

FISHING TACTICS IN THE JAVANESE RING NET FISHERY

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Abstract

The Javanese fishermen use Fish Aggregating Devices (FAD) and light to concentrate fish before catching it. Since years, the FAD were used as the main attractors and the light as an help for fishing. Today, the situation reversed and light is the main attractor. This evolution induces some changes in the fishing tactics. Formerly, the vessels stayed along their trip on the same fishing ground, now they can prospect more than one fishing ground by trip. On the fishing ground, the seiners are not randomly distributed and the concentration of the vessels show a high structuration.

Key words : Java Sea, Fishing tactics, fishing devices.

Introduction

The fishermen want to catch the fish in the most efficient way in order to maximize the time they spend at sea and raise their profit. To achieve this goal, they are willing to quickly adopt new technologies. The introduction of the ring net in the Java Sea was a technological improvement which allowed the Javanese fishermen to fish all along the year and to have a higher catch compared with the catch of traditional nets such as "payang".

Fishermen rely on their knowledge on environment and of the fish behavior. Then they apply it to the fishing tactics. They are a set of coordinate actions made by the fishermen on the fishing grounds in order to catch the fish.

Results

Fishing Tactics

Traditionally the Indonesian fishermen used the FADs or "rumpon" to catch fish. Around 1950, the use of light (paraffin pressure lamps) spreads. All the ring net fisheries in Indonesia use these tools widespread in the South-East Asia. In the ring net fishery of the Java Sea, lamps and rafts are combined. The fishing operation takes place at night (Potier *et al.*, 1992) after aggregation of the fish.

Traditional fishing tactic

The tactic used by the Javanese fishermen can be resumed in two phases : the mooring of the rafts and the fishing operation itself.

Mooring of the rafts

To moor the rafts the fishermen look for the color and the transparency of the water. A good fishing ground should be with transparent and deep-blue colored waters. The catch of fish with lines around old rafts or the observation of shoals at the surface just before dusk are also good indicators.

Until 1988, the ring netters used to moor around 12 rafts on the same fishing ground. Now, the number decreases to four or five rafts, moored several nautical miles apart. They are laid according to compass bearings the first one used as a starting point, and marked with distinguishing flags to identify the parent vessel. The rafts remain there for several fishing trips (two to three months) until they deteriorate.

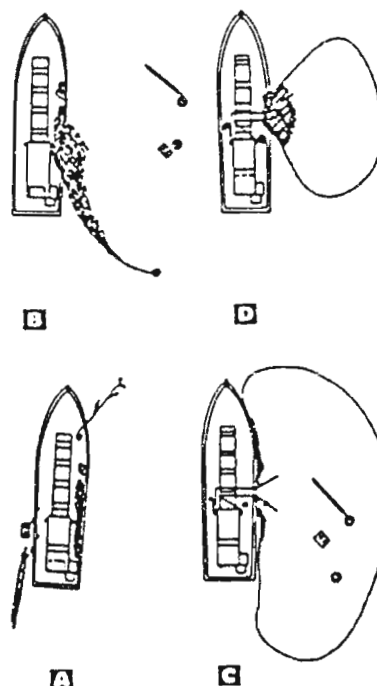


Fig. 1. Different phases of a ring net set.

Fishing operation

Choice of the "rumpon" : it starts in the afternoon when the vessels inspect the rafts. Every time lines are laid on, the raft in which the catch is the best or around which shoals have been seen is chosen. Before anchoring close to the raft, the vessel moves to find the

best position according to the current and to the wind. The raft is secured with a rope remaining 10 to 20 m. behind the stern of the vessel. As soon as mooring is done, before dusk (17h15-17h45), lamps are turned on and their supporting framework lowered to the horizontal so that they shine down into the sea.

Hauling the *rumpon* : the setting starts by hauling the raft (Fig. 1a) which is put on board with the ballast. The upper part of the line, around 18m, is laid on and placed along the hull. Paraffin pressure lamps are placed on floats in the water. Every 2 minutes the vessels lights are gradually turned off.

Setting : the vessel weighs anchor and moves away from the raft. It moves around the raft following the informations given by the *juru arus* (current master) about the current direction and the fish position.

Starting leeward, the net is shot over the stern (Fig. 1b) while one fisherman in the water, with an inflated inner tube, holds on to a bamboo pole attached to the floating line and acts as a marker buoy. In order to be seen in the dark he carries an electric torch. The net is shot in a circle at full speed, the bamboo pole and the floating line are picked up at the bow. The boat is kept leeward from the net so that it does not drift into it. The setting operation is very fast, 3 minutes for the shooting, 15 minutes for the purse line hauling (Fig. 1c) and 35 minutes to form the bag (Fig. 1d).

