

Construction and Operation of Longline Gear for Artisanal Fishermen

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RESUMEN

Las artes y métodos de pesca que fueron usados temprano en el desarrollo de la pesca con palangre del pez espada en Florida, se adaptan fácilmente para la pesca artesanal en las Islas del Caribe. El pez espada se encuentra en gran parte de esta región como ha sido demostrado por la presencia de sus larvas en las colecciones científicas del Caribe. Una pesca artesanal de palangre ha existido por muchos años fuera de la Costa Noroeste de Cuba y en 1975 se empleaban métodos similares por exilados cubanos para empezar la pesca del pez espada en el Sur de la Florida. Aunque poco usado en Florida hoy día, este arte de pesca ha tenido much éxito. Este palangre es relativamente barato, no requiere mecanización para calarlo o recogerlo y puede usarse virtualmente por cualquier embarcación con capacidad para permanecer doce (12) horas fuera. Se mostrará cómo se monta el palangre, usando componentes fácilmente asequibles. Las técnicas de pesca del pez espada, así como los métodos para adaptar este arte de pesca para otras especies, tales como el atún de aleta amarilla y tiburones, serán discutidos.

INTRODUCTION

Swordfish, sharks and other pelagic species are widely distributed throughout the northwest Atlantic and Caribbean Sea, as is indicated by the recent expansion of pelagic longline fisheries in this area. Larval swordfish have also been collected throughout much of the Caribbean area indicating the presence of spawning adults (Markle, 1974; Grall et al., 1981). Thus, it appears that many areas of the Caribbean have sufficient populations of swordfish and other pelagic species to support longline fisheries. While high seas pelagic longlining as typified by the Japanese involves large vessels and considerable mechanization and electronics, nearshore pelagic longline fisheries such as those off southeast Florida and the northwest coast of Cuba are carried out with small boats and a minimum of specialized gear. Areas in which deep water is accessible within a short distance from shore have potential for artisanal pelagic longline fisheries.

Such a fishery has existed off the northwest coast of Cuba for many years (Guitart-Manday, 1964; 1975). Swordfish, various shark species and marlins comprise the catch. Gear and methods similar to those used in Cuba were fished experimentally off southeast Florida in 1975 by Cuban emigres. The gear proved very successful and a major new fishery was established.

FISHING POTENTIAL

A number of species are potentially available to artisanal pelagic longline fisheries in the Caribbean region. These include swordfish, many species of pelagic sharks, marlins and tunas.

Summarized results of ichthyoplankton surveys indicate that the eastern Caribbean is a major swordfish spawning area (Markle, 1974; Grall et al., 1981). Other areas where concentrations of swordfish are found, i.e., Florida Straits and Gulf of Mexico, support active swordfish longline fisheries (Fig. 1). Thus, there is reason to believe that adult swordfish will be found, at least seasonally, in many areas of the Caribbean.

GEAR AND METHODS

Although swordfish longline gear and methods have changed considerably in recent years, techniques used in the Straits of Florida during the development of that fishery are suitable for artisanal fisheries in the Caribbean. A schematic drawing of this gear is shown in Figure 2. The mainline varies from 2 to 7 km in length and consists of two strands of 150-kg-test monofilament twisted together using an electric drill. Twisted monofilament is advantageous because it is light, very durable, has little water resistance and has a small diameter for its strength. Hook lines or gangions are made in the same way and tied into the main line. Usually, somewhat lighter monofilament such as two strands of 100-kg-test monofilament is used for the gangions. Gangion length can vary, but in the Straits of Florida fishery they were about 10 m long. The free end of the gangion has a large brass snap swivel attached by an eye splice. Leaders are from 2 to 5 m long and are also

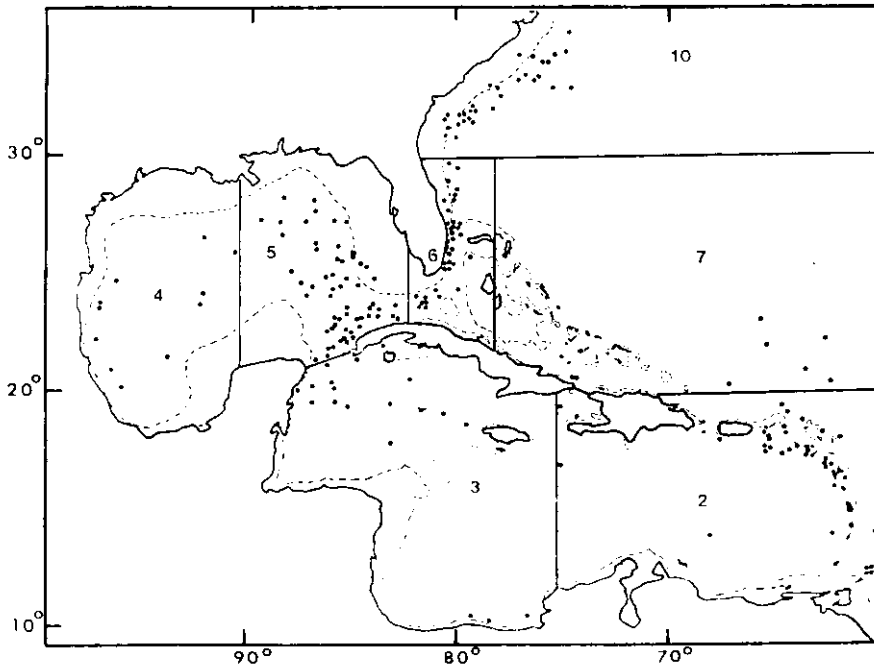


Figure 1. Distribution of larval swordfish in the western North Atlantic (Reprinted from Grall et al., 1981).

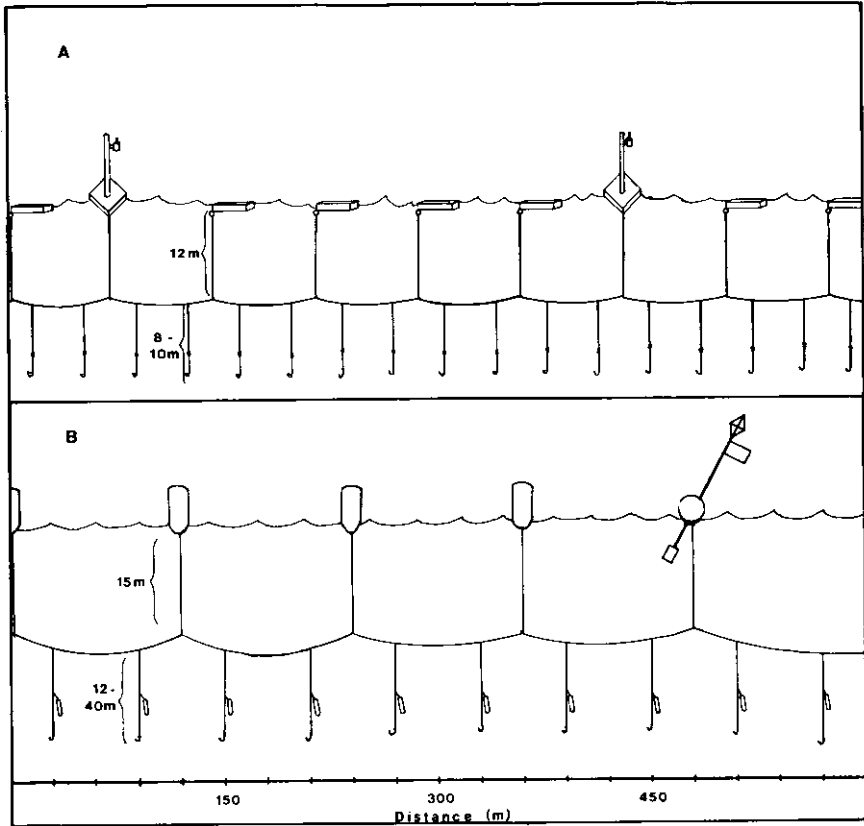


Figure 2. A, Typical Cuban longline; B, Typical Florida longline with Cyalume lights attached to gangions.

made from two strands of monofilament twisted together. One end is spliced to the hook and the other end has a loop spliced in it. Hooks are usually large, 3/0 or 3.5/0 shark hooks, and are spaced every 30–45 m along the mainline. Silver mullet (*Mugil curema*) of about 250 g apiece are the preferred bait. The rigging procedure is as follows: First the body cavity is opened and the viscera removed. Next a small slit is made in the caudal peduncle and the hook inserted so it passes into the body cavity. The hook is pulled through and put through the head of the mullet so that it passes out the top of the head and points toward the tail. The tail is then tied to the leader and one or more Spanish sardines (*Sardinella* sp.) or thread herring (*Opisthonema oglinum*) placed on the exposed part of the hook. Because of the time required, baits are rigged before leaving the dock. Other baits are probably equally suitable. Squid, which has become widely used recently, would be a good choice as would any fish similar in size and shape to a mullet (e.g., small Spanish mackerel or ladyfish).

Floats are made from short lengths of 5- by 10-cm cedar lumber (1 m long). If painted white, they are easily seen with a searchlight at night and provide adequate flotation for the line. A small floating platform with a kerosene or diesel fuel lantern fastened to a wooden pole is placed about each 400 m. The lantern need be nothing more than a 1-liter jar with a wick in it. The platforms are approximately 60-cm square and are made of plywood and foam. The lanterns serve to attract swordfish, mark the line, and when extinguished, to indicate that a fish is hooked.

Fishing Methods

The mainline and attached gangions and float lines are stored loosely coiled in a wooden box. The buoy lines and gangions, which have been tied to the mainline in sequence, have clips attached to their free ends, and are placed over vertical metal posts attached to the side of the box. The clips are placed in the order in which they will come out of the box when the line is set. Buoys, platforms and baited hooks and leaders are laid out on deck. The lanterns are lit and as the boat moves slowly ahead, the first platform is clipped onto the main line and placed overboard. As the line runs free over the stern, the next clip is removed from the post and a leader attached and placed overboard. This sequence is continued until all the gear is set. The boat may then either move to the center of the line where all the platforms are visible or begin cruising slowly up and down the line. If a fish is hooked, usually one of the platforms will flip over extinguishing the light. The boat moves to this platform, relights the lantern and replaces it overboard, retrieves the buoy line until the main line is reached and then moves along the main line to the gangion with the hooked fish. The fish is brought aboard, the leader unclipped, and a new bait and leader clipped on and put back in the water. In addition, the boat cruises along the line periodically throughout the night because hooked fish will not always tip over a platform. In some cases the floats, which are clipped to the float lines at their ends, will be tipped from the normal horizontal position to a vertical position by hooked fish. In the morning, the first platform buoy is picked up and the main line is pulled by hand as the boat moves slowly ahead. The main line, gangions and buoy lines are laid in the box, and leaders and buoys unsnapped. The clips from the gangions and buoy lines are replaced on the posts as they come aboard. Fish can be stored on deck without ice for several hours if they are kept covered with wet blankets or other absorbant material so that evaporation keeps the fish cool.

Although primarily used for swordfish, this method is also effective for sharks and other billfish. The kerosene lights play a major role in attracting swordfish. Recently, with the invention of the chemical light stick (Cyalume light¹), surface lanterns became unnecessary. However, Cyalume lights are expensive and cannot be re-used. The effectiveness of these torches in attracting swordfish is determined by the depth at which the fish are found. In

¹ Registered trademark, American Cyanamid Company.

Florida, swordfish are frequently caught as deep as 120–150 m below the surface. At these depths, surface lights presumably are less effective than the chemical lights which are attached to the leader a few feet above the bait.

Possible Gear Modifications

The apparent simplicity of longlines masks their complexity. There are many factors which affect how longlines fish and consideration must be given both to gear arrangement as well as to such physical and biological factors as bottom topography, currents, habits of target species and others. Swordfish, sharks, billfish and tuna are all highly migratory species and their distributions and seasonality are not well known. It is therefore important when exploring new areas to fish all seasons and to experiment with techniques. Swordfish and several species of sharks are primarily nocturnal feeders and fishing for them must be done at night. Tunas and billfish are primarily diurnal feeders and should be fished during daylight hours. If sharks are the target species, wire leaders should be used to prevent loss of gear and catch.

Fishing depth can be varied by changing the length of the buoy lines or by changing the length of the gangions or both. It should be borne in mind that the mainline will sink at least as deep as the length of the buoy lines and if they are very long, retrieving the mainline can be difficult. If the leaders are very long, they will have to be spaced farther along the mainline to prevent tangling adjacent gangions when a fish is hooked.

The spacing of both hooks and buoys can be varied considerably. In the Florida swordfish fishery, hooks have been spaced farther and farther apart as the fishery evolved. It was found that placing too many hooks on the line was inefficient and unnecessary presumably because swordfish are generally far apart and because cyalume lights attract fish from a considerable distance.

Although double stranded monofilament has many advantages over other materials, it is about twice the cost of hard-lay or braided nylon. Braided or hard lay nylon is more difficult to work with and hard to pull by hand but can be used if the mainline is only a few miles long. If multifilament nylon is used, buoys with more flotation will be necessary. The use of nylon will also allow the use of snap-on connectors (Fig. 3) for the gangions and buoy lines thus making the gear more flexible. In this case the mainline can be stored in a box by itself and the buoy lines and gangions in separate containers. Buoys and gangions can be snapped on any distance apart as the mainline is being set. For initial experimentation, different length buoy lines and gangions can be tried and easily changed using this method.

In order to fish more than 5–7 km of gear, it is necessary to mechanize the setting and hauling operations. This involves the installation of a hydraulically operated longline spool (Fig. 4). Fifteen to 30 or more km of mainline can be fished this way, depending on the size of the spool. In Florida, hydraulic spools are now used universally in the swordfish longline fishery. Usually 15 to 30 km of line are fished per set. Leaders and buoy lines are most often stored on separate, manually-operated spools (Fig. 5), and attached to



Figure 3. Snap-on connectors.

the mainline with snap-on connectors. This system enables much more gear to be fished, but the initial expense is considerably more than in the previously described system. Due to the amount of gear fished, it is not possible to keep track of the entire line and therefore heavier buoys and marker poles with strobe lights and radar reflectors are used to help prevent gear loss. The expense involved in this system will be justified only if sufficient concentrations of fish are available. Further information on the development and economics of the Florida swordfish fishery can be found in Berkeley et al. (1981) and Cato and Lawler (1981).

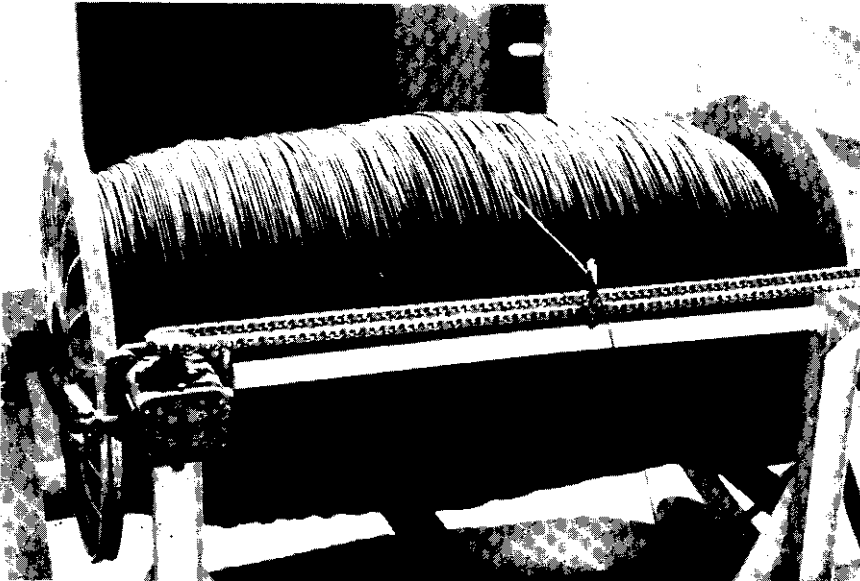


Figure 4. Hydraulically-operated spool for hauling and storing main line.

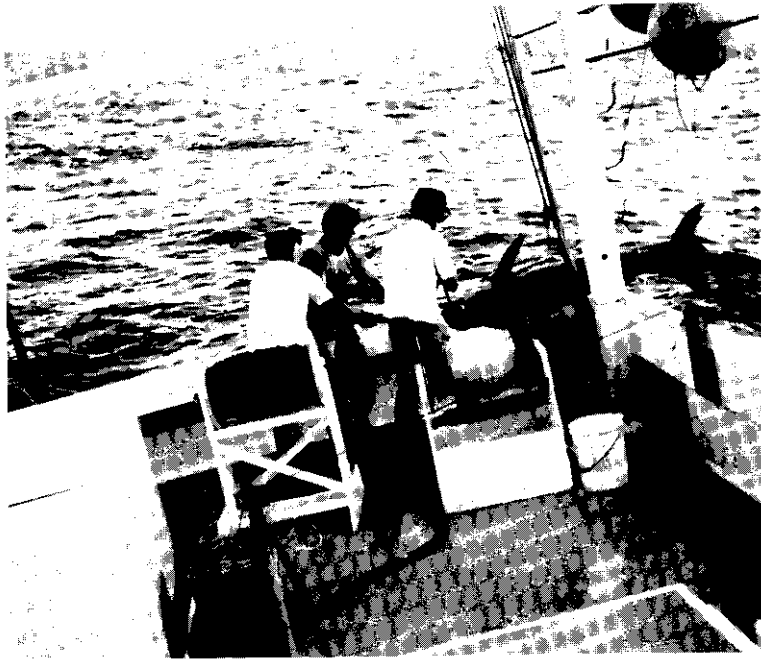


Figure 5. Florida longliner with gangion spool (right) and buoy line spool (left).

Moon phase is believed to be a factor in swordfish fishing. In Florida, the period beginning approximately 1 week before the full moon and extending a few days past the full moon is generally considered the best time to fish. Many fishermen believe that during this lunar period, fish will be found further below the surface and often they will adjust their gear accordingly.

The success of an artisanal longline fishery obviously will depend on the availability of fish in the area. Although there is evidence that swordfish, marlins and sharks are likely to be found in many Caribbean areas, the only way to determine whether a viable artisanal fishery can be established is to put the gear in the water.

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