

## SETTING THE SEINE : A MATTER OF LUCK KNOWLEDGE AND BELIEFS OF PURSE SEINE CAPTAINS IN JUWANA

I. ANTUNES

### ABSTRACT

Setting the seine closely depends on the weather, the direction and strength of the winds and currents and on the position of the FADs or rumpon. The Java Sea offers a fishing ground governed by a typical monsoon climate marked by a complete reversal of the wind regime which directly affects the setting of the currents.

Within twenty years, the pelagic fishery on the north coast of Central Java has experienced a rapid evolution and development. The masters of the purse seine fishing strategy have been forced to learn, innovate, adapt and discover new fishing grounds to meet the new production demand. If today, a large number of captains have become real experts, successful purse seine fishing remains for many of them a gamble which is a matter of luck and of fate.

KEYWORDS : purse seine, fishing strategy, knowledge, fishing grounds, perception of the sea, beliefs.

### ABSTRAK

*Kegiatan "tawur" sangat tergantung pada cuaca, arah dan kekuatan angin serta posisi "rumpon". Laut Jawa memiliki daerah penangkapan yang dipengaruhi oleh musim yang ditandai oleh angin yang berlawanan yang mempengaruhi sifat arah arus.*

*Dalam 20 tahun, perikanan pelagis di utara Jawa Tengah mengalami evolusi dan perkembangan yang cepat. Nakhoda kapal "purse seine" dipaksa belajar, berinovasi, beradaptasi dan menemukan daerah-daerah penangkapan baru, agar dapat memenuhi permintaan akan produksi ikan. Bila saat ini, sejumlah besar nakhoda telah menjadi benar-benar ahli, namun penangkapan yang berhasil, bagi sementara mereka, masih merupakan suatu untung-untungan.*

KATA KUNCI : strategi penangkapan, pukot cincin, pengetahuan, daerah penangkapan, persepsi terhadap laut, kepercayaan.

The introduction of new technology such as GPS, radio (SSB), echo-sounders, lamps and bigger size boats and nets raised hopes among captains that purse seine fishing would be easier. To some extent, these hopes were met in that the crews can communicate with each other, they can look for a position, record good fishing grounds, avoid dangers and change their fishing tactics (Potier and Petit, 1995). Yet they are still facing a major problem to them : the results of a set of purse seine during a trip remain uncertain no matter the season or the boat. For most captains, there seems to be no set rules and little guaranties to successful catches apart perhaps from the help of the *dukun*, the wise man and the rituals in favour of protection and chance.

After describing the purse seine fishing strategies and the fishing grounds, we shall discuss the reaction of the captains and the fishermen from Juwana in relation to their perception of the sea.

The research was conducted from April till December 1995 on 20 purse seiners based in Juwana and their captains, through the medium of log books, interviews, visits on board and a three week trip in the Java Sea on board two large seiners of 32 and 37 meters long, *Margo Wibowo* and *Margo Waluyo*.

## ACTIVITY ON THE FISHING GROUNDS

### Purse seine fishing

- General strategy and tactics

Most purse seiners prefer to sail in groups or to move individually from one group to another depending on radio information which relate course, position, species of fish as well as size, school of fish, direction of the wind and of currents, the size of the waves, the colour of the water.

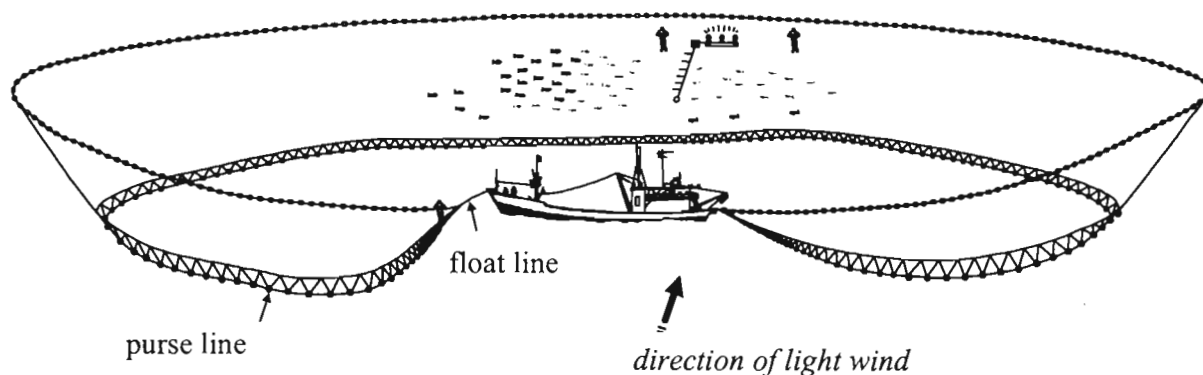
Radio information does condition the choice of moorage for the majority of captains who as soon as they learn about a good ground set for it and anchor. Others prefer to find grounds alone in which case they will soon be rejoined by others if they find fish and let others know about it. Fewer will be in contact with local fishermen with who they will exchange fish for information.

Once a ground has been reached, captains generally look at the sea in search for the signs that will predict fish. According to fishermen, the colour of the water is important because it should neither be too blurred nor too crystal clear. The strength of the surface current should not be too strong in which case the setting of the seine would be difficult. The captain also examines all around the boat to see if there are little bubbles coming up from the bottom to the surface which are a sign there are fishes below the boat.

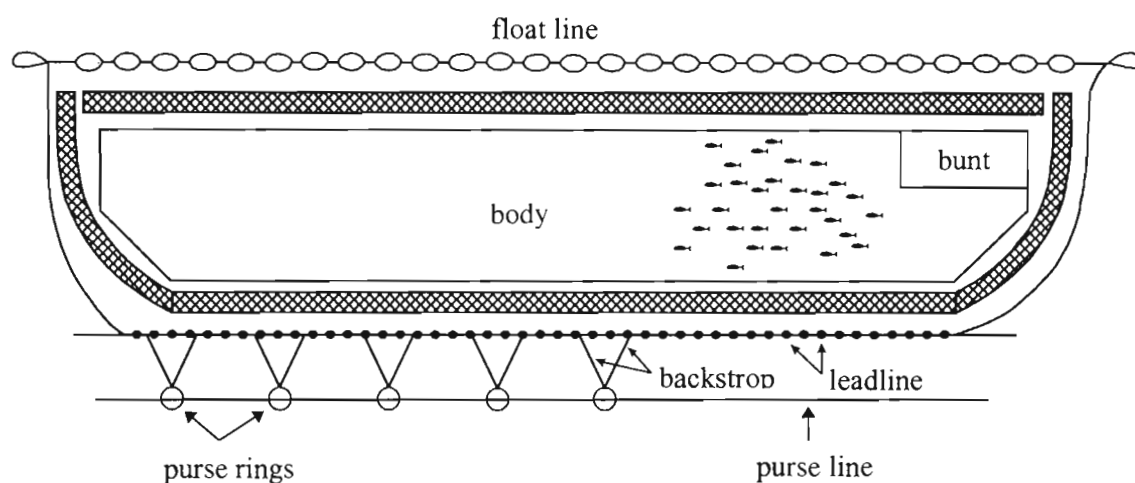
After anchoring the boat, the captain usually throws a line full of small fishing hooks to see if there are fishes and what are the species. Then he will throw a line of about 50 meters long which has a tiny sinker to check the direction of the surface and bottom currents. The captain holding the line in his hand can feel the change of direction and therefore knows the direction of currents which he will straight away check on the compass. This information will condition the way he will set the net.

The evolution of the purse seiners in the Java Sea has been described by Potier and Sadhotomo (1995a). Purse seine fishermen combine the use of electric lamps and paraffin pressure lamps and of Fish Aggregating Devices (FAD or *rumpon*) to catch the fish. The *rumpon* is a fish aggregating device made up of a line along which coconut leafs are tied. It is maintained on the surface by a piece of polyethylene. Electric lamps are permanently set both in the stem of the boat and around the wheel house on supporting framework which can be lowered and directed to give light down to the water. Paraffin pressure lamps are used on a raft which is tied to the *rumpon* just before the boat is about to set the seine to concentrate the fish and prevent it from going away (Fig. 1). Although today the use of lamps plays a major role in the fishing, the *rumpon* keeps all its importance as show the observations on board the boats as well as the interviews with the 56 captains based in Juwana in 1995. At the beginning of the fishery the *rumpon* were permanent and spread around in the sea (Potier, 1995). They are now mobile and attached to the side of the boat wherever the boat anchors.

a)



b)



**Figure 1 : Purse seine fishing : setting the seine**  
**Perikanan pukot cincin : menebar jaring**

Two types of *rumpon* used by the captains in Juwana were noticed :

- type A is a *rumpon* of about 50 to 60 meters long maintained in the water by two stones, one at the end of the line, the other at about a third of its length (Fig. 2, type A);
- type B is two *rumpon*, one of 50 to 60 meters long and another of about a third of the length of the first one. Each of them is maintained in the water by a stone (Fig. 2, type B).

We notice that in the case of type A, the *rumpon* is located in the centre of the boat whereas in type B, they have added a smaller *rumpon* at the rear of the boat. In 1995, 54 captains out of the 56 registered at the time in the Juwana harbour use the *rumpon* type B. The other two prefer to use type A *rumpon*. Type B is a more recent version of type A.

According to the fishermen, the *rumpon* type B is better for two reasons. The first one is that fish can gather under two poles. They can move from one to another and concentrate under the *rumpon* located at the rear when the one located on the centre is brought on board again. The second reason is that it is more convenient to have two *rumpon* rather than putting a third of its length back to the sea as it is the case of the *rumpon* type A. The two captains using the *rumpon* type A say it does not really make a difference and that it is just as quick to throw back a third of its length in the sea before all the *rumpon* is brought up on board so that the fish do not go away than to have another shorter *rumpon* at the back.

