

STUDY ON THE BIG PURSE SEINERS FISHERY IN THE JAVA SEA

(III. The Fishing Method *)

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ABSTRACT : The encircling purse seine first appeared in the Java Sea around the 70's and later became one of the main gears used to fish small pelagic species there. It equips the big purse seiners of the northern coast of Java which are the subject of this study. Fishing is carried out for the most part at night around anchored rafts, the fish being attracted by lights. This method is still very archaic, despite some new developments. The fishing gear is of a standard design, but it is the skippers who are in charge of setting and assembling the nets. The numbers of rafts and set nets vary with the seasons, with a maximum in March-April and a minimum in October-November. The preliminary results obtained require further investigations and log books must be distributed and kept by the skippers.

RESUME

Apparue dans les années 1970 en mer de Java, la senne tournante et coulissante est l'un des principaux engins pour la pêche des petits poissons pélagiques de cette mer. Elle équipe les grands senneurs de la côte nord de l'île de Java, objets de cette étude. La pêche est réalisée essentiellement autour de radeaux ancrés, de nuit et sur des aggrégations de poisson concentrées à la lumière. La méthode employée reste très archaïque et ne semble pas évoluer malgré les changements observés dans la pêcherie. L'engin de pêche présente un plan standard même si le montage et l'assemblage sont réalisés par les patrons eux-mêmes. Le nombre de radeaux et de calées varie avec synchronisme suivant les saisons. Les maxima sont observés en mars-avril et les minima en octobre-novembre. Ces premiers résultats doivent être confirmés par une extension des enquêtes et la délivrance de journaux de bord auprès des patrons pêcheurs.

INTRODUCTION

The encircling purse seine appeared at Batang in the Java Sea in the 70's where it was used for the first time by the firm PT. Puspita Niky. Since the ban on trawling in this sea, it has now become one of the main fishing gears employed there. Two types of seiners operating off the north coast of Java are equipped with this gear. Only the big seiners landing their catches exclusively in the Central and Eastern Provinces of Java are studied here.

This article completes the preceding ones devoted to this fishery and concerning the structure of the fleet, the species caught, the quantities landed, the fishing effort and the catches (BOELY and *al.*, 1987, POTIER and *al.*, 1987).

DATA AVAILABLE

The data available is very fragmentary, consisting mostly of interviews with skippers and shipowners.

* This note is part of a series analysing in greater detail the global problem of big purse seiners fishery in the Central Province of Java. It is founded on all the essential data available since 1976 on the activity of the fishing vessels based in this area (BOELY and *al.*, 1987).

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Since October 1986 a plan for sampling (BOELY and *al.*, 1987), has been inaugurated at Tegal and Pekalongan. The skippers whose vessels are sampled are interrogated systematically on the following points:

- The fishing grounds exploited.
- The number of sets per day and the time of day they take place.
- The fishing method employed.

DISCUSSION

1. The Fishing Zones

The different fishing zones, delimited by the fishermen, are characterized by the name of the groups of the islands scattered throughout the Java Sea (Fig. 1). Some of these zones however are closer to other groups of islands than those of which they bear the name. This is the case with the islands of Bawean and Masalembo. The fishermen often possess only a compass and these islands serve as landmarks for positioning. With this method the boats take longer to go from one area to another, for when they want to find their position, they have to retrace their course to look for their rafts. Figure 2 gives some examples of these routes.

The names for the various fishing zones are chosen somewhat subjectively and this is evident when looking through the data obtained by the enquiries made at Tegal. Here many zones overlap (Fig. 3). A consistent delimitation of each zone should be envisaged, for the area cannot be divided into a grid system for statistical purposes until most part of the fishing vessels is equipped with instruments for positioning finding. Then only will it be possible, by evaluating the specific composition of the catches and studying the size frequencies observed for each species, to define the zones from an ecological point of view.

2. The Fishing Gear

a. Fishing nets

The seine net is usually constructed on the same scheme but it is not easy to find a detailed description of the varying dimensions of the encircling purse seine. Those given in figures 4a to 4c were provided by a talk with a skipper of a fishing boat (1986) or were reported by DJADJURI (1978) and WUDIANTO and *al.*, (1986). The skippers survey the making of their seines and each one modifies the standard plan to suit his own methods.

Generally the net measures between 400 and 500 metres in length and has a drop of 60 to 80 metres. It varies in weight from 2 to 2,5 tons. The mesh size is small, ranging from one inch for the main body and wings to $\frac{3}{4}$ inch for the bag. The main features of the seine used in the Java Sea are given in Annex 1. The netting usually comes from the factories in Bandung and Cirebon, but the quantity of netting imported from abroad, particularly from Korea, is constantly growing. The netting is cut and assembled in the harbours. In July 1986 the price of a seine net reached 20 to 30 million rupees, representing about 30% of the cost of the seiners itself.

b. Operating the net

Most stages of the setting are conducted manually. The power block or hydraulic pullies are unknown. A majority of the newest vessels have a capstan driven by an auxiliary engine, but still nearly all the handling is done manually, which explains the large number of crew required (POTIER and *al.*, 1987).

A skiff is adjoined to the boats which serves as a fixed point when encircling the fish and for getting out the raft from the net.

c. Anchored rafts

In the Java Sea these are called "rumpons" and are generally installed above depths of 35 to 70 metres (Fig. 5). A raft consists of three parts:

- The platform, 2 to 3 meters long and 1.5 metres wide, made of an assemblage of bamboo tied together, on which a mark is planted bearing the name of the vessel.
- The immersed part consists of a long rope to the upper 2/3 of which coconut palm leaves are attached. The length of this rope is generally equal to one and half times the depth at which the raft is placed.
- There are two types of rafts according to the anchoring used. The first one, anchored lightly to the bottom, is equipped with 25 to 30 kilos of ballast attached to an anchor, whereas the second one is more securely fixed to the bottom with a 75 to 100 kilo weight formed by stones strung together or placed in a wicker bag.

