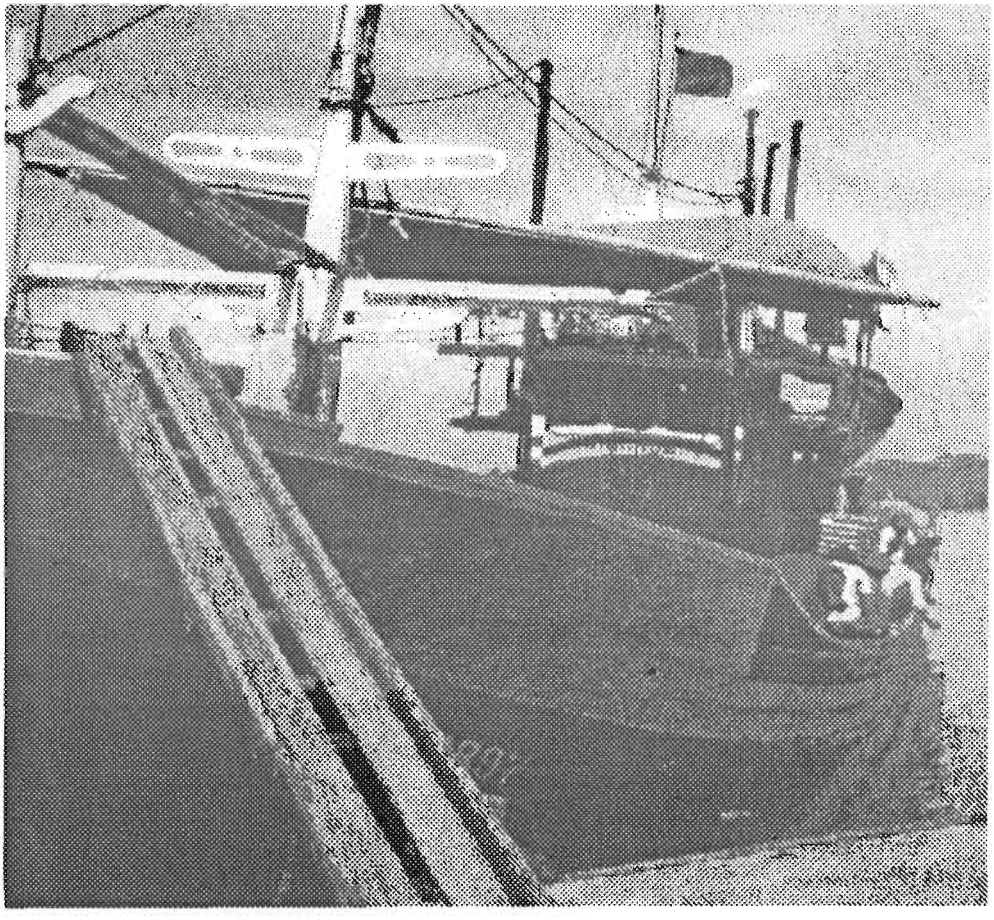
SEINERS FISHERIES IN INDONESIA

LARGE SEINER AT LANDING HARBOR

KAPAL PUKAT CINCIN BESAR DI TEMPAT PENDARATAN



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ABSTRACT

The study is based on the 1991 national statistics published by the Directorate General of Fisheries. The reliability of this data varies according to the Indonesian provinces. Accurate data only exists for the province of Central Java. Nevertheless, it can give a profile of the present situation of the Fisheries in Indonesia.

The Indonesian fish production was 2 200 000 tons in 1991. The Java Sea with 7% of the main territory accounts for 32% of this production. Among the 760 000 tons of fish caught in that area, 485 000 tons consists of pelagic fish. Most of the landing is of small pelagics caught by the seines fisheries. The purse seines fisheries account for 40% of the total landing.

They are mainly found along the northern coast of the Java Island. Introduced in 1968 in Indonesia at the Batang harbor in the province of Central Java, the purse seine quickly widespread and is now found in almost all Indonesian provinces. Its catch is higher and its fishing season longer than those of the traditional seine nets used by the small-scale fisheries and it tends to replace them.

Mostly based on the exploited pelagic resources, shape of the coast, presence of rivers, and extension of shallow waters, on cultural, historical habits and economical factors (investors, landings facilities, potential market) , three types of fisheries can be defined :

- The mini seiners fisheries which are dispatched along the northern coast of the Java Island (mainly in the province of East Java) and in the province of South Kalimantan. During short trips they search for species with high value and sell locally.
- The medium seiners fishery is exclusively found at the Pekalongan harbor in the province of Central Java. Their trips last between 6 and 15 days. They only sell fresh fish under auction for the Javanese market.
- The large seiners fishery is concentrated in the province of Central Java in three centers, Tegal, Pekalongan-Batang and Juwana-Rembang. Their trips last up to 40 days and they sell fresh and salted fish for the national market.

Vessels, fishing grounds and fishing tactics vary among these fisheries according to target species and fish market.

Telaah ini dibuat berdasarkan buku statistik nasional tahun 1991 yang diterbitkan oleh Direktorat Jendral Perikanan. Data yang disajikan berdasarkan propinsi ini kurang lebih dapat dipercaya. Informasi yang lebih tepat hanya didapatkan di Propinsi Jawa Tengah. Walaupun demikian data tersebut dapat memberikan suatu gambaran situasi perikanan di Indonesia dewasa ini.