Most of the time one set will take place during the night, but around the new moon (two or three days before and after) when the fish concentrates easily under the lights two sets will be done (Boely *et al.*, 1988). Most of the settings are conducted between 3 a.m. and 5 a.m. (Fig. 2).

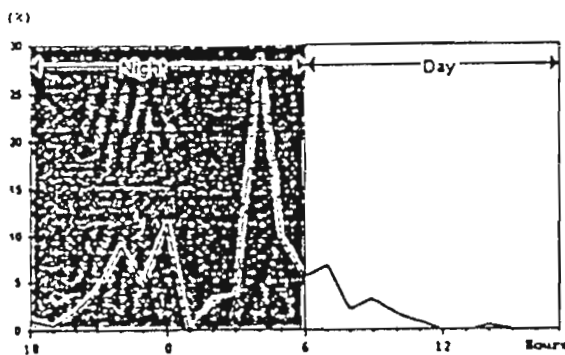


Fig. 2. Distribution of the ring net sets (%) according to the daytime.

Evolution of the traditional tactic

Light fishing

Since 1987, the use of auxiliary generators has widely replaced the paraffin pressure lamps formerly used in the Javanese ring net fishery, most of the vessels carrying 12-36 lamps of 200-1000 watts. First using

mercury lamps, some are now using enclosed halogen floodlights.

Today, the light initializes the concentration and the raft only helps to the aggregation and the setting. The traditional roles of these tools have been inverted (Fig. 3). Fish search is still done late afternoon. When the fishing master estimates an area good, he stops the boat. The light are turned on before dusk. Two rafts called *tendak* are moored at the stern and the bow of the boat respectively. Before setting, they are hauled on board. The upper part of the one placed at the stern is moored again and the setting occurs in the same way as before.

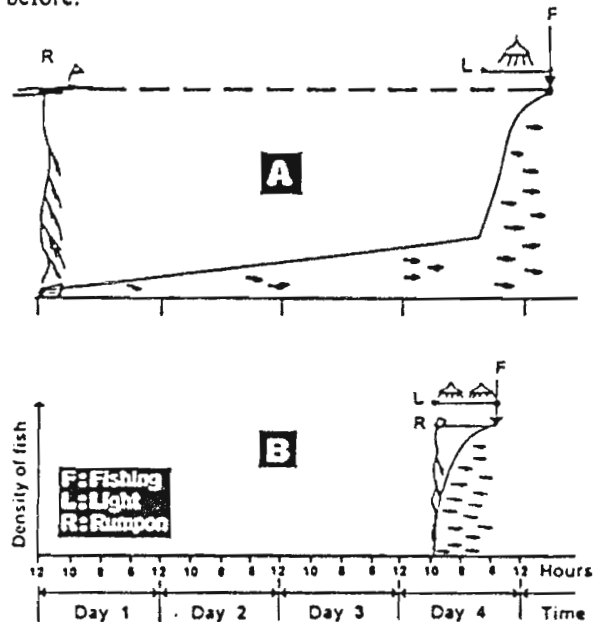


Fig. 3. Phases of fish attraction. Old (A) and new (B) fishing tactics.

Pack fishing

Whenever fishermen go at sea they try to find the fishing area where fish is most abundant. To achieve this aim radio communication is very helpful. Today, the fishing vessels adopt a "pack" strategy. They can track the fish in several fishing grounds during a trip. The distribution of the fishing vessels in the fishing area is highly related to this strategic change.

To illustrate these changes, some visual and radar observations made during acoustic cruises in the fishing grounds add to the information collected during inquiries on the field. The survey of these distributions consisted of the following method. The cruises made on Bawal Putih I covered the fishing grounds of the Javanese ring netters. At night, when the fishing vessels are grouped their spotting is easy. According to the size of the clusters they can be detected 30-35 nautical miles away. When the distance between these clusters and the Bawal Putih I is less than 15 nautical miles, the position of each fishing vessel is noted with the help of the radar.