3. The Fishing Tactics

Once it has reached its destination the boat launches its rafts at a distance of some hundred metres of nautical miles one from the other. The number of rafts launched by each boat varies from 5 to 30. They are left on the fishing grounds until they disappear. There is a notable difference in the number of rafts between those of old boats (6 to 12) and those of new ones (20 to 30). The number also varies with the seasons. During the period observed (October 1986 - April 1987), the lowest number was recorded in October when the greatest catches are taken, and the highest number in April when the catches are decreasing (Table I), (Figure 6). Obviously the fishermen increase the number of rafts when the resource is not easily accessible, in order to multiply the aggregative sources.

During the day the boat remains near the rafts. At dusk the different rafts are then inspected and the boat returns to the one with the maximum concentration of fish. At night, five to ten lamps are lit and some of them are placed on the raft. These are usually petrol lamps of 200 to 300 watts (Petromax). Some vessels nowadays are equipped with electricity.

When the skipper considers that the fish is sufficiently concentrated around the raft the lamps on board ship are extinguished and the net is set. This is when the skiff serves as a fixed point.

According to the type of the raft, the net will be operated differently. When the raft is weighted with only a light ballast, the boat sails round it and before closing the seine the submerged part of the raft is hauled up and this last is removed from the net with the help of the skiff. When the anchoring is heavier the technique used consists in launching a "secondary" raft and provoking by stimulations of various sorts (sinking the first raft, noise made by tapping on the bamboo or the fishermen diving into the water) the concentration of the fish under this raft around which the boat is circling (SUBANI, 1986).

The fishing tactics vary according to the boats, but all skippers make at least two sets each night, often early on, but above all before dawn (Fig. 7), (Table II). Investigations carried out at Tegal show that 30% of the net settings take place between 20h and 0h and 56% from 3h to 7h, with a maximum just before dawn (between 4h and 5h according to the fishing ground).

It is exceptional to set nets visually in daytime, without the help of rafts, and in fact none of the fishermen questioned operated "visually". This method is used though for catching the mackerels *Rastrelliger brachysoma* and *Rastrelliger kanagurta* at certain seasons of the year.

The seasonal evolution of the number of seine sets shows a minimum in October – November and a maximum in March – April (Table III), (Fig. 8). This coincides with the number of rafts and seems to be determined by the same causes. Although the number of seine nets seems higher in the traditional fishing zones than in eastern Java Sea (Table IV), the averages do not differ greatly.

Likewise, when examining the number of rafts laid per fishing zone (Table V) and comparing the means observed, a significant difference between these zones is seen (Table VI). They can be divided into two groups, the first one formed by the traditional fishing grounds of the Javanese fishermen and the second one by the fishing zones in the east (Masalembo and Matasiri) and north (Pejantan) of the Java Sea. This result seems to give evidence of a stratification of the fleet. The older boats prospect the traditional zones and their maximum limit seems to be the Bawean Islands, whereas the more up-to-date vessels prefer to explore farther distant areas (POTIER and al., 1987).

CONCLUSIONS

The enquiries carried out on the fishermen in Tegal and Pekalongan have provided a preliminary picture of the nets used and the fishing tactics employed, and what points still remain to be clarified. All the fishermen use the same tactics which they modify according to their experience of the fishing grounds and to the meteorological conditions.

1. General Conclusion

The fishing method usually employed stays very archaic but nevertheless relatively efficient. Thanks to its drop the seine net is capable of collecting the entire concentration of fish around it attracted by the light. The lack of navigational equipment (radar and sounders) makes the search for the rafts rather problematic. The only way to find the position is to take the island for landmarks and this wastes time. As the fishing operations are manual they are naturally very lengthy.

The numbers of the rafts launched and of the sets made change with the seasons and so with the periods of greater or lesser vulnerability of the fish. When the resource is abundant the number of rafts and sets falls, but when it diminishes then the number of rafts and sets increases.

2. Improvement of the Data Available

These results need to be confirmed by more enquiries and by extending the study to cover at least an annual cycle. At the moment the data available is fragmentary. They could be much improved by distributing log books to the ships' captains, or by sending out simple questionnaires to be filled in on the number of sets and of rafts launched, as well as on the anchoring and catch sites. The sampling plan introduced at Tegal and Pekalongan should be extended to other ports (Juwana and Rembang) where the enquiries carried out with the local skippers should be carried further.

To complete our knowledge, it is worthwhile envisaging the embarkation of scientific observers on board the seiners who could estimate the number of rafts followed from day to day, the length of time spent on the different seine operations and the composition of the shoals of fish caught.

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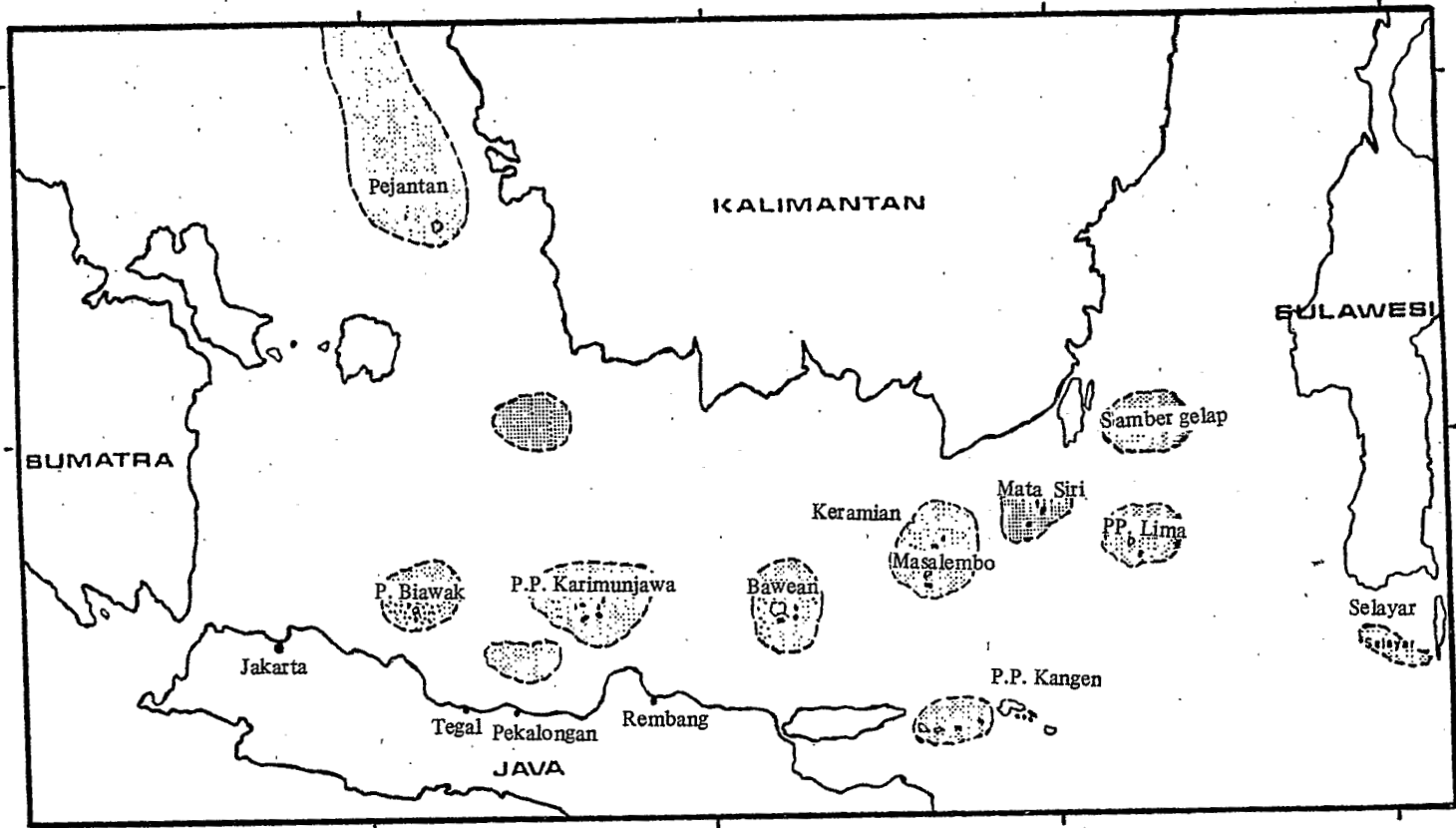


Figure 1. Localisation des principales zones de pêche des senneurs en mer de Java.
Location of the main fishing grounds of the purse seiners in the Java sea.

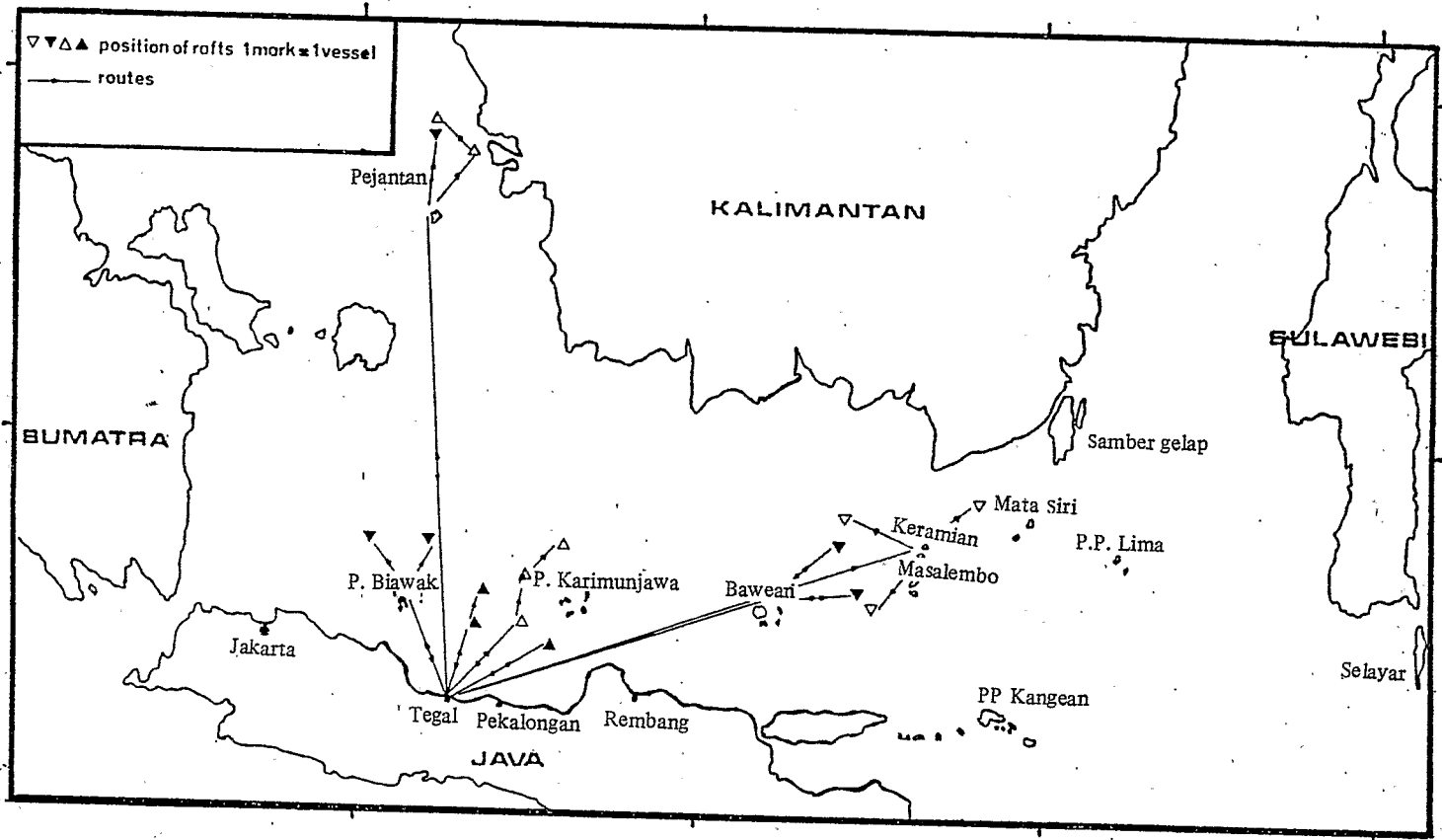


Figure 2. Exemples de trajets effectués par les senneurs de Tegal pour atteindre les zones de pêche.
Examples of roads followed by the Javanese purse seiners to reach the fishing grounds.

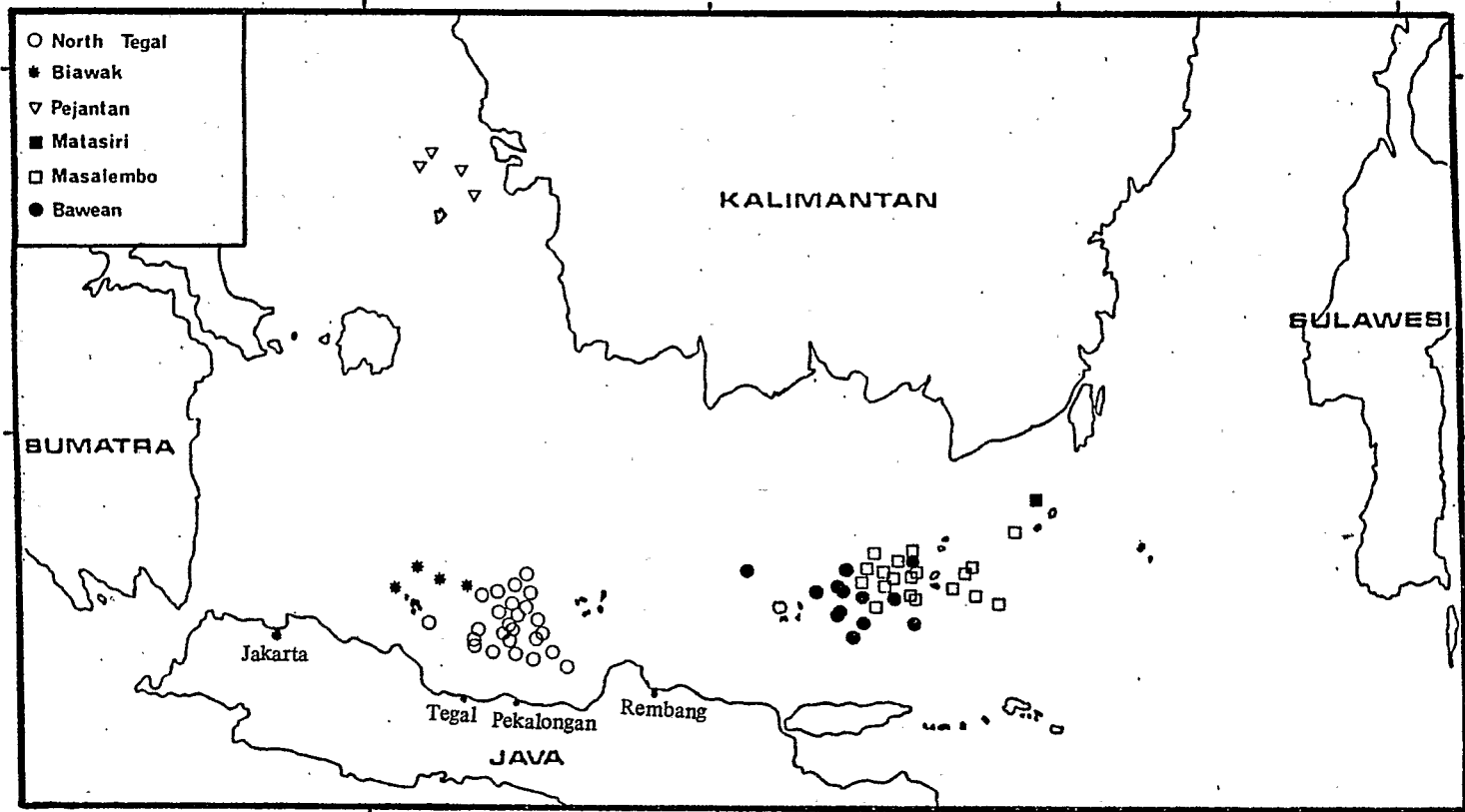


Figure 3. Zones de pêche déclarées par les patrons d'octobre 1986 à avril 1987.

Fishing grounds according to the enquiries conducted with the fishing masters from October 1986 to April 1987.

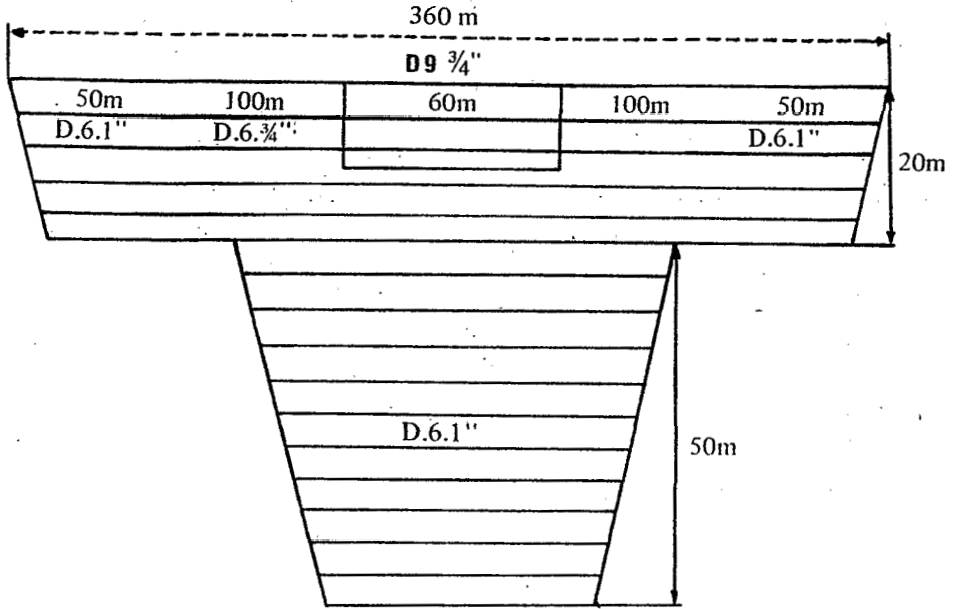


Figure 4a. Plan de senne (DJADJURI, 1978).
Purse seine design (DJADJURI, 1978).

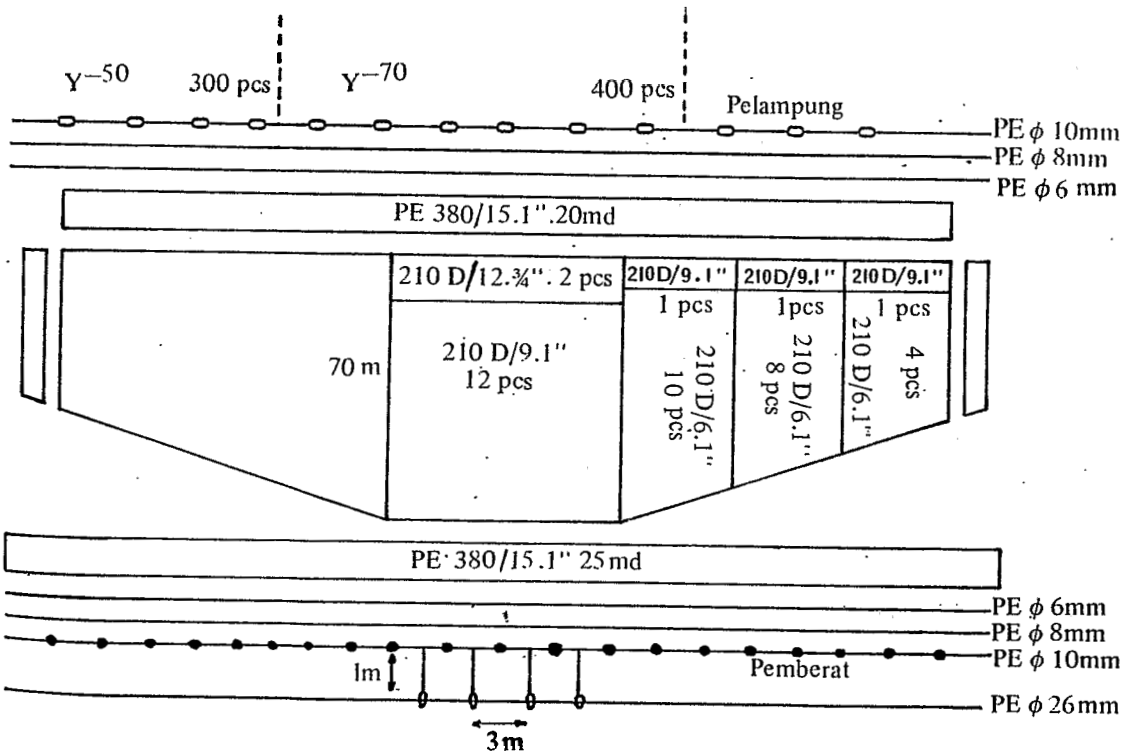


Figure 4b. Plan de senne (WUDIANTO and al., 1986).
Purse seine design (WUDIANTO and al., 1986).

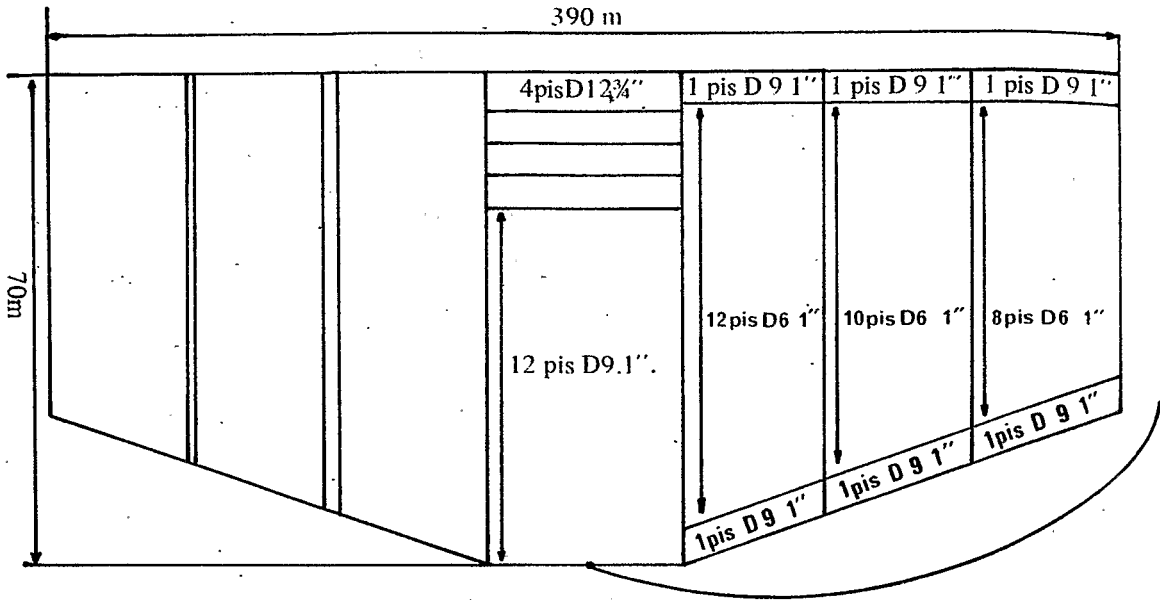


Figure 4c. Plan de la senne du senneur Kartika Jaya.

Purse seine design of the purse seiner Kartika Jaya.

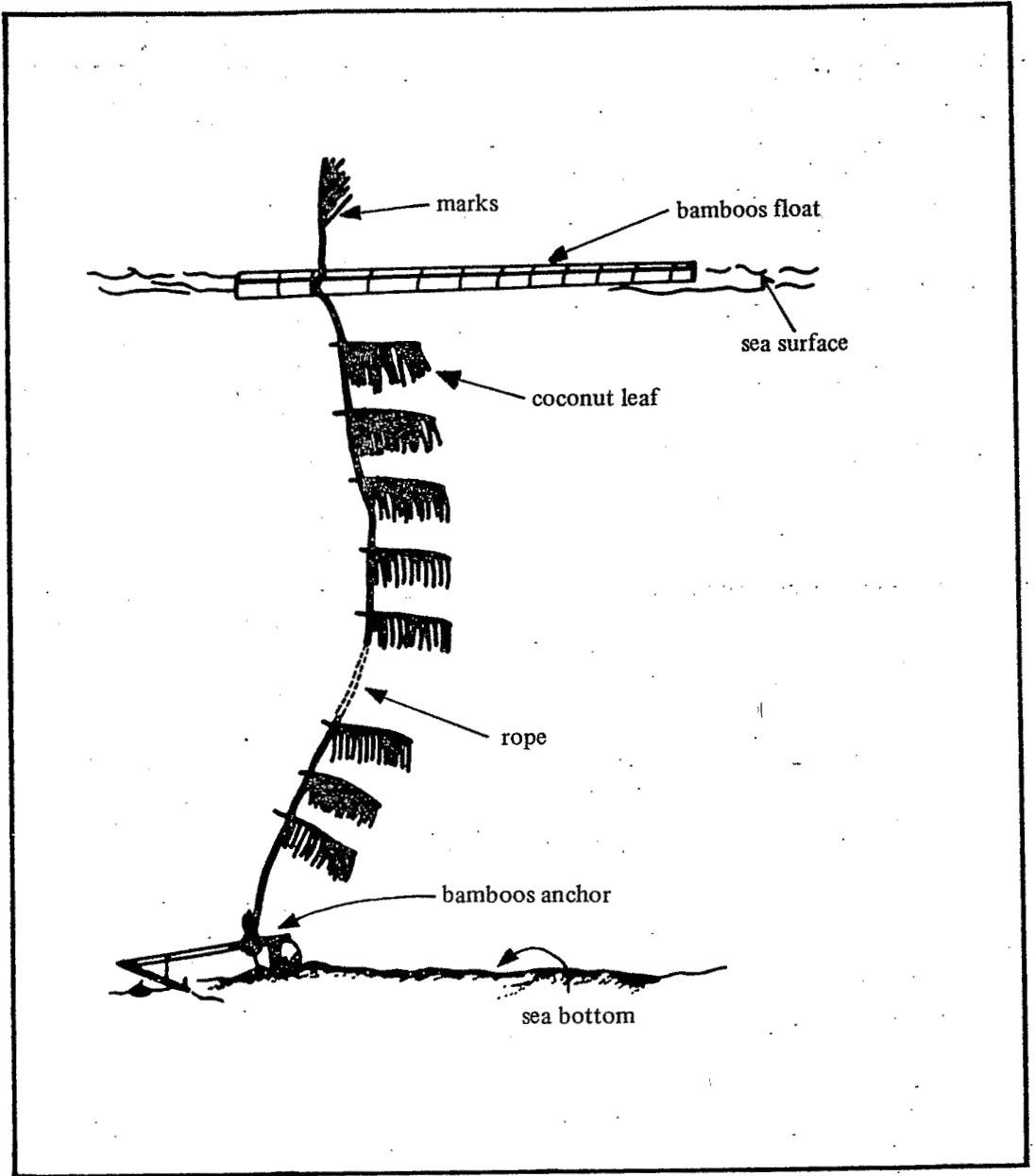


Figure 5. Schéma des radeaux employés en mer de Java (SUBANI 1986).
General design of the rafts used in the Java Sea (SUBANI - 1986).

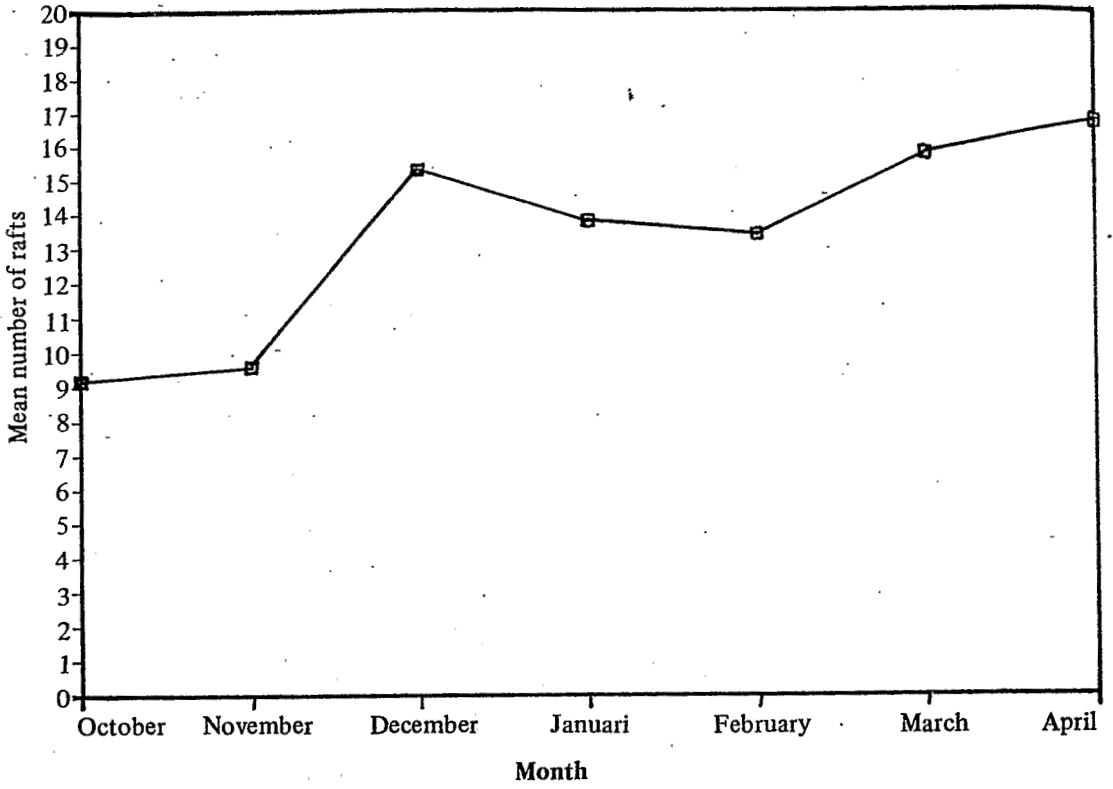


Figure 6. Moyenne mensuelle des radeaux mouillés par les senneurs d'octobre 1986 à avril 1987.
Monthly mean of the rafts anchored by the purse seiners from October 1986 to April 1987.

