

## DESCRIPTION OF THE SMALL SEINER FLEET IN THE JAVA SEA

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### ABSTRACT

Several census of the fishing units using mini seine nets were carried out in 1994 and 1995. The first census, in October 1994, set the inquiry protocol.

During this non-exhaustive census along the north coast of Java, more than 1000 fishing units representing mini-seiner or related boats were studied. Technical characteristics including boat shape, mechanisation, presence of holds, and capstan were noted.

The most important of these characteristics was the shape of the ship; four main patterns of which were seen. Analyzing other characteristics according to these shapes allowed the definition of fleet types using either mini seine net, or related fishing techniques (Danish seine, gillnet, ...).

The fleet of mini seiners was characterized by the presence of a capstan, working perpendicularly to the boat, the use of kerosene pressure lamps to lure fish (96% of the observations) and by the use of baskets to store catches on the deck (79%). It was noticed that this definition changes according to the area with the use of electrical lighting devices being seen in the western part of the study area, and isothermic fish holds being more common in the central part.

**KEYWORDS:** *Purse seine, description of the fishing unit, equipment, artisanal fishery, Java Sea, Indonesia.*

### INTRODUCTION

Aquatic living resources in the Java Sea (Figure 1), both demersal and pelagic, are exploited by numerous fishing fleets which operate mainly along the shores of the northern coast of Java and the south-eastern coast of Kalimantan. According to 1991 statistics (DGF, 1993; Potier and Sadhotomo, 1995a), the landings of pelagic fishes in the Java Sea account for more than two third of the total landings (700,000 tons).

These pelagic resources are exploited by fishing fleets which use a lot of fishing devices, the purse seine<sup>4)</sup> being the main one. A first analysis, covering the biology, exploitation and dynamics of the pelagic fishes caught in the Java Sea, based on the medium and large seiners fleets of Java, has been done during the Biodynex Seminar (Potier and Nurhakim, 1995). This report presents the results from studies carried out between 1990 and 1994.

In the Java Sea statistics, the seiners fleets are usually divided into three catego-

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<sup>4)</sup> According to Potier and Sadhotomo (1995a), it would be better to use the term ring net. The expression purse seine is used here to be in accordance with Indonesian terminology.

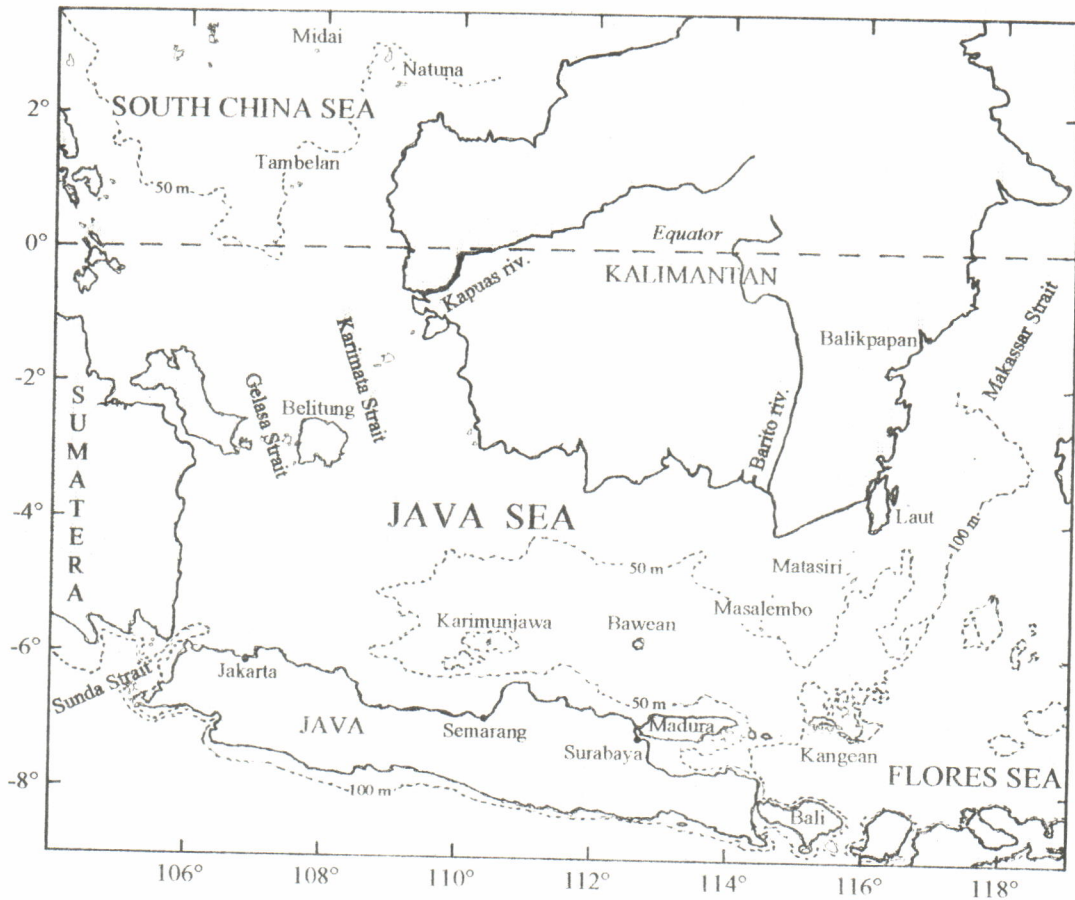


Figure 1. The Java Sea and its surroundings.

ries based on the length and the duration of the trip:

- the fishing vessels which stay at sea up to 40 days and have a hull more than 20m long are called "large seiners";
- the "medium seiners" stay at sea from 15 to 30 days and are 15-20m (Potier and Sadhotomo, 1995a);
- the third category called "mini seiners" consists of vessels less than 15m long and which have fishing trips which last less than three days. They are powered with outboard engines and use a seine net of approximately 300m long (Potier and Boely, 1990).