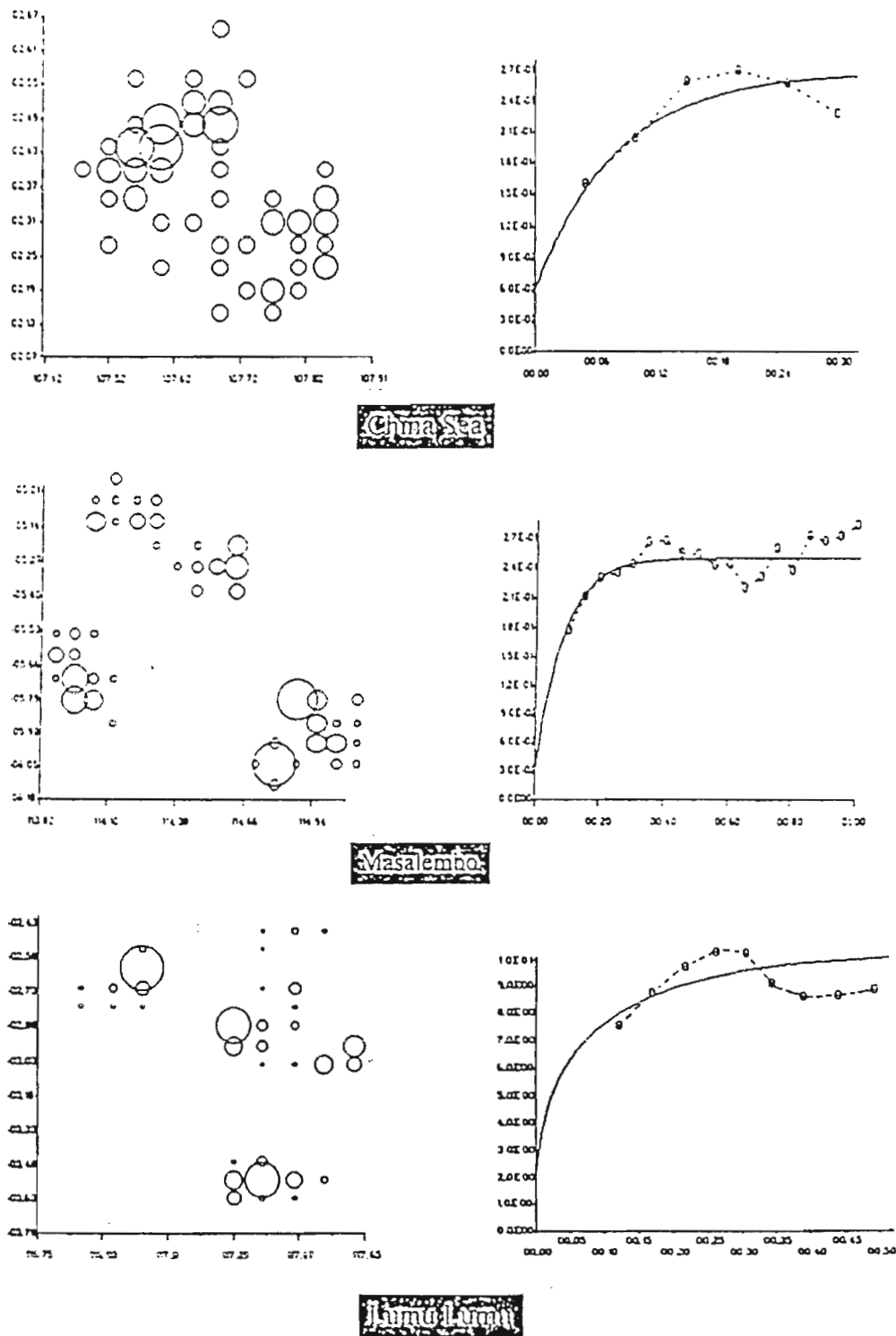


Fig. 4. Vessels clusters and associated variograms.

