwarded to the South Pacific Commission.

Insect Survey Of Micronesia

Insects of Micronesia—Vol. I: Introduction, by J. L. Gressitt. Bernice P. Bishop Museum, Honolulu, Hawaii, 1954; pp. I-IX, 1-257.

THE colonization of the Pacific islands by man has a universal interest, and its fascination is enhanced by the bold and perilous sea voyages which were necessary for its achievement. Man, however, is a relative newcomer in the Pacific, and however proper a subject for study he may be, much more is to be learned of the ways in which the process of evolution takes place from a study of the animals and plants. They also made their journeys and voyages. More important are the changes and diversification which have occurred in them under the influence of isolation, and for such a study the Pacific offers unexcelled opportunities.

The ancestors of the majority of the animals and plants in the Pacific would appear to have invaded the area from the west, and only a relatively small number of the original invading species reached the easternmost islands of the Pacific.

Most of the insect faunas of the Pacific which have so far been studied have been, like those of Hawaii and French Oceania, near the eastern boundary of the Pacific and therefore small in size or, like those of Samoa and Fiji, at mid-distance on the invasion path.

Great interest thus attaches to a study of the fauna of places like New Guinea and Micronesia. The latter comprises the Caroline, Marshall and Mariana Groups north of New Guinea and east of the Philippines. Both are much nearer to the presumed point of entry into the region for the major part of the flora and fauna.

The Pacific Science Board and its specialist committee, the Invertebrate Consultants Committee, are to be congratulated both on their vision in undertaking, shortly after the war, a survey

of the insects of Micronesia, and on their persistence in carrying it out.

Since 1947 a score of specialists, largely financed by the U.S. Office of Naval Research, have made insect surveys in the area. The large collections which are now available for study are, however, the work of perhaps 100 collectors, including the Japanese, who formerly controlled the area.

The Bishop Museum of Honolulu, which accepted the responsibility for arranging for specialists all over the world to study the different groups and the publication of their findings, is of course only continuing its active association in the past with work of this nature in the Pacific.

The Micronesian fauna is probably the largest Pacific fauna to be studied as a whole, and may be expected to throw much light on the origins, invasion routes and evolution of insects in the Pacific.

The survey was conceived as a contribution to pure science, but in the process much information has been accumulated on pest species and their distribution.

The present volume by Dr. Gressitt is an admirable introduction to the area under study. The area is defined and the maps, photographs and descriptions of typical environments enable one to form a clear picture of the conditions which exist there.

After the reports of the specialists on their particular groups have appeared, the whole fauna will be reviewed in a final volume. The new information which will emerge from these studies may modify some of the present ideas and conclusions on the origins and distribution of the Pacific fauna which are presented in this volume as a background to the study. The succeeding and final publication will be awaited with great interest.

—L.J.D.