While the literature is rather abundant for the two first categories (Potier and Sadho-

tomo, 1995b; Potier and Petit, 1995; Nurhakim *et al.*, 1996) the studies on the small seiners are sparse and do not give a global picture of that category (Hariati and Krissunari, 1991; Hariati *et al.*, 1995; Atmaja and Ecoutin, 1996 ; Wijopriono *et al.*, 1996).

At the end of 1994, the Pelfish project started a study on the latter category based first on censuses carried out along the coast of Java from Binuangun in the west (south coast of Java, Figure 2) to Banyu Putih in the east (Madura strait). The purpose of these censuses was to estimate the number of mini seiners operating in the Java Sea from the northern coast of Java, to describe the different fishing units of that category, and to obtain information on the migration patterns of these units.

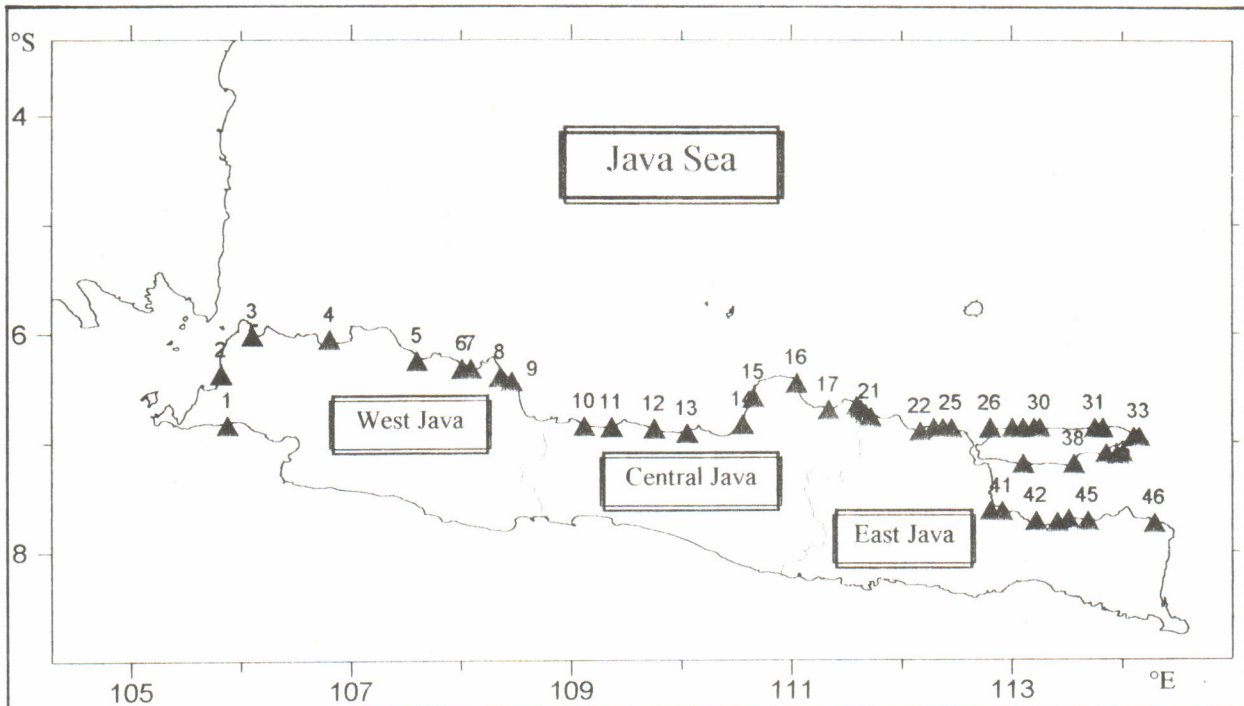


Figure 2 : The different places of the census in October 1994

1 - Muara Binuangeun	13 - Weleri	25 - Weru-Paloh	37 - Kaduarsa Timur
2 - Labuhan	14 - Moro Demak	26 - Klampis	38 - Padelagan
3 - Banten	15 - Jepara	27 - Banyu Sangka	39 - Camplong
4 - Jakarta	16 - Banyutowo	28 - Sotaber	40 - Lekok
5 - Blanakan	17 - Tasik Agung	29 - Pasean	41 - Ngemplak
6 - Kalimenir	18 - Pandangan	30 - Ketapang	42 - Mayangan
7 - Eretan Wetan	19 - Kragan	31 - Pasongsongan	43 - Kraksan
8 - Indramayu	20 - Sarang	32 - Ambuten	44 - Paiton
9 - Dadap	21 - Bulu	33 - Slopeng	45 - Besuki
10 - Tegal Sari	22 - Karang Agung	34 - Tanjung	46 - Banyu Putih
11 - Krasak	23 - Brondong	35 - Bandaran	
12 - Klidanglor	24 - Kranji	36 - Talang	

Based on the first census, carried out on 16-17 October 1994, a first description of the different fishing units which form the "mini seiner" category is presented in this report.

## MATERIAL AND METHODS

### Description of Census

To perform this census, the north coast of Java was divided into 8 sectors of variable importance and 46 different places were visited (Figure 2).

To characterize the small seiner fleets of the north coast of Java, inquiry sheets were completed in every fishing village visited during the census. This gave a first picture of the importance of the small seiner fleets and allowed them to be characterized in relation to the fishing units of the same size which did not use the small seine.

This first census was focused on the fishing vessels able to embark a mini-seine. The main unit of observation was the fishing boat. Only the vessels present on the beach or

landing place on the day of inquiry were counted and described. Bias due to fishing units which were at sea at the time of the census and were not taken into account, may therefore be present

Seven elements of technical information were collected during the census: the name of the boat or its registration number, the shape of boat, the type of light used, the number and type of engine, the storing method of fish on board and the possible presence of a capstan.

A second questionnaire was also completed in every fishing village. Crewmen of some observed fishing units were selected random and asked to answer few technical questions which gave some information on the general activity of the fishing units.

### **Description of the Shape of the Boats**

Potier and Sadhotomo (1995b) describe two types of small seiners. Based on the shape of the boat, they called the first one "Payang" type (see below) and the other one "East Java" type. The second shape, according to their diagram, is the "Kranji" type described below. Two more types are indicated by Barus *et al.* (1991). One derives from the *Payang* shape, the second from a traditional shape of fishing boat unfortunately not described in their work.

Temple *et al.* (1993a) describe a shape that they link to the use of a "mini seine". Their description (inboard engine, insulated fish hold, electrical equipment necessitating a generator, ...) and the dimensions of the boats that they measured, are closer to the notion of medium seiners used by Potier and Sadhotomo (1995a) than to the mini ones. However that shape called *Sopek* (see below) for these medium seiners can be compared to some shapes observed in the mini seine fleets.

This study covers the description of five basic types of boats which can be found to

parts of this fleet (Figure 3). The presentation of these five shapes does not take into account the method of construction of the boat's hull (made with boards with ribs, planking and deck, etc.) since that corresponds to the chosen unit of observation. The boat equipment and the motorization are described later on. Three of these shapes correspond to names of villages located on the north coast of Java. This relationship between the name of a shape of boat and the name of a village deserves a study through a diachronic approach of evolution of the shape of boats during the last fifteen to twenty years, since the small purse seiners only appeared in the province of East Java around 1976 according to Potier and Sadhotomo (1995a).

#### **The *Bulu* shape (Figure 3.1)**

This boat has a tapering bow which sits high on the water and tend to close at the back of the boat. Its stern is straight, low in the water and the sides extend beyond the stern. A rough superstructure occupies a third of the back of the boat. At the bow is a mast with the distinctive colors of the fishing unit. On this mast, supplementary equipment can sometimes be observed: sometimes a cargo mast ending in a pulley used to raise the brailer containing part of the net's catch, sometimes two boards used as observation seats when searching for shoals of fish (Figure 4).

This type of boat was initially built in the coastal village of Bulu, in East Java. Later its building extended along most of the east coast of Java from the village of Sarang (Central Java) to Madura Island. In these different villages, marine carpenters modified the shape of the boat's stern as well as the existing superstructures on the deck.

#### **The *Kranji* shape (Figure 3.2)**

Originating in the 1970s in the village of Kranji (East Java), this type of boat was used throughout the 1980s in a large number of

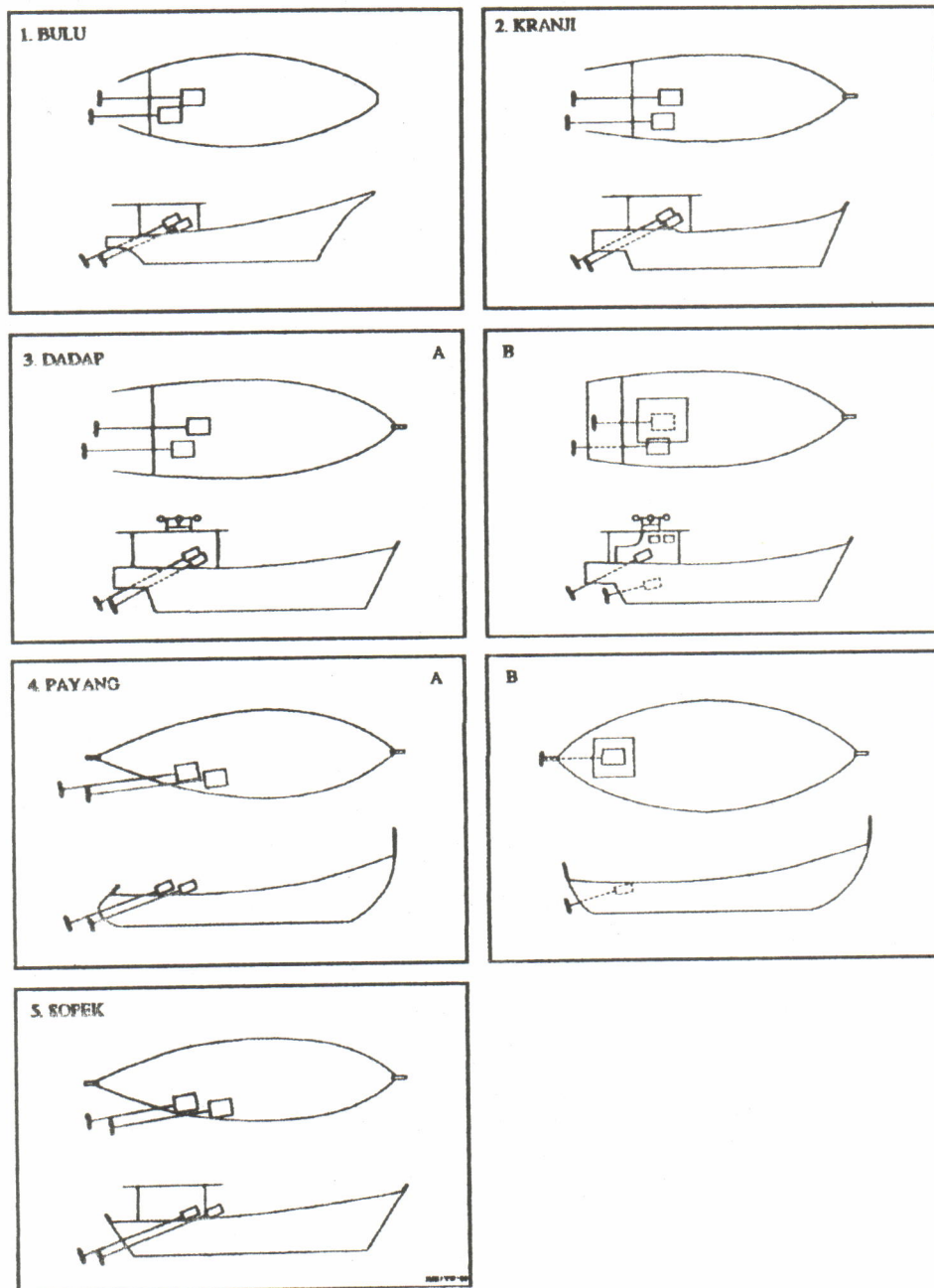


Figure 3. The different shapes of mini purse seine boats (mini-seiners) observed during the census of October 1994.

the villages on the north east coast of Java and Madura. A planked and decked boat, its tapering bow is less high off the water than the preceding shape and often supports wide gunwales. Although wider than the *Bulu* type, its stern is as straight and is similarly

extended, although the sides do not close up as in the *Bulu*.

The *Kranji* type has also a rough superstructure and a front mast that can hold the cargo mast and observation chair as observed in the *Bulu* type.

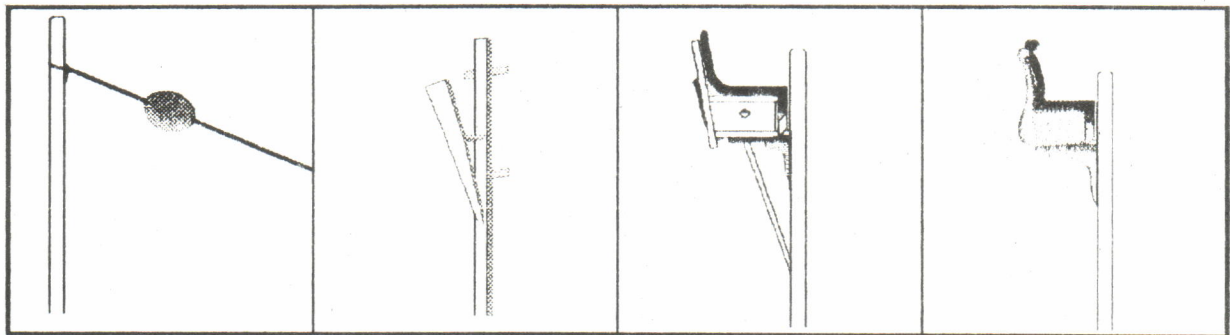


Figure 4. Different shapes of observation seats.

### The *Dadap* shape (Figure 3.3A & B)

The *Dadap* boat can be described in part as a *Kranji* shaped boat, of which the space between the rear side extensions can be decked in order to increase the space available for the crew (Figure 3 A & B)). The main difference however, is in the length/width ratio, which shows this shape to be wider for a given length than the *Kranji* type. The other difference concerns the presence of a superstructure which is much more solid than in the preceding designs, constituting the beginning of a closed shelter.

### The *Payang* shape (Figure 3.4 A & B)

Formed by tapering and rounded stem and stern, this boat represents one of the most commonly seen craft along the coast of Java. Used for diverse types of fishing and transport activities, it presents a large variety of lengths and widths. The *Payang* boats which make up the small seiner fleet are amongst the largest boats of this type. According to the type of motorization (one or two lateral engines, outboard engines placed on a shaft), the length-width ratio and the place of the widest part of the boat, it is possible to describe three types of *Payang*, though only we pictured here. Although generally without superstructure, the *Payang* may have one or two masts. On the front mast, it is frequently possible to observe a real observation chair (Figure 4).

### The *Sopek* shape (Figure 3.5)

The *Sopek* shape is also a boat with tapering stem and stern but these are straight. The boats also usually have a well-constructed superstructure. The widest part of this type of boat is always located in its middle. This boat is often chosen by many fishing units which use a large variety of fishing techniques. Wijopriono *et al.* (1996) describe the characteristics of this type of boat for the units using trammel nets.

In this first study, the *Bulu* and *Kranji* types were mixed up by the observers.

## RESULTS AND DISCUSSIONS

### General Description of the Census

During the October 1994 census, 1001 fishing units were recorded in 40 villages (Table 1). This value corresponds to the number of visual observations of fishing units. It does not represent the whole fleet as the fishing units which were absent from the fishing places were not counted.

Seventy per cent of the fishing vessels were recorded from East Java province (including Madura). The number of vessels in East Java is twice as many as in Madura, and three times more than the two other provinces. The role played by the *Payang* type

Table 1. Geographical distribution of the different boats during the 1994 census.

Type of boat	West Java	Central Java	East Java except Madura	Madura	Total
<i>Bulu</i>	65	122	189	41	417
<i>Dadap</i>	13	0	10	40	63
<i>Payang</i>	2	28	285	124	439
<i>Sopek</i>	27	41	0	8	76
<i>Cungking</i>			1		1
<i>Improved Sopek</i>				1	1
Unknown	4				4
Total	111	191	485	214	1001
Number of places	7	12	10	11	40

(44% of the total) seems to be important, since more than 90% of the recordings of this small craft were in of East Java.

In addition to the technical information collected during the census, this study seeks to present, for each shape, the variability of this information with a view to defining, if possible, a standard shape. Finally, for the two principal fishing techniques observed, a standard presentation of a fishing unit is proposed.

### Main Characteristics

During this investigation, five main descriptors were collected: three connected with the boats equipment motorization, capstan, and storing method of fish; and two with the fishing operation fishing gear and lights.

#### - Motorization

During the October 1994 census, all boats in the census were motorized. Six different types of motorization were observed (Table 2). Most of these were outboard engines sealed on the deck, with extended propeller shafts and three-bladed propellers. These engine

and their propeller shafts are mounted on axles which allow the shafts to be raised. These shafts often cross the hull by a groove, made either on the level of the starboard side of the boat, or on the back panel of the latter. For each of these two solutions, there can be one or two engines. Two other situations were observed, on one hand an outboard engine attached to the shaft, on the other hand, an inboard motor.

With the exception of the *Bulu* shape which presents a well-defined propulsion method, it was observed that for each of the other shapes there was a large variety of motorization methods. Nevertheless, dominant tendencies like the relation between the *Dadap* boat and back motorization, and the one between the *Payang* boat and lateral motorization could be found.

#### - Storing method of the catch

On board the units ready to make fishing trips, a few wicker baskets were observed. Their presence in large numbers indicated that the fishermen stored their catch in them. In this case, these baskets, once filled, would be arranged on the deck, hampering the fishermen's movement after a certain level of

Table 2. Distribution (in %) of the different types of motorization (October 1994).