Produksi ikan di Indonesia adalah 2 200 000 ton pada tahun 1991. Laut Jawa yang mempunyai luas 7% dari luas perairan Indonesia menyumbangkan 32% dari total produksi. Diantara 760 000 ton ikan yang tertangkap di daerah tersebut sebesar 485 000 ton terdiri dari ikan-ikan pelagis. Jenis-jenis ikan utama yang didaratkan adalah ikan pelagis kecil yang tertangkap oleh pukat, dimana pukat cincin sendiri memberikan kontribusi sebanyak 40% dari total yang didaratkan.

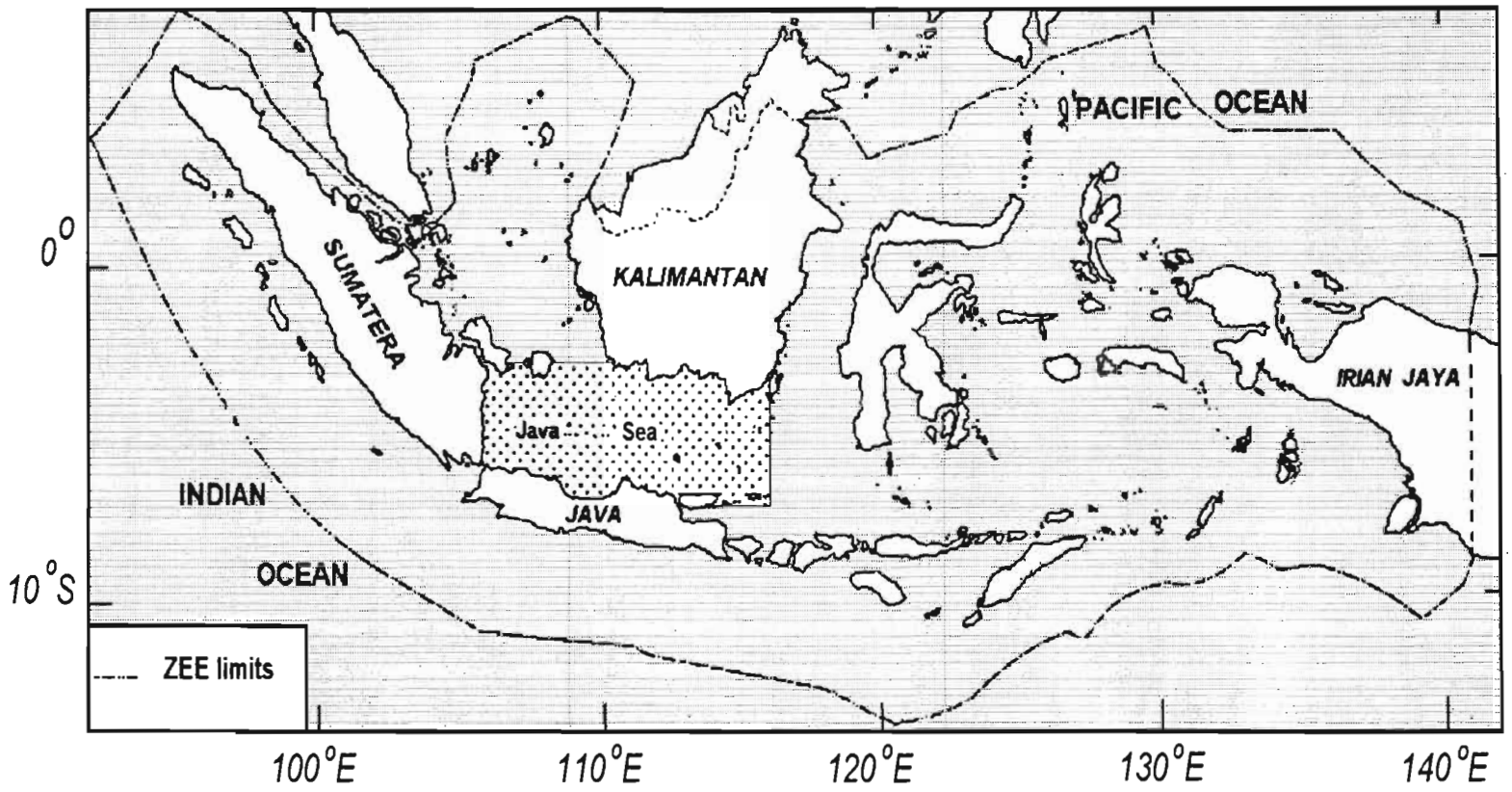


Figure 1

Indonesian E E.Z. waters and geographic location of the Java Sea

Perairan Z.E.E. Indonesia dan lokasi geografi Laut Jawa

Pukat cincin terutama terdapat sepanjang pantai Utara Jawa. Sejak diperkenalkan pada tahun 1968 ke Indonesia di Batang, Jawa Tengah, alat tangkap tersebut tersebar dengan cepat dan sekarang dapat diketemukan di seluruh propinsi di Indonesia. Dibandingkan dengan pukat tradisional yang dipergunakan oleh perikanan skala kecil, hasil tangkapan pukat cincin adalah lebih baik dan musim penangkapannyapun lebih lama.

Berdasarkan sumberdaya pelagis yang dipanen, bentuk geografi fisik {letak sumgai dan pantai} dan geografi manusia {permodalan, tempat pendaratan dan pasar yang potensial}, maka bentuk perikanan pukat cincin dapat dibedakan menjadi tiga jenis:

- *Perