INVERTEBRATES

Sponge	*Verongia longissima*	Squilla	*Squilla empusa*
Loggerhead sponge	*Spheciospongia verparia*	Spiny lobster	*Panulirus argus*
Russian helmet sponge	*Ircinia campana*	Stone crab	*Menippe mercenaria*
Spotted shrimp	*Penaeus duorarum*	Squid	*Doryteuthis plei*
Stone shrimp	*Eusicyonia sp.*	Fighting conch	*Strombus pugilis*
Spanish lobster	*Scyllarides aequinoctalis*	Chinese alphabet	*Conus spurius*
Box crab	*Calappa flammea*	Tulip shell	*Fasciolaria tulipa*
Box crab	*Hepatus epheliticus*	Pecten	*Pecten gibbus*
Swimming crabs	*Cronius ruber*	Lion's paw	*Pecten nodosus*
Squilla	*Lysiosquilla maculata*	Star fish	*Oreaster reticulatus*

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Methods of Capturing Flying Fish

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BARBADOS is one of the few places in the world where the flying fish industry constitutes over 80 per cent of the fishery. The species sought is *Hirundichthys speculiger* which averages about one-third pounds in weight. At the present time they are sold for 6c each in the local market. In glutted periods this price is often reduced to 1½c each or less.

The boats used in Barbados are almost all sail boats of about 22-26 feet overall length, having a large oversized jib and an equally large mainsail. These boats are relatively fast sailers, and the ballast, which is usually all inboard, is shifted from side to side. Such boats carry a crew of three men.

Boats put to sea during the very early hours of the morning and generally endeavour to follow the prevailing current, since the flying fish are usually to be found travelling in the direction of the current. Up to 1949 observation of the current was the only method used to trace the movements of the flying fish.

In December of 1949 a Government research boat was added to the Fishery Department, and research work was started for the purpose of finding better methods for locating flying fish. This program is under the writer's direction.

The old methods for spotting and capturing fish were tried for some weeks with moderate success, following which new methods were tested. First, an examination was made of the plankton occurring in areas where flying fish were prevalent. To do this a small cylindrical plankton indicator was put over and towed at half speed (4½ knots) astern of the boat for periods of twenty minutes about 5-7 miles off-shore. The indicator screen was then inspected under the microscope to determine the occurrence of indicator species. There were often thirty or more types on the four-inch screen.

After some weeks of this plankton collecting it was evident that certain kinds of plankton were associated with the flying fish. Examination of the gills and upper stomach of freshly captured flying fish showed certain plankters to recur frequently. Henceforth, particular attention was paid to the numbers

of this plankton variety appearing on the screen of the indicator. Fishing trials were made if twelve or more of this plankton species could be seen on the screen. A majority of the specimens were crustaceans together with larvae of the sea urchin.

This phase of the research effort was most productive, and after some weeks of trials the relationship between the plankton and flying fish abundance was put to practical use. On many occasions, when the local fisherman returned with only a moderate catch, the research boat, working with the plankton indicator, returned with a catch many times above average.

These results have been reported to the Secretary of State's Advisor on Fishery Matters, Dr. C. F. Hickling, who considers these observations so important that it is proposed to send a trained student in plankton research to Barbados to further the studies.

Having decided to fish in an area, the boat is stopped, sails removed, mast unstepped and the hull is allowed to drift broadside to the prevailing current. A basket of foul-smelling bait is hung over the side, awash with the surface. As the boat rolls on the wave, the basket dips and pieces from the basket are scattered gradually over the area. A small amount of coconut oil or cotton seed oil, mixed with 2-4 gallons of sea water is thrown all around the boat to becalm the area, as well as make it possible to see the fish as they come near the surface and approach the boat.