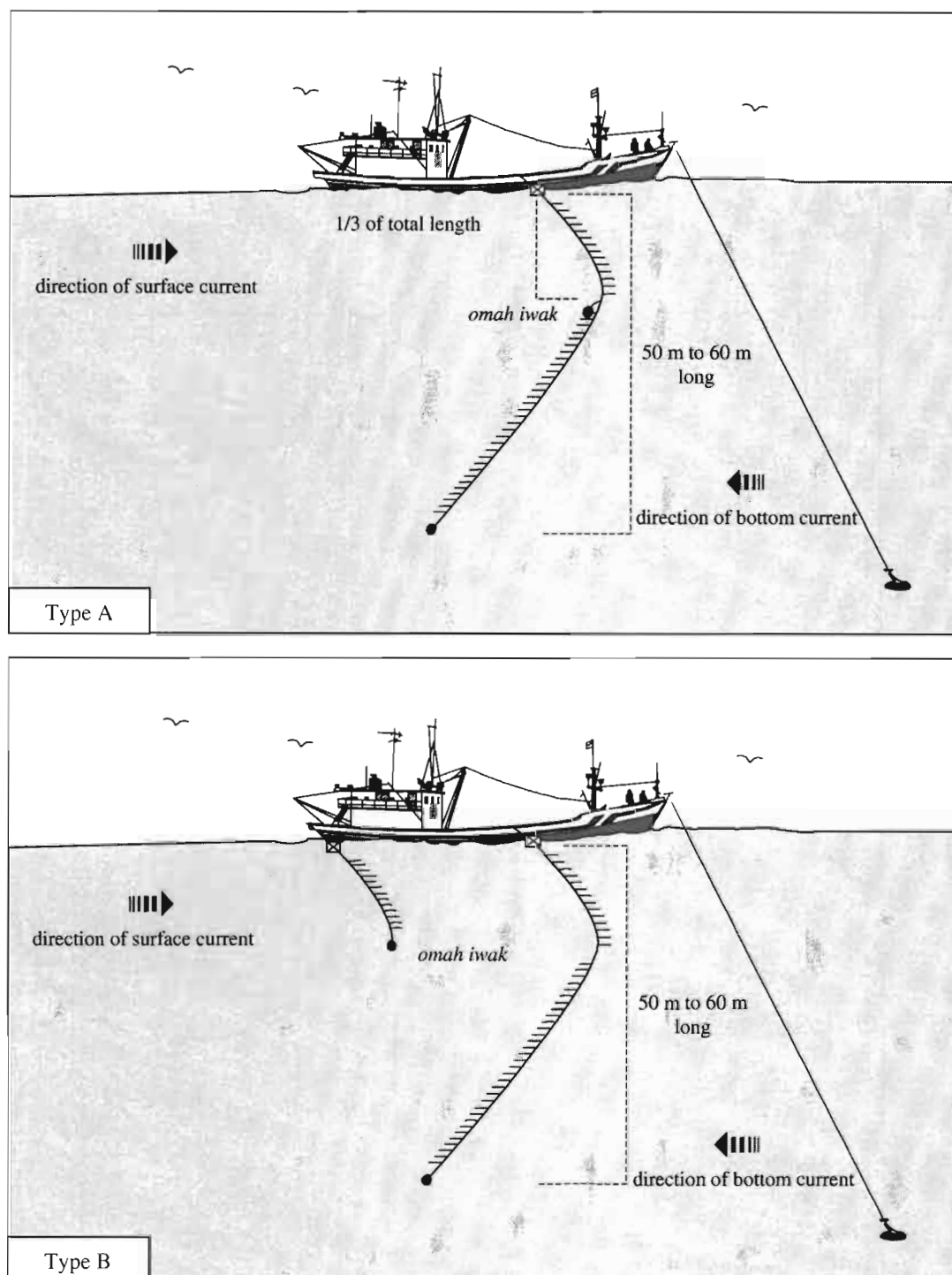
- Setting the seine

Every time a boat decides to anchor, she will straight away put the *rumpon* in the water. The *rumpon* will be secured with a 5-meters-long rope to the boat (either at the centre or at the centre and at the rear depending on the type of *rumpon*) as soon as she has chosen a suitable moorage and has anchored. At 5:30 p.m., the boat lights up all its projectors/lamps set on supporting framework which are lowered and directed to give light down to the water until the next morning. At 3 a.m., the captain wakes up his crew to get ready for the setting of the seine. Apart from the captain, the crew is made up of a first man, sometimes a second, a mechanic and an assistant mechanic and of seamen which depending on the size of the boat gathers between 35 to 50 men. Some of the seamen are permanently responsible for specific tasks. We shall list here only the main ones on which depend the success of a set of purse seine : two men are in charge of the paraffin pressure lamps. They are known under the name of *juru lampu*. One fisherman is called the *juru arus*. He is responsible for the *rumpon* and his job is to tell the captain if the fish is concentrated or not under the *rumpon* and to tell the direction of the current. Finally, another crew member is responsible for holding the gavel of the seine in the water while the boat is going around the raft. He is called the *percelan*.

The *juru lampu* start the paraffin pressure lamps and put them on a steel-framed floating polyethylene raft. In the mean time, the rest of the crew brings in the *rumpon* on board (type B brings in the longest *rumpon*). In the case of type A, a third of the length of the *rumpon* will be put back in the water and tied again to the side of the boat. When ready, the paraffin pressure lamps raft is put in the water and carefully tied to the *rumpon*. The boat then starts up the engine and cautiously turns off the projectors on board one by one every minute not to scare the fish away and giving it time to concentrate under the *rumpon* and the pressure lamps raft. Before leaving the moorage, the captain checks again the direction of the currents as the way he will set the net closely depends on the direction both of the winds and of the currents.

The *juru arus* and *juru lampu* are at post floating in the water with an inflated inner tube to look after the lamps and the *rumpon* and make sure that they do not go anywhere. At 3:45 a.m., the purse seine weighs anchor. The raft and the *rumpon* are untied from the boat. The purse seine sets away to prepare encircling the *rumpon* with the seine finding the best position depending on the direction of the wind and of the current. In the meantime, the *juru lampu* watches out that the lamps do not die in which case all the fish would go away and they would not set the seine while the *juru arus* looks below the *rumpon* to see if there is fish. The *juru arus* will always position himself in relation to the *rumpon* and lamp raft agreeing with the surface current. A way to remind the captain of the direction of the current and not to be caught between the raft and the net and to prevent the raft from going anywhere. At the stern of the boat, the *percelan* waits for the signal to jump in the water with an inflated inner tube and holding in his hands an electric torch and the gavel of the seine. Once in the water, he will act as a marker buoy. The captain keeps his eyes on the raft and waits for the *juru arus* signal which will tell him if the fish is concentrated or not under the *rumpon* by throwing pitches of water in the air. At 4 a.m., the net is set in circle around the *rumpon* and the lamp raft. It takes about three to five minutes to meet the *percelan* (Fig. 3).