Types of motorization	Type of boat			
	<i>Bulu</i> n=417	<i>Dadap</i> n=63	<i>Payang</i> n=439	<i>Sopek</i> n=76
1 engine on the side	0.2	6.3	22.3	59.2
1 central back engine	6.0	4.8	5.9	1.3
2 back engines	91.4	47.6	0	2.6
1 outboard engine	0.5	25.4	27.6	9.2
1 inboard engine	0	15.9	0.7	21.1
2 engines on the side	1.9	0	43.5	6.6

Table 3. Distribution (%) of the different storage methods (October 1994 observations).

Equipment	Type of boat			
	<i>Bulu</i> n=417	<i>Dadap</i> n=63	<i>Payang</i> n=439	<i>Sopek</i> n=76
no equipment	11.3	3.2	36.4	30.3
baskets	83.6	95.2	61.7	46.1
fish box	1.2	0	1.8	1.3
fish hold	1.0	1.6	0	19.7
box and baskets	1.7	0	0	2.6
hold and baskets	0.2	0	0	0
box and hold	1.0	0	0	0

catch. Two other pieces of equipment complement or replace these baskets. In some cases wooden isothermal boxes were placed on the deck to store the catch, while some other boats were built with fish holds. These holds could be shaped spaces under the deck, or real holds thermally isolated from the rest of the space below deck. The boxes and isolated holds were more commonly used on medium and large seiners (see Temple and Sari, 1992) allowing them to carry, if necessary, the ice to preserve the fish. These technical developments on board *Sopek* boats may correspond to changes in the fishing strategy.

Despite all the observed possibilities, the presence of baskets was dominant, and they were seen, alone or with other equipment, in 73% of the total observations. Furthermore, it was possible to consider that some observations (lack of equipment) corresponded in reality to the use of previously unloaded baskets. This issue will be discussed below (Table 4).

- **Capstan**

A capstan was present in 85% of the observations. This equipment, most often placed on



the starboard side in the first third of the boat, was observed in all of the four main types studied. It was almost always present in the *Bulu* and *Dadap* shapes, common in the *Payang* (80%) but rather uncommon in the *Sopek* (one out of three).

#### - Fishing techniques

Prior to the field census, four fishing techniques were anticipated: two *payang* type nets (*pinggir* and *tengah*) or Danish seine nets; the lampara net, which is an encircling gillnet; and the mini purse seine (Subani and

Barus, 1988). Following the census, a fifth, the *jaring bondet*, was added, but its presence was subject to discussion as it involved a *payang* net for shrimp fishing. Among these five different gears, one was never observed, the *payang pinggir*.

Due to the nature of the investigation (census focused on the boats equipped with a mini purse seine or potentially mini-seiners), this type of fishing gear dominates the samples (88%) but its use may be more or less common depending upon the shape of the boat (Table 4).

Table 4. Distribution (%) of the different types of fishing nets (October 1994).

Fishing nets	Types of boat			
	<i>Bulu</i> n=417	<i>Dadap</i> n=63	<i>Payang</i> n=439	<i>Sopek</i> n=76
no net	1.7	0	1.6	1.3
<i>payang tengah</i>	0	6.3	17.3	34.2
lampara	0	0	0.5	26.3
mini purse seine	97.3	93.7	80.4	38.2
<i>jaring bondet</i>	1.0	0	0.2	0

#### - Light equipment

Light equipment was used to attract pelagic fish shoals. If necessary, these shoals could be aggregated around a fish aggregating device (FAD) called locally by the generic term of *rumpon*. Three types of lamps were used on these boats, either alone, combined two by two, or sometimes all three together (Table 5). The petromax lamp is a kerosene pressure lamp. Mounted two by two on the same gas bottle, this equipment may be put on a bamboo raft, called *bangkrak*, which can carry between 2 and 4 gas bottles. According to Barus *et al.* (1991), the *bangkrak* equipment with 10 to 12 petromax lamps provides a luminous power of 200 to 300 watts. The two other types of light are electric lamps

used with a generator. They can be differentiated by the type of bulb, which is either the incandescent type (galaxy) or the halogen type (mercury). The luminous type is far more important, since each lamp has a minimum power of 200 w (Temple *et al.*, 1993b). This electric equipment is comparable with the equipment used by the large and medium seiners, the difference between these categories being only a matter of electric power.

The petromax lamp alone was observed in 85% of the cases, and in combination with another type of light, a further 1%. The mercury lamps were found, alone or in combination, in only 3% of the cases; while the galaxy lamp, which, according to Temple *et al.* (1993b), is of most recent usage in the me-

Table 5. Distribution (%) of the different light equipment (October 1994).

Equipment	Type of boat			
	<i>Bulu</i> n=417	<i>Dadap</i> n=63	<i>Payang</i> n=439	<i>Sopek</i> n=76
no equipment	2.4	6.3	21.0	6.6
petromax lamp	97.4	73.0	78.5	68.4
mercury lamp	0.2	3.2	0.5	5.3
galaxy lamp	0	1.6	0	2.6
petromax and mercury	0	1.6	0	1.3
mercury and galaxy	0	0	0	14.5
the three types	0	14.3	0	1.3

dium and large seiner fleets, being even rarer. The absence of visible light equipment on a boat (11%) did not necessarily signify that such equipment was lacking. Often, due to a long period of inactivity, light equipment was stored ashore. In these cases it can be supposed that the fishing vessels were equipped with petromax lamps.

Even though the size of these boats and their motorization allowed the prediction of this dominance of the petromax, it would be suitable to follow, in future censuses, the development of mercury and galaxy lights. This could be used as an indication of change in the fishing strategy of these fishing units.

#### Analysis by type of boat: unit of observation

Among the 1001 observations, four did not indicate the type of boat (province of West Java, village of Blanakan, n°5 Figure 2). Two more shapes were observed during the course of this work, the *Cungking* shape which described the medium or large seiner boats (Potier and Sadhotomo, 1995a) and a shape called the « improved *Sopek* ». They were not taken into account in this work due to their unique presence in the census (Table 1).

#### The *Bulu*<sup>5</sup> type

Over 90% of *Bulu* are powered by two engines fastened to the back of the deck with propeller shafts straight crossing the back panel. The presence on this type of boat of another configuration of motorization will have to be checked during the next census.

Within the 417 observations carried out, this type of boat was associated almost exclusively with petromax lamps.

Approximately 95% of the boats of this type were equipped with a capstan. The 25 cases lacking direct observation of this equipment corresponded to records where the boats being located far from the place of observation. The 25 fishing units were, however, equipped with a visible seine net, which suggested that a capstan was on board but was not visible by the interviewer.

Most of the observations indicated the presence of baskets in large numbers on board the *Bulu* units. Only 5% of the boats possessed either an insulated fish hold or an ice box to preserve the fish caught. All these observations were carried out in the East Java province where a large number of *Kranji* shapes, confused with the *Bulu* shape,

<sup>5</sup> It should be remembered that throughout this census, the *Bulu* and *Kranji* shapes were confused.

were found. This peculiar description of the method of the fish preservation on board these units should be followed up as it is indicative of technical development. The rest of the observations showing the absence of baskets on board the fishing unit, can be linked, to their temporary removal while the vessels was inoperative.

Over 97% of the observations revealed the presence of a mini seine on board the *Bulu*. In seven cases there was no fishing gear (all observed in the village of *Bulu*, n°21 Figure 2, East Java) and in four cases, to the presence of the *jaring bondet*, a *payang* net for shrimp fishing (also observed in *Bulu*). These last boats are not equipped with lamps.

In conclusion, a *Bulu* shaped boat must be considered as the typical shape of the mini-seiner fleet. The absence of a capstan could invalidate the membership to a specific unit of this fleet. The light equipment and the

method of the fish preservation, were relatively simple although some technical developments focused on the preservation of the fish were observed, in particular in East Java.

This type of boat was observed in 24 of the 40 villages investigated on the north coast of Java, from Binuangeun (n°1 Figure 5) to Ngemplak (n°41). The *Bulu* fishing vessels type recorded during the census, were found in Central Java (25% of the records) and East Java (75%) and came from 19 villages. In October 1994, inter-provincial migration concerned 17% of these units observed during the census (Table 6). With the exception of Ketapang village on Madura Island (n°30 Figure 5), no short distance migration was observed inside the same zone. In that season, the *Bulu* units which were moving along the north coast of Java came from East Java and their movement was always westward.

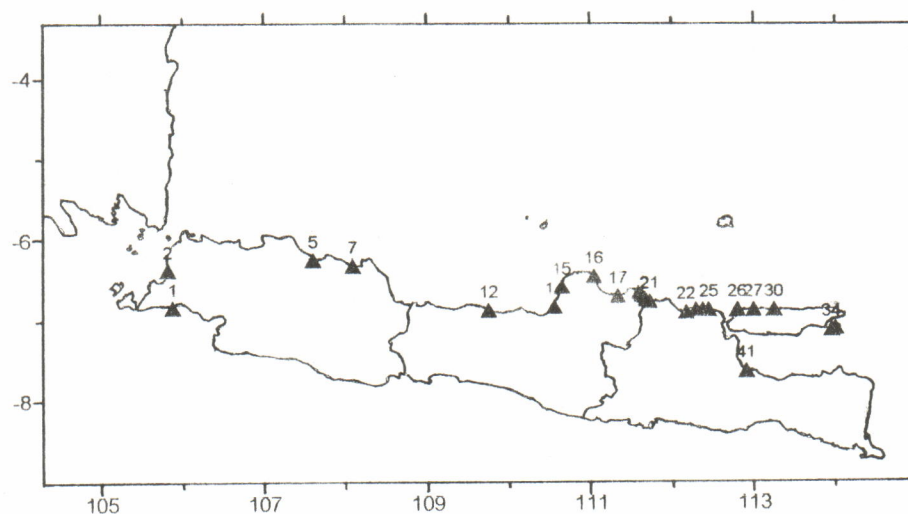


Figure 5. Geographical distribution of *Bulu* boats.

#### - The *Dadap* fishing unit

The 63 fishing units registered as *Dadap* boats were observed in seven different villages. Three of these were located in West Java (Blanakan, Eretan Wetan and Dadap, n°5, 7, and 9 Figure 6), one in East Java

(Mayangan, n°42) and the three last on Madura island (Tanjung, Bandaran and Camplong, n°34, 35 and 39). The three units observed in Blanakan were originally from Dadap. For this type of fishing unit, inter or intra-provincial migration was only over short distances (Figure 6).

Table 6. Analysis of the inter-provincial movement of *Bulu* fishing units.

Province of origin	Investigated province				Total
	West Java	Central Java	East Java	Madura	
Central Java	3	89			92
East Java	29	33	189		251
Madura				41	41
Unknown	33				33
Total	65	122	189	41	417

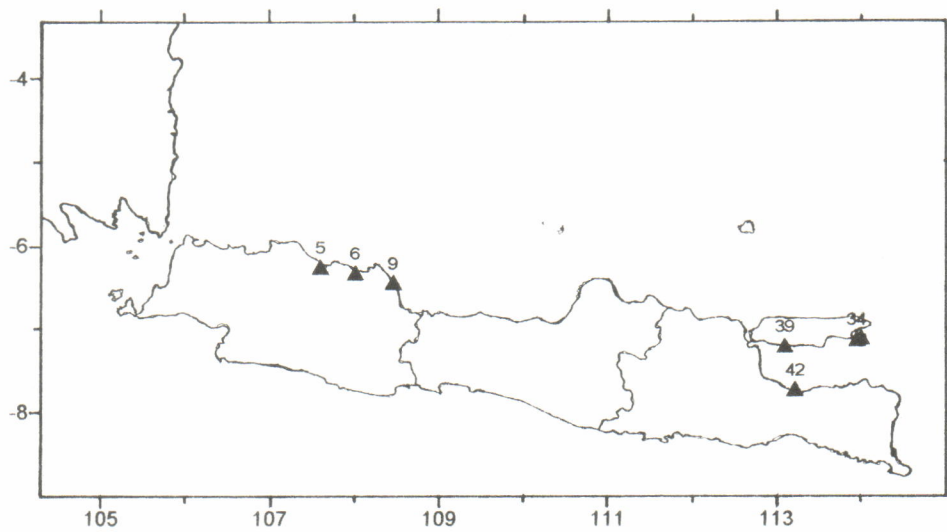


Figure 6. Geographical distribution of *Dadap* boats.

More than 75% of the 63 observations indicated the presence of petromax lamps, while 15% showed light equipment composed of mercury and/or galaxy lamps. These latter units were observed in West Java only. Sometimes petromax lamps and rafts could also be associated with the fishing equipment. This fact was not observed elsewhere, as only the petromax lamp was used when there was light equipment.

Over 90% of the observations noted the presence of a capstan and of a mini-seine at the same time. The four fishing units without a capstan (Camplong village, Madura island, n° 39) were equipped with a *payang tengah*

net and with a single engine on the starboard side. These units corresponded with the only four observations without light equipment.

The *Dadap* units which were equipped with a capstan and a mini-seine, presented all kinds of motorization (Table 2)<sup>6</sup>. Two main methods of motorization could be described, either back motorization or an out-

<sup>6</sup> It should be noted that the 10 *Dadap* units equipped with an inboard engine were counted in one place only, the village of Mayangan (n° 42, Figure 2). These boats, with inboard engines, present some other technical characteristics which allows us to expel these units from the *Dadap* group (Wijopriono *et al.*, 1996).

board engine on a shaft. The catch is stored in baskets (Table 3), with only one exception, a fish hold occurrence in Eretan Wetan.

All the *Dadap* units were also included as part of the mini-seiner fleet, due mainly to the importance of capstan observations (parallel to the side of the fishing vessel). This location of that capstan was exclusively linked with the use of a mini-seine. The development of electric equipment as observed on the *Bulu* units was also found on the *Dadaps*.

#### - The *Payang* unit

The *Payang* shape was the most commonly observed shape during the October 1994 census (44%, Table 1). Located mainly on the coast from Karang Agung (n°22) to Banyu Putih (n°46) (65% of the records) and on Madura Island (28% of the records), these fishing units were observed in seventeen villages of Java (Figure 7): one in West Java, three in Central Java and thirteen in East Java. However, three villages of East Java provided 70% of the *Payang* records; Besuki, Banyu Putih and Kraksan located in the Madura Bay (n°43, 45 and 46, Figure 7).

The use of petromax lamps was observed as 80% of the boats. In two cases in the village of Eretan Wetan, the presence of mercury lamps was observed. Eight boats in Weleri Central Java (n°13, Figure 7), were equipped with ice boxes. The presence of baskets was noted in two thirds of the cases, with the remainder corresponding to a lack of baskets (or other kinds of transportation) on the boat.

Five different motorizations (three dominating) were seen on the *Payang* type boats (Table 2).

Two types of fishing nets were commonly used by this boat, the mini-seine (80% of the observations) and the *payang tenggah* (17%). The presence of a mini-seine on board this boat was linked with petromax lamps (97%) and a parallel capstan (99%) but is never linked to the observation of a central back engine nor with an inboard engine. The use of a *payang tenggah* net on a *Payang* unit was associated with the absence of light equipment (99%) as well as a capstan (99%).

Save in Central Java, no movement of the *Payang* type units was recorded during this census. The units were mainly investigated

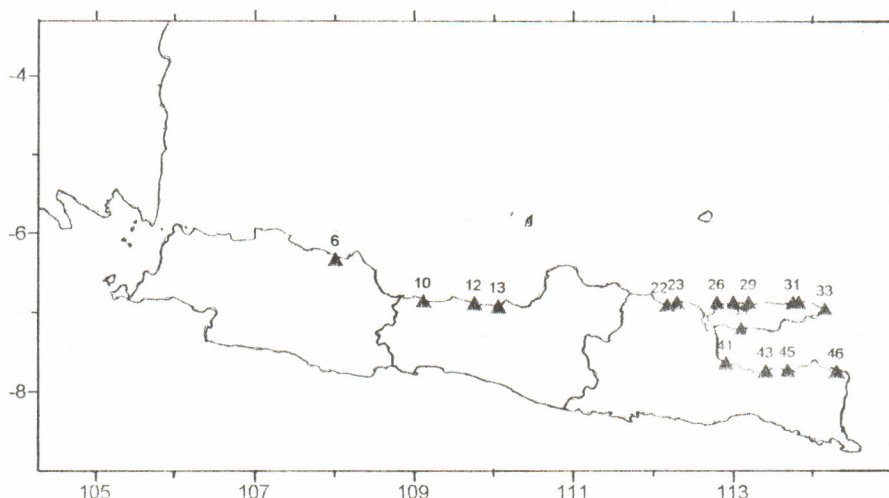


Figure 7. Geographical distribution of *Payang* boats.

in their villages of origin of the *Payang* units equipped with a mini-seine, five units were observed in Tegal or Batang (Central Java) originating from Brondong or from Karang Agung (East Java) and five others, also observed in Batang, came from Weleri (movement within the province). For the units equipped with a *payang tengah* net, three movements were observed, from Brebes to Tegal, within the same province.

Among the *Payang* type boats, two main groups linked to two different fishing nets could be described:

- all the *Payang*/mini-seine units equipped with a capstan and petromax lamps; the motorization usually consists of one or two engines on the starboard side (74%); 96% located in East Java (70% on the north coast of main island, 26% on Madura Island), these units may make large movements all along the coast;
- the *Payang*/*payang tengah* units, without capstan and without light equipment; the type of motorization may vary a lot; they do not make large migrations.

### - The *Sopek* unit

*Sopek* shaped boats were observed 76 times during the census representing 7.6% of the total observations. These units were counted in nine villages in West Java (4 villages and 36% of the observations), in Central Java (3 and 54%) and in Madura (2 and 10%) (Figure 8).

Though the light source is predominantly petromax lamps (68%; 100% in Madura and in Central Java), all types of light equipment were seen (Table 5). The *Sopek* unit was the only type of boat where the presence of a capstan was not dominant (38%). Different ways to preserve the fish were seen but the presence of baskets (46%) or of a fish hold (20%) were the most common. The absence of baskets or other methods of storing the fish accounted for 30% of the records. All types of motorization existed (Table 2) with two main ones: a engine on the side (59%) or an inboard engine (21%).

Three types of fishing gears were used: the *payang tengah* net, the lampara net and the mini-seine (Table 4). As observed with the

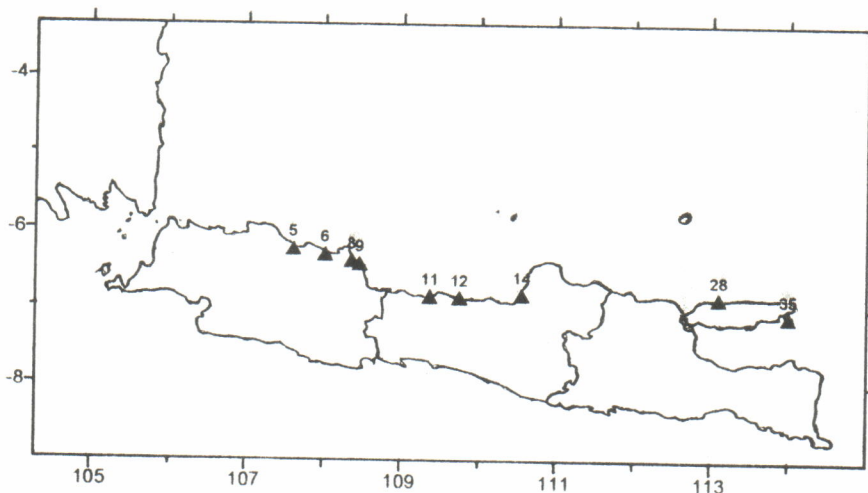


Figure 8. Geographical distribution of *Sopek* boats.

*Payang* units, the type of net present on board the *Sopek*, can simplify the descriptions made below.

The mini-seine was observed on all the *Sopek* boats which were equipped with a parallel capstan and in 93% of the cases with petromax lamps. The remaining 7% were seiner units without visible light equipment on board. The motorization consisted mainly of a lateral engine (66%) or of an outboard engine (24%). This type of unit was observed in all three provinces. Movement between provinces was evident, with two units from Bulu working in Batang, and within a province, one unit moving from Eretan Wetan towards Blanakan, West Java; and five from Weleri towards Batang, Central Java.

The *Sopek/payang tenggah* units had capstans, usually lateral engines (66%), and petromax lamps (81%) but a few mercury or galaxy lamps were also observed (11%). The fish was stored almost exclusively in baskets. This type of unit was seen either in Central Java (80%) or in West Java.

The *Sopek/lampara* unit did not use a capstan as in the preceding case, but showed every variety of light equipment. The catch was preserved mainly in fish holds (70%). This type of unit was only observed in West Java where they seemed to stay.

## CONCLUSION

Two fishing techniques dominated this census, the mini-seine (85%) and the *payang tenggah* (11%). This result was mostly due to the organization of the census itself, as it was focused on fishing vessels carrying or being able to carry seine nets. Nevertheless, it was possible to define the main characteristics of a fishing unit or potential mini-seiner as well as to propose elements to better define the fishing fleet *payang tenggah*. Some information on the characteristics of the units with lampara nets could also be given.

## Homogeneity of Mini-seiner Fishing Units

The first recorded characteristic which was associated with the use of a mini-seine was the unfailing presence of the capstan. Among the 16 observations of boats with capstan, but without mini-seines, eleven had no fishing gear at all on board the vessel.

The high percentage of petromax lamps (96%) and of baskets (79%)<sup>7</sup> in the records also indicated a strong homogeneity of the equipment used. Nevertheless, there was a tendency towards the development of more powerful electric lamps and towards insulated fish holds. These technical improvements have to be taken into account, as they close the gap between the mini-seiners and the medium and large seiners.

This mini-seiner fleet includes the four shapes of boats described above. 97% of the *Bulu-Kranji*, 94% of the *Dadap*, 80% of the *Payang* and 30% of the *Sopek* respectively are mini-seiners. Notable differences in the behavior of these four types lie in coastal movements: 17% of the *Bulu-Kranji* units were found outside their province of origin, 7% of the *Sopek*, very few of the *Payang* and none of the *Dadap*. All these movements were to the westwards.

The *Bulu* fishing unit seems to be the representative unit of the mini-seiner fleet, having all the homogeneity criteria and the possible adaptation elements. The *Dadap* may be an adaptation or a development of the *Bulu* type.

## The *payang tenggah* and lampara fleets

This first group was seen in 106 times. Three shapes of boats form this fleet, 72% are *Payang*, 25% *Sopek*, and the remaining 3% *Dadap*. To use this net, it is not necessary to have a capstan on board, such a device being

<sup>7</sup> 10% can be added to this figure - an assumption where no fish storage method was visible.

observed only once on these units. The technical equipment observed was limited; 76% being without light, and 66% without storing capacities. All the units without a storage capacity (absence of baskets) were also without light equipment. The use of light for this fishing technique was a function of the desired target fish, demersal or pelagic.

No movement between provinces was observed and only four cases of very localized movement within a province were described.

Even though, only 22 observations were made on the lampara fleet, it seemed to show substantial homogeneity. Formed 90% of *Sopek* boats, and recorded only in West Java, it was characterized by the presence of outboard engines in more than two cases out of three, by 80% of the light equipment being mercury lamps, and by the presence of ice box fish holds on more than 60% of the boats but with no capstan, and showing no migratory movement.

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