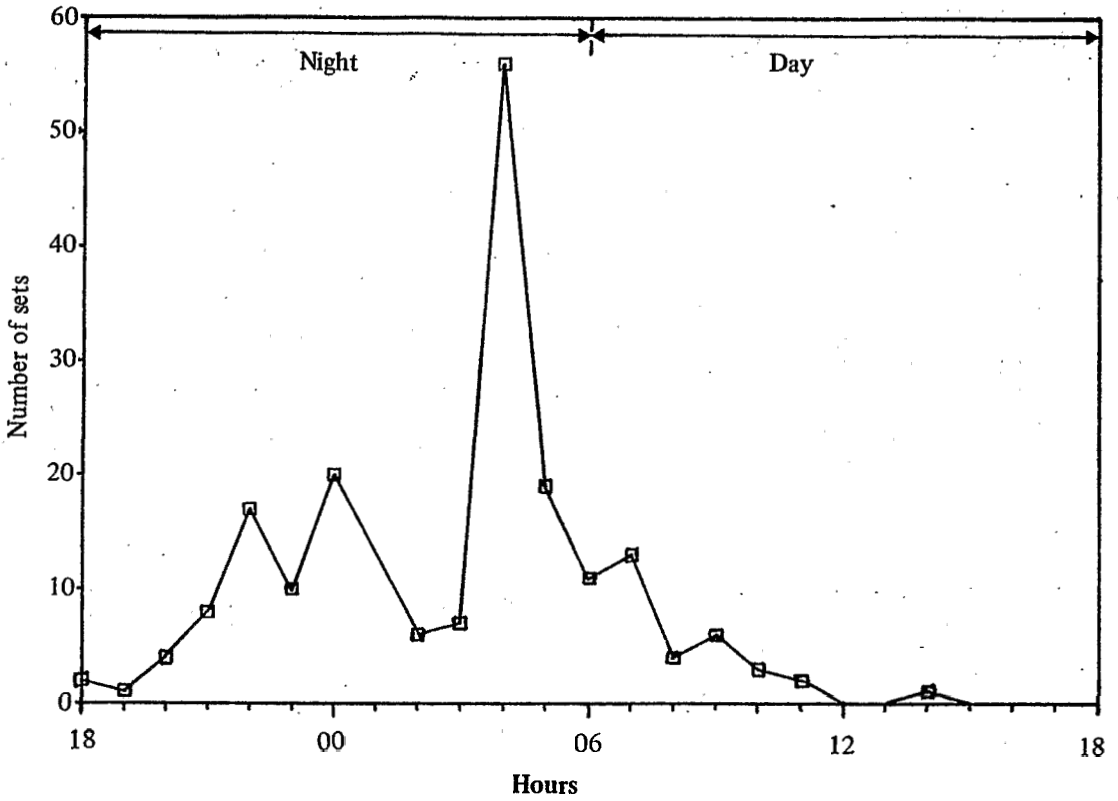


Figure 7. *Nombre de coups de senne suivant l'heure d'octobre 1986 à avril 1987.*
Number of sets according to the time from October 1986 to April 1987.

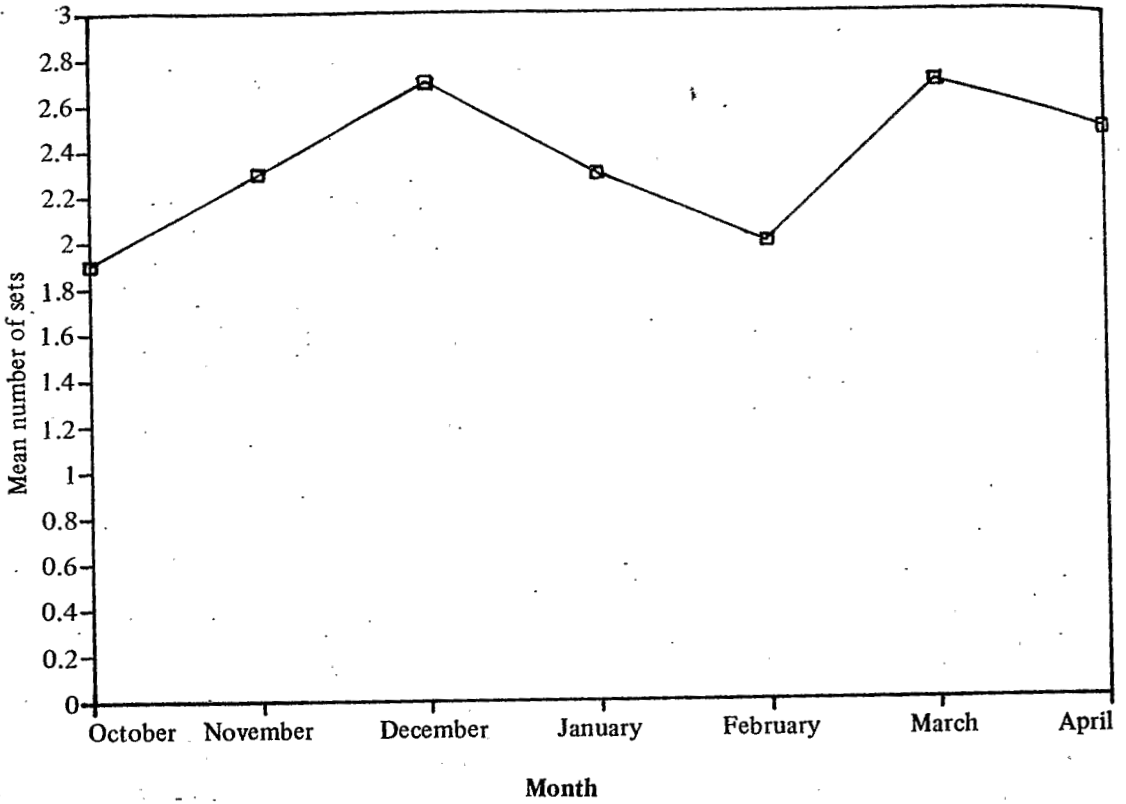


Figure 8. *Moyenne mensuelle des coups de senne réalisés par les senneurs d'octobre 1986 à avril 1987.*
Monthly mean of the sets achieved by the purse seiners from October 1986 to April 1987.