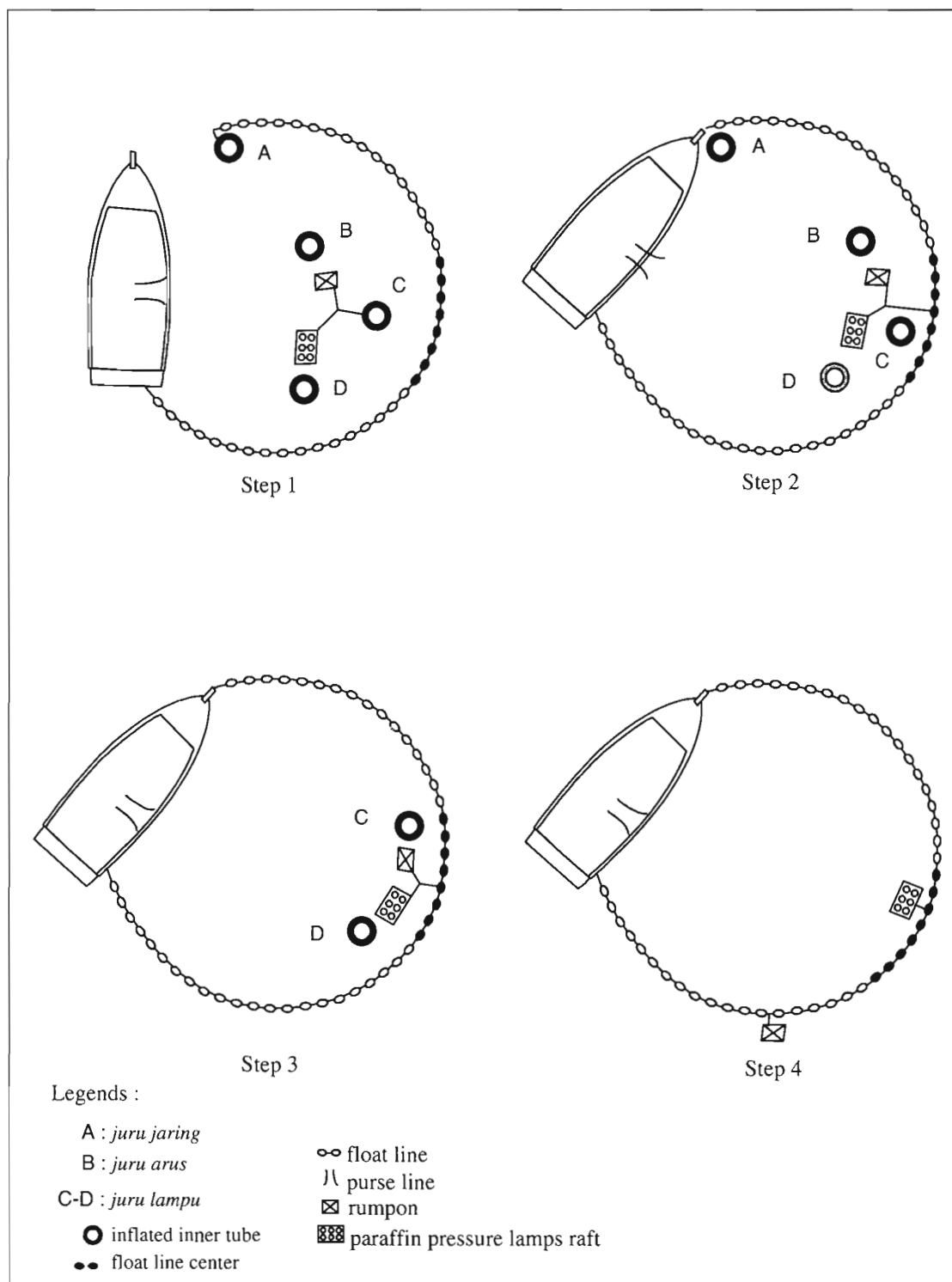
The latter undoes the purse line tied up to the gavel so as to let the other crew members bring it quickly to the centre of the boat. The first man directs the operations until the purse rings are on board which will then definitely close the purse and imprison the fish. In the meantime, the *juru lampu* and *juru arus* ties up the *rumpon* and the lamp raft to the centre of the float line so as to concentrate the fish away from the purse line thus preventing it from escaping until the purse is closed (Fig. 3, steps 2 and 3).



**Figure 2 : Fishing aggregating devices and location of the fish house (*omah iwak*)**  
***Alat pengumpul ikan dan lokasi dari rumah ikan (omah iwak)***

Once the purse is closed, the *juru arus* goes back on board while the *juru lampu* ties the *rumpon* outside the net leaving only the lamp raft tied on the float line (Fig. 3, step 4). This operation lasts between 20 to 40 minutes depending on the size of the net.

Six seamen, three sitting at the front of the boat and three sitting at the rear will always make sure to carefully bring in the float line so as to make sure that it does not go under the hull or that the net is not caught in the propeller. In the meantime, all other fishermen bring in the main body of the seine on board.



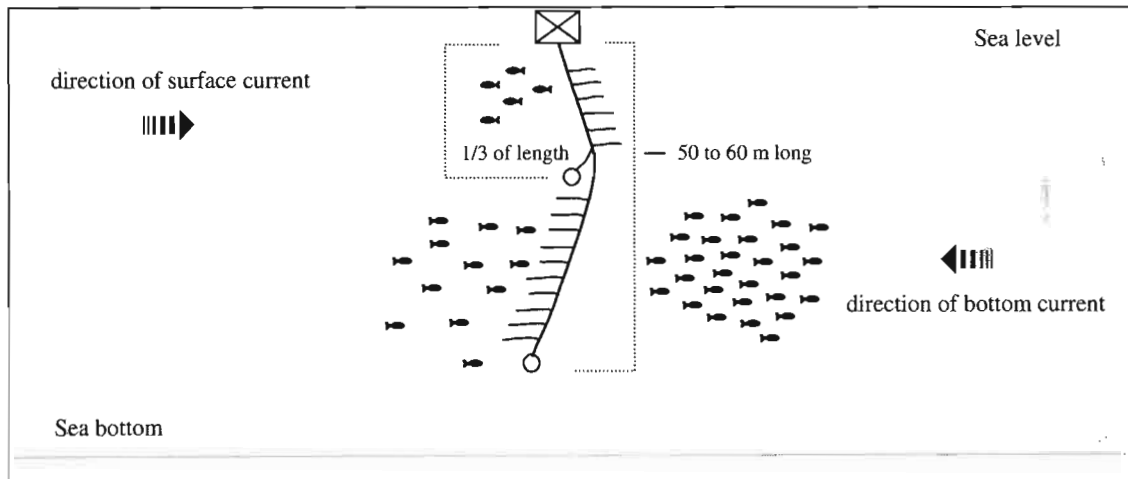
**Figure 3 : Setting the seine**  
***Menebar jaring***

- Utility of *rumpon*

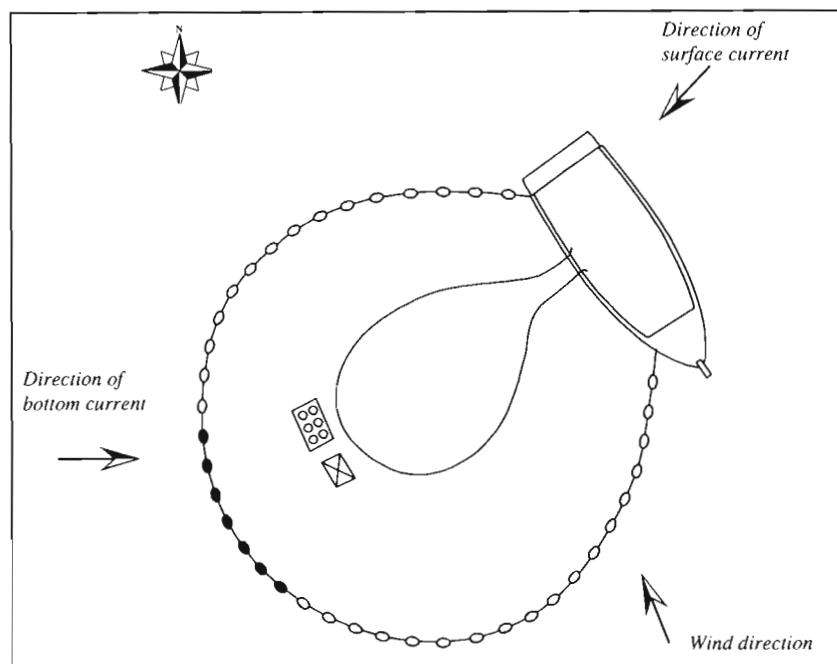
The *rumpon* and the lamps help to concentrate the fish in a certain place and to move the fish from one place to another so that they do not escape. According to fishermen, it is impossible to catch fish without the *rumpon*. First they believe that fish need a place to gather and to play around. They insist on the fact they if they used lamps only, fish would be attracted by the light but that they would not stay under or around the boat especially when the boat is about to set the net.

Secondly, they say that the *rumpon* is an indicator of the localisation of the fish in relation to the current. Thus the shoals are always localised upstream the direction of the bottom current (Fig. 4). This information to the captain is very valuable. The captain must take into consideration the localisation of the fish, where and how the purse line will fall and anticipate the shape of the float line after setting the seine. It is the combination of both the strength and direction of the wind and currents together with the speed and the route of the boat while encircling that will influence on the success of the catch.

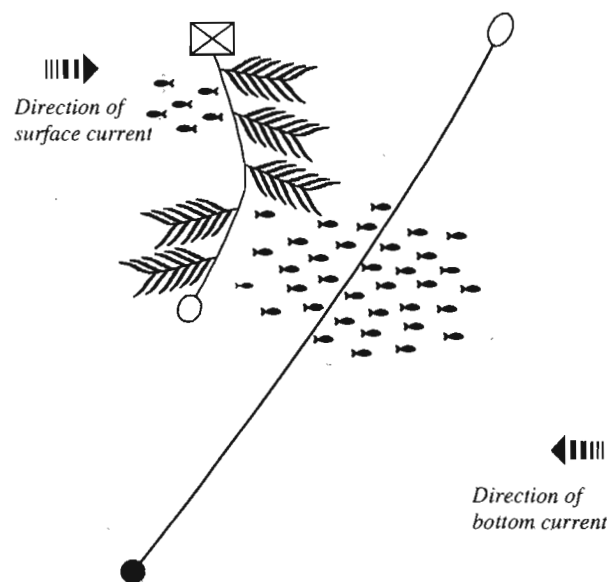
Mostly, captains would set the seine and anchor to the wind trying to combine with the currents to catch fish. In ideal conditions, the surface current will maintain in place the float line while the bottom current would nicely fall and capture the shoal facing up its direction under the *rumpon*. The wind would keep the boat away from the net (Fig. 5) whereas in figure 6, the seine has been set too close thus catching only part of the shoal.



**Figure 4 :** Location of fish under the FADS or *rumpon* before setting the seine  
*Lokasi ikan dibawah FADS atau rumpon sebelum menebar jaring*



**Figure 5 :** Ideal wind and currents conditions  
*Keadaan ideal angin dan kondisi arus*



**Figure 6 : Wrong position of the purse rings relating to the *rumpon* position and the currents' direction**  
*Posisi salah dari cincin kantong hubungannya dengan posisi rumpon dan arah arus*

### Fishing grounds

Information was collected from purse seine captains in Juwana. It shows that all the fishing grounds for 1995 are located on the eastern part of the Java Sea. Fishermen choose their fishing grounds according to the climate cycle, that is a typical monsoon climate characterised by the complete reversal of wind from west to east which was described by Durand and Petit (1995).

With the arrival of west winds in December and January, the purse seiners sail to the Makassar strait in search for shelter on the leeward of Kalimantan. Fishermen operate there during the raining season which last until march. Fishermen call this season *musim sepi* or the low season. A transition period follows the west season bringing along a more temperate climate and a northerly wind. The sea is usually calm. Fishermen say that this is the mating season both because the fish they catch are full of eggs and that it is difficult to catch fish because the fish would rather stay at the bottom of the sea to lay their eggs.

The months of July, August and sometimes September see the arrival of very strong easterly winds with very formed seas. Fishermen sail between the islands of Masalembo, Bawean up to Sembirgelang and Sembirgelap. During those months and at these positions, they catch small size fish, not yet mature. Finally, the high fishing season begins in September right through till November and sometimes December. It is a transition period marked by north-westerly winds and light seas. Purse seiners sail around the islands of Madura, Masalembo and Matasiri until December. As soon as the west season arrives, all the vessels go back to former fishing grounds located north-east.



## Fishing efficiency

Setting the seine does not necessarily guarantee successful fishing nor the quantities of fish caught. We shall present here two types of daily catch report taken randomly in November, that is towards the end of the high season. The first type shows the progression of the catch during a trip for a particular boat. The second one shows the quantity of fish caught on a particular day by various boats fishing in same area.

We choose the example of five boats who left at the same time Juwana or were at sea during the same period. The data come from log books and from everyday radio monitoring recording. We should mention that it is likely that some of the radio information be distorted due to the fact that some captains want to keep for themselves good fishing grounds before informing their colleagues.

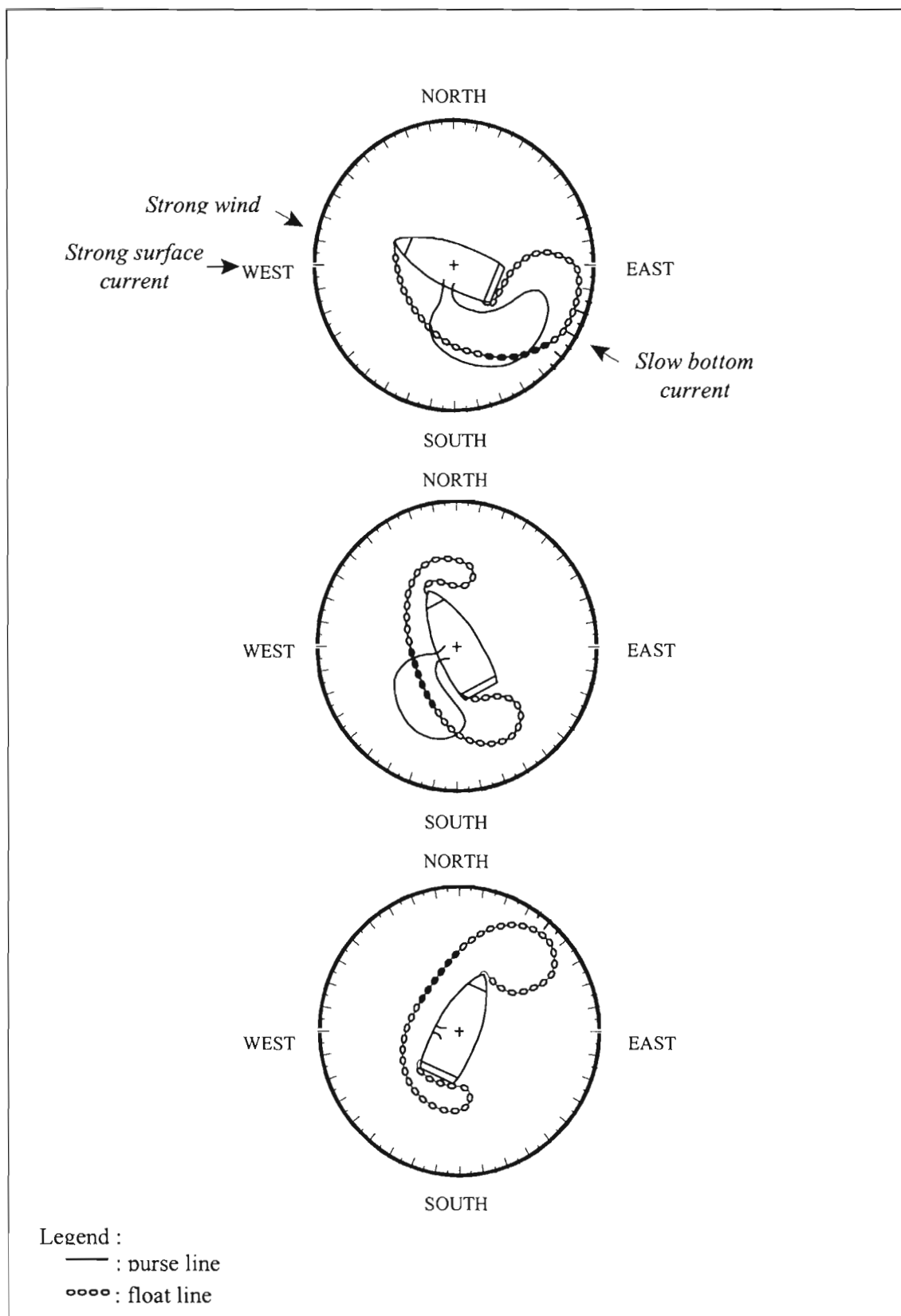
All reports show the irregularity of the catch and the probability of not catching any fish regardless of the boat or the position. When several boats are on the same position, some catch fish, some do not.

Potier and Sadhotomo (1995b) mentioned that the full moon could have an effect on the catches. Fishermen agree that the chances to catch fish are smaller during that time, but some captains are still able to catch up to three holes. There seem to be no set rules. Many reasons could explain such irregularities :

- the size of the boat, the engine horse power and the number of lamps on board;
- the weather;
- the frequency of movements of the ship;
- the absence of fish;
- technical incidents such as for example the paraffin pressure lamps raft which die just when the boat is about to set the seine, the *rumpon* which disappears, because the setting was done much too wide in which case the crew has to use a rope to bring the pilot on board again, thus giving a chance to the fish to escape as the purse rings are not quickly brought back on board;
- the accidents;
- the number of boats fishing on the same ground;
- the combination direction and strength of wind and currents.

The length of the trip varies according to the season (Potier and Sadhotomo, 1995b) so there is no doubt that they are affected by the weather and by the currents. Thus, from the end of December till June the boats may stay up to 45 days at sea. During the high season from September till November, it will sometimes take only 10 days to fill up 12 holes. Some of the log books frequently mention the difficulty to set the seine because the currents constantly change or are much too strong to work. The fishermen's description shows that the west monsoon and its following transition period present some currents which either constantly change or run too fast.

Strangely enough for the fishermen, the low season corresponds to the time when the currents constantly change. Inversely, the high season corresponds to the time where the currents are not too strong and rather stable. The example below illustrates a situation that does present a problem where the wind and the surface current come from the west whereas the bottom current comes from the opposite direction (Fig. 7). In such conditions, it will be difficult to set and succeed in catching fishes because the strength of the wind and surface current being much stronger than the bottom current will move the float line too close to the side of the boat before the purse ring can actually be brought on board which gives all the chance to the fish to escape.



**Figure 7 :** Example of a difficult sea condition to set the seine  
*Contoh suatu kondisi laut yang menyulitkan untuk menebar jaring*

As we just have seen, the results of a set of seine cannot be predicted. It presents irregularities which are perceived by the fishermen as a question of luck and of fate. If not why would some catch fish and others not ? This brings us to the question how do the fishermen react to the success or the failure of setting the seine ? How do such reactions translate their perception of the sea and its resources ?

The most popular reaction is to visit one or several *dukun* for advice on where the fish are but also to change their fate. The *dukun* is a wise old man who can get in contact with the spirits and the gods of the sea, thus acting as a mediator between men and higher forces to ask their help or be pleasant to them.

For the fishermen from Juwana, the sea is a huge empty space without any boundaries nor resting place. It is a mysterious and unpredictable space inhabited by demons and evil and beneficent spirits. It is also the home of the prophet Kidir, warden of the Java Sea, the prophet Sulaiman, warden of animals and fishes and of Sutombono, son of the King Sutoyo, angel protector of all fishermen from Jepara till Rembang in Central Java, thus including Juwana. The sea is a dangerous place for two reasons. The first one is that it is invisible and dark bellow the surface, thus hiding currents, reefs and rocks. The second is that spirits and ghosts can constantly disturb or distract fishermen and have an effect in the success of their catch.

Thus, in order to face up these dangers, fishermen and captains of boats observe rituals for protection and the chance before going at sea. Three of the most common practices will be described here.

### ***Jarum emas or gold needle***

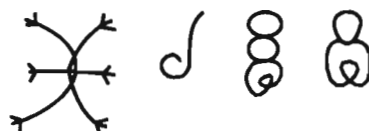
Before a captain from Juwana take the command for the first time of a boat, he will buy two needles in 24 carat gold, one of 1,5 or 2 grams and a second one of 1 gram which he will bring to the *dukun* of the village for him to put them on the boat.

The ceremony *pasang jarum emas* or the setting of god needles usually takes place around 7 o'clock at night. The *dukun* puts one gold needle right at the stem of the boat and another at the helm. To do so, he will first prepare the hole with a steel nail and a hammer. When the hole is ready, he takes a piece of banana *pisang emas* and puts some of it around the gold needle and in the hole. He then whispers some magic formulas and prayers as he enters the needle in its hole. When asking either the captains or the *dukun* on the meaning of the ritual, they say that the needle at the stem is there so that the boat shines, that is appears clear and bright as it sails the seas. The one placed on the stirring wheel has for function to go in the right direction and when meeting trouble or spirits to be quickly able to stir away from them.

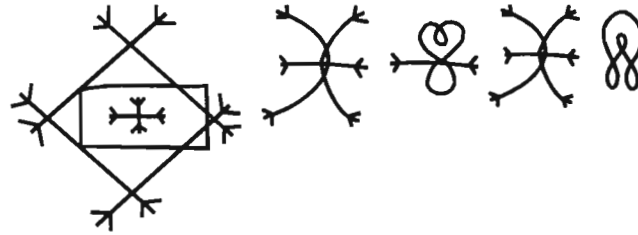
### ***Rajah or magic formulas***

Rajah are written magic formulas in favour of protection and chance. The writing is both Javanese and Arab(Appendix 3). They translate various requests to the gods of the sea. *Paron* oil drops will be put on each *raja* to be effective : some examples are given here.

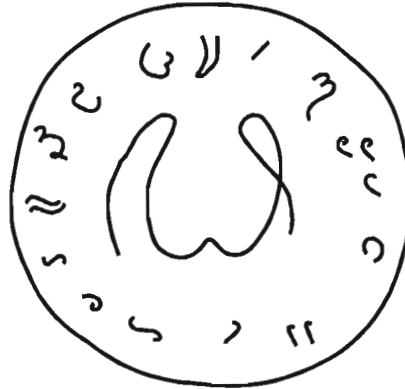
a) to address the prophet Kidir :



b) to address the King prophet Sulaiman :



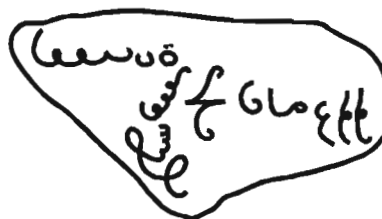
With such symbols so that both kings show them where to look for fish and enable them to catch a lot. For the search of luck and chance, four symbols have to figure in the *raja* (Fig. 8a).



8a



8b



8c

**Figure 8 : *Rajah***

Finally, to keep away from any trouble or spirit, the *dukun* uses the following symbols (Fig. 8b).

According to the *dukun*, there are of lot of turbulence in the sea like accidents due to the appearance of ghosts. Other time captains may not see fishes even though there are plenty because some ghosts are disturbing and making captains see other things. This is one reason that explains that they do not catch fish. Thus those formulas are used to clear away any kind of ghost.

Special formulas are used so that the fish be attracted to the boat and decide to play and stay under the *rumpon* (Fig. 8c).

*Rajah* are wrapped up in a thin plastic. In some cases, they may also be wrapped again in a white linen. They may be specific for one purpose or for several in which case few formulas will be combined. At least three or more *rajah* are found on the boat, usually nailed at the stern and at the bow of the vessel, above the stirring wheel and in the engine room.

On board each boat, one, sometimes two *rajah* are tied to the stone which maintains the *rumpon* in the water (Fig. 2). The stone is called the *omah iwak* or fish home in Javanese. Fishermen believe that the *rumpon* is a shelter for the fish, a house to stop by during the long run across the bare world. The stone, the anchor is the foundation of that house. Thus, *rajah* are placed here both to push away any ghosts that would want to live in that house, preventing the fish to stop by and as an attraction calling the shoals.

### **Selamatan or ceremonial meals**

Before each trip, fishermen observe two types of *selamatan* :

- The *selamatan* directed by the *modin* or Muslim priest called in Javanese *manakipan*, a prayer in Arab asking god to protect the fishermen. The prayer is followed by a communal meal made of rice, different Javanese dishes, chicken and bananas. The meal is shared among the crew. By doing so, they ask god for a safe trip and that luck be with them.

- The *selamatan* directed by the *dukun* who dictates the meal that has to be prepared depending on the boat, the date and the situation. This *selamatan* is a way to ask the God of the sea the permission to catch fish before leaving. To be pleasant to the gods, they offer meals they like eating best. Thus, a pyramid of rice will be a gift to the god Kidir, yellow rice for the god Sulaiman, chicken eggs to please the god Sutombondo. Even if one of these offerings was not to please as long as some of them were right, fishermen could still get fish. A plate is offered at the bow of the boat and the rest is shared among the crew. This *selamatan* generally takes place on the way to the river mouth or at the river mouth before entering the sea.

This *selamatan* is usually followed by another ritual called *siraman*. The *dukun* gives to the captain a bowl of water in which he has thrown flowers while whispering the usuals. The captain is told to pour the mixture starting from the front of the boat going toward the stern on both right and left sides as well as on the net. Fishermen believe that there are one or several invisible good guardians protecting the boat. Thus, before leaving for the sea, they wash the invisible guardians so that the boat feels clean and clear, ready to go. They often appear as crazy people to the captains in their dreams if the boat was not watered with flowers or as nice persons for those who have observed the ritual.

If after following all these rituals and ceremonials, the captain still does not catch any fish, he will first contact his manager by radio if he is at sea to ask his wife to go and see the *dukun* and make a *selamatan*. Depending on the date, the boat and the captain, the *dukun* will call for a number of offerings to be prepared so that the captain is able to catch fish. On his return from the sea, the captain will look for other *dukuns* in order to put all his chances on his side. Each will advise him on the choice of fishing grounds, new rituals to observe and give him things to carry at all times for protection and chance.

No matter the captain, whether he is young or senior in the profession, he will consult one or more than one *dukun* before going at sea. Some will also ask the *dukun* which is the best day for him to leave. Even the most performing captains keep up with the tradition afraid to see the wind of luck change. So much so that the less performing ones believe that there are *dukun* more powerful than others and so they are always on the hunt at for a new wise man.

To compare their reactions to the success and failure of setting the seine with their reaction at sea when confronted to a particular situation, we organised a test with 20 of the 56 captains registered in Juwana in mid 1995. Each situation presented specific wind and currents' directions as well as their strength. From this information, the captain was to draw how he would set the seine in such a situation.

The results presented here present two aspects. The first is that the majority of captains set the seine to the wind no matter the direction of the currents and their strength. The second thing we observe is that a minority is setting the seine trying to adapt to each particular situation in order to maximise the

catch which means that some of them associate their failure with the situation they are confronted to while setting at that particular moment. Thus, they will set the net with the wind in the back or on the side. Because of the minority aspect, we tend to think that they are still at an experimenting stage. This idea is confirmed by looking at the log book which keeps record of the evolution of setting the seine during a trip.

#### CONCLUSION

For the purse seine fishermen from Juwana, the Java Sea is a hostile and an unknown world. On the one hand, they perceive the resource as unlimited. On the other hand, they need to refer to some known elements to explain the probability of catching fish. It is a sign of a culture that has not yet appropriated its environment, thus the rituals in favour of protection and chance. Their activity can be compared in relation to day and night. Some known element such as a projector informing on the dark, and at the same time denying it and protecting, acting as a barrier between men and the unknown.

However, even if fishermen are still attached to traditional value, some of them are innovating, trying and learning the sea. It would interesting in further studies to compare their tacit knowledge with formal scientific research on the current pattern of the Java Sea.

#### REFERENCES

- Ben Yami M., Pichovich A., 1988, La seine tournante avec des petits bateaux. Collection FAO formation, FAO, Rome.
- Durand J.R., Petit D., 1995. The Java Sea environment, *in* : BIODYNEX, Biology, Dynamics, Exploitation of the Small Pelagic Fishes in the Java Sea, Potier M. and Nurhakim S. (eds), AARD/ORSTOM : 14-38.
- Potier M., Sadhotomo B., 1995a. Seiners fisheries in Indonesia. *in* : BIODYNEX, Biology, Dynamics, Exploitation of the Small Pelagic Fishes in the Java Sea, Potier M. and Nurhakim S. (eds), AARD/ORSTOM : 49-66.
- Potier M., Sadhotomo B., 1995b. Exploitation of the large and medium seiners fisheries. *in* : BIODYNEX, Biology, Dynamics, Exploitation of the Small Pelagic Fishes in the Java Sea, Potier M. and Nurhakim S. (eds), AARD/ORSTOM : 195-214.
- Potier M., Petit D., 1995. Fishing strategies and tactics in the Javanese seiners fisheries. *in* : BIODYNEX, Biology, Dynamics, Exploitation of the small Pelagic Fishes in the Java Sea, Potier M. and Nurhakim S. (eds), AARD/ORSTOM : 171-184.