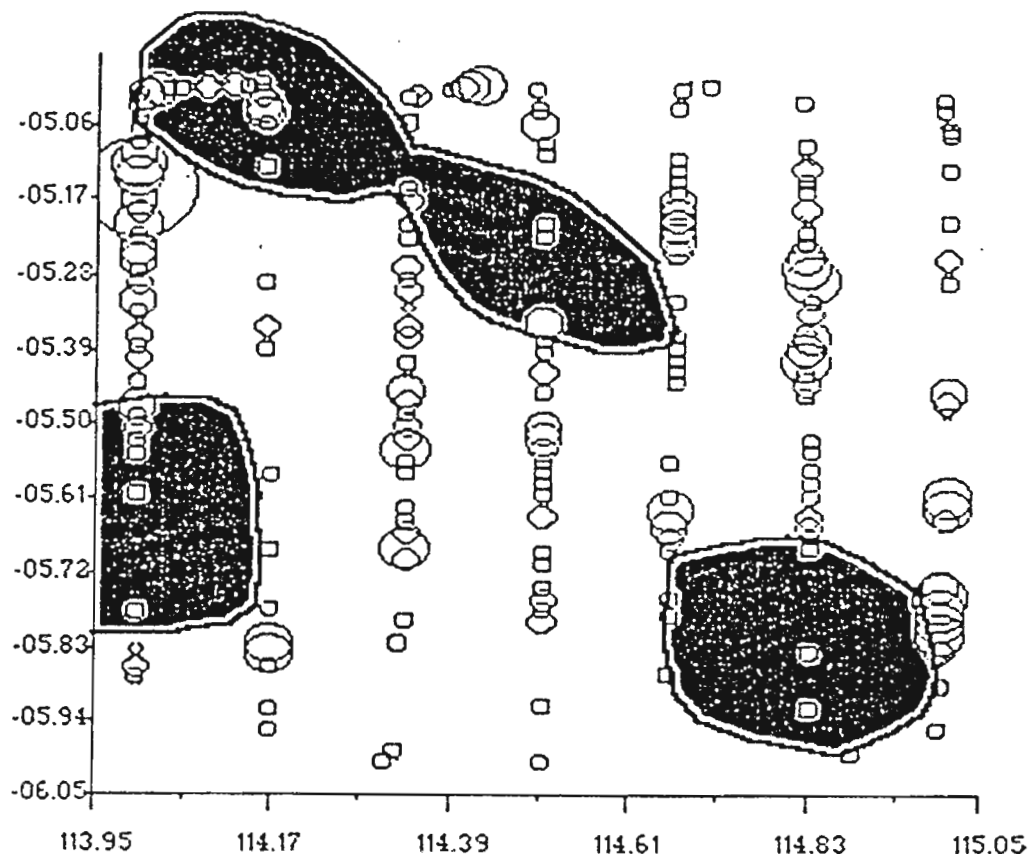


Fig. 5. Position of vessels clusters and schools of fish around Masalembo Island October 1992.

In October 1992, large clusters of ring netters were observed around the Masalembo and Keramian Islands, in April 1993 South of the Midai Island (South China Sea) and in January-February 1995 in the Makassar Strait. The movements of these clusters were observed during several days. Such clusters consisted of 36 vessels in October, 79 vessels in April and 50 vessels in January-February. They make up patches of 20 to 30 nautical miles in surface (Fig. 4a, 4b, 4c). The number of light spots echoed by the radar control allow us to confirm that most of the observed vessels were in fishing operation. In such clusters, the average distance between the ring netters is 1.4 nautical miles and the maximal 4 nautical miles. Sometimes, they are less than half a nautical mile apart.

A study of these clusters based on geostatistics show that the fishing vessels are not randomly distributed in a fishing area (Fig. 4d, 4e, 4f). When we compare in a fishing zone the distribution of the vessels with that of fish schools (Fig. 5) we record that in the area where are the vessels the fish schools are few. It can mean the vessels are able to aggregate most of the surrounding biomass acting as a pump towards this last one. Using this tactic they tend to exploit a fishing ground to its maximum level even if the fishing zone is not located over area where the fish abundance is the highest.

The vessels being not far from each other this tactic can lead to a competition among them to attract the fish. We can observe an increase in the average light power among the vessels which can confirm that hypothesis.

Conclusion

The use of rafts and lights in a fisheries sets the question of their presence and their utility. In the case of the Javanese ring net fishery several interpretations can be given :

first, the ring netters are not able to fish at "sight" shoals seen at the surface because of their low speed ;

second, shoals are small and not numerous, the fish being scattered in the water column.

In both cases, it has to be aggregated and fixed before being fished. This is a problem of resource availability. The fluctuation of the number of rafts in an area can also reflects the fish accessibility. More numerous are the rafts less is the fish accessibility and *vice versa*. The evolution of the tactics since 1987 sets the two aspects of the question. In a first approach the increasing use of electric lamps could be a way to increase the fish vulnerability because there would be a better aggregation around the boat. In a second approach, the replacement of rafts by light could be

linked to a change in the fish accessibility since 1990-1991. Changes in tactic often happen when the fisheries have to face difficulties as stagnation or decrease of the catch.

In the actual state of the technology the ring net fishery of the Java Sea exploit all the space available. As the knowledge of the Javanese fishermen about environment and fish behavior is quite good, the fishing tactics are efficient. The fishing pressure is high on the prospected fishing grounds. A new evolution will be only possible with changes at high cost not only leading changes in the fishing tactics but also in economic and commercial ones.

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