This "baiting-up" period may last for an hour or more. Local fishermen, relying on the old method of current observation, may take 1½ to 2 hours to drift into an area. Working on plankton indicator it is usually possible to see fish within twenty minutes after stopping the boat. When few fish are seen it is customary to try hooking them with a tiny #12-#14 hook (English numbers) on fine crochet cotton lines. On some days it is possible for three men to hook over five hundred of these fishes. The fish gradually become accustomed to the boat and often come alongside. At this stage large hoop nets are put into the water. The fish then go towards the nets, which are lifted over the side of the boat. It is common to dip as many as five to nine at one time in one of the dip nets. This peculiar habit of the flying fish encouraged the investigation of the possibilities of the gill net. It was discovered that a gill net of 1⅞ inches stretched mesh, of a muddy green colour, was most suitable. The research boat uses three gill nets of small size (two of 15 yards each, and one of 30 yards), These nets are small for ease of recovery in case sharks or larger pelagic fish are encountered. With these three nets, the research boat has taken as many as 9,000 flying fish in six to seven hours fishing time; the best single haul was 1,005 fish in one 30 yard net, taken in 35 minutes. The local fishermen have realized the value of gill nets, and since 1951 many boats are using them.

After the interest of the local fishermen had been aroused in the gill net method of capturing flying fish, another type of net was introduced to the industry. This net is much larger, 50 yards long and 24 feet deep, and is very similar to the purse seine. The mesh of the net is 1⅞ inch stretched mesh.

One end of this net is put into the water and allowed to drift to windward of the boat. The far end is then hauled back to the boat by a side rope, thereby forming a horseshoe-shaped enclosure. By then the net has enclosed a fairly large area. The net is now closed by hauling a purse line, running through rings attached to the leadline. This prevents the fish from escaping by diving. At this moment many fish dart at the sides of the net and are gilled. This causes future work to disengage the fish but if the meshes were smaller, the fish would have

an opportunity to bounce the net and glide over the cork ropes. The remainder of the net is now closed, hand-hauled back to the boat and put on board. More than half of the catch may be gilled, but the remainder are free, as if captured by a purse seine net.

This net has been very successful. In the first haul made, it captured 1,040 fish, weighing over 300 pounds, in 15-20 minutes. In the second haul, 1,567 fish were netted. Two further hauls were made, bringing the day's total catch to over 6,000 fish. Due to an accident to one of the men who fell on the slippery deck, fishing operations had to be broken off, otherwise many more thousands could have been captured with the net in the one fishing operation. This larger net has been used on eight occasions between May 15 and June 30, 1951, and over twenty-five to thirty thousand fish have been taken by it. It is important to note that this net can be operated from all types of fishing boats, both sail and power, and whether decked or otherwise. It is believed that this is the first occasion when flying fish have been caught in this manner.

The Gear Development Program of the M-V Oregon

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AS AN INTRODUCTION to this report it would be profitable to discuss the present progress being made in gear development by the fishing industry itself in the Gulf of Mexico. For many years such experimentation by commercial boats was almost non-existent. Until late in the 1940's snapper fishermen were using the same techniques and gear employed by the fishery at its inception. Even today a large number of smacks travel around the Gulf under varying qualities of dead-reckoning. The location of good fishing grounds has been held in the highest secrecy, making it extremely difficult for a newcomer to break into the fishery. Until recently the shrimp fishery was moving ahead at only a slightly faster pace. During several decades there was practically no progress in trawl design. The recent discoveries of new shrimping grounds have rapidly changed the static attitude on gear, however. Until the Key West shrimp strike early in 1950, each area had its own favorite trawl style. The great influx of boats from all over the Gulf and South Atlantic States to the Key West grounds put the existing trawl designs on a competitive basis for the first time, and, of added importance, on a type of bottom previously unworked. Soon boats that had never used anything but flat trawls were trying out the so-called balloon trawls. Later, trawls embodying features of both styles were used. Many small refinements appeared, some of which were rejected, and some retained. Several trawl makers in the north Gulf tried to make balloon trawls without ever having seen one, and some peculiar designs were produced. Biloxi fishermen, not quite willing to go all the way with a new idea, were tying the wing-tips of balloon trawls up close to the trawl doors instead of allowing the customary 15 to 30 feet between wing-tip and door. A few extremely courageous New England boats were even trying to use roller type trawls on north Gulf snapper lumps. In other words, within a few months, trawl experimentation had become the rule rather than the exception.

By early 1951 many fishing areas had developed or adopted new or differently rigged trawls. Even in the period of the most intense experimentation, however, designs never exceeded the fishermen's sense of practicability.

With these developments came the rapid acceptance of the sonic depth