ANNEX I -

Main characteristics of the seine nets used in the Java Sea, from WUDIANTO and *al.*, (1986).

The Net

- Main body	: nylon 210 D/9	meshsize	1 inch	12 nettings
- Wings	: nylon 210 D/9	"	1 inch	6 "
	nylon 210 D/6	"	1 inch	44 nettings
- Bunt	: nylon 210 D/12	"	¼ inch	2 nettings

The Selvedge

On the edge of the seine net, to reinforce the tensile strength, polyethylene 380/12 with a meshsize of 1 inch is used. 25 meshes for the float edge, 20 meshes for the wings edge and 25 meshes for the lead edge.

Lines

- floatline	: Polyethylene	φ 10	mm length	420 m.
- headline	: "	φ 6 - 8	mm length	420 m.
- purseline	: "	φ 10	mm length	450 m.
- leadline	: "	φ 6 - 8	mm length	450 m.
- buntline	: "	φ 26	mm length	500 m.
- towline	: Polyvinyl alcohol	φ 27	mm fore	38 m.
	"		aft	15 m.

Floats

1 000 floats with 400 at the centre (Y-80 φ 11.5 cm), and 600 equally allotted fore and aft.

Leads

700 leads : φ 3 cm, length : 6 cm.

Purse ring

1 purse ring every three metres, inside : φ 1.5 cm

Total weight of the seine net : 2 to 2.5 tons.

Tab. I: Nombre total et moyen de radeaux mouillés mensuellement par les senneurs de Tegal d' octobre 1986 à avril 1987.

Total number and mean of the rafts anchored by the purse seiners from Tegal from October 1986 to April 1987.

Month	October	November	December	January	February	March	April
N. rafts	111	77	261	166	161	174	134
Mean	9	10	15	14	13	16	17

Tab. II. Nombre de coups de senne réalisés suivant les heures du jour par les senneurs de Tegal d'octobre 1986 à avril 1987.

Number of sets achieved according to the hours of the day by the purse seiners from Tegal from October 1986 to April 1987.

Month	18	19	20	21	22	23	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	
Octobre		1	1	1	1	2	4			1	8	3	2												
Novembre	1			1	1	1	2			1	7	2	2	2	1										
Decembre			2	3	5	3	7		3	2	13	4	3	1								1			
January			1		4	2	3			2	10		1	2	1	1	1								
February					2		1			1	8	1	2	5		2	1								
March	1			2	3	1	2		2		5	5	1	3		3		2							
April				1	1	1	3		1		5	4			2		1								
Total	2	1	4	8	17	10	22		6	7	56	19	11	13	4	6	3	2				1			

Tab. III: Nombre total et moyen de coups de senne réalisés par les senneurs de Tegal d'octobre 1986 à avril 1987.

Total and mean number of set achieved by the purse seiners from Tegal from October 1986 to April 1987.

Month	October	November	December	January	February	March	April
N of sets.	24.0	16.0	51.0	28.0	24.0	30.0	20.0
Mean	1.9	2.3	2.7	2.7	2.0	2.7	2.5

Tab. IV. Evolution mensuelle du nombre de coups de senne réalisés par zone de pêche par les senneurs de Tegal d'octobre 1986 à avril 1987.
 Monthly evolution of the number of set achieved by fishing ground by the purse seiners from Tegal from October 1986 to April 1987.

Month	October	November	December	January	February	March	April
North Tegal	11	14	21	5	16	20	9
Bawean Is.	9	4	10	7	1	2	—
Masalembo Is.	4	3	13	13	—	8	2
Matasiri Is.	—	—	—	—	2	—	—
Sumber Gelap	—	—	—	—	2	—	—
Pejantan Is.	—	—	—	—	—	—	9
Penyawakan Is.	—	—	7	3	3	—	—

Tab. V. Evolution du nombre moyen mensuel de radeaux mouillés par zone de pêche par les senneurs de Tegal d'octobre 1986 à avril 1987.
 Monthly evolution of the mean number of rafts anchored by fishing ground by the purse seiners from Tegal from October 1986 to April 1987.

Month	October	November	December	January	February	March	April
N. Tegal	6	8	10	6	9	12	15
Bawean Is.	11	9	18	15	20	20	—
Masalembo Is.	13	15	15	15	—	24	22
Matasiri Is.	—	—	—	—	20	—	—
S. Gelap	—	—	—	—	15	—	—
Pejantan Is.	—	—	—	—	—	—	17
Penyawakan Is.	—	—	25	20	33	—	—

Tab. VI. Comparaison des moyennes observées du nombre de radeaux mouillés par zone de pêche par les senneurs de Tegal d'octobre 1986 à avril 1987.

Comparison of the observed mean of the rafts' number anchored by fishing ground by the purse seiners from Tegal from October 1986 to April 1987.

Fishing gr.	Month.	October	November	December	January	March	April
Bawean - N. Tegal		†††	---	†††	---		
Bawean - Masalembo		---	---	---	---		
Bawean - Biawak				---			
N. Tegal - Masalembo		†††	---	†††	†††	†††	
N. Tegal - Biawak				†††			
N. Tegal - Pejantan							---
Masalembo - Biawak				†††			

††† significatif - significant.

--- non significatif - no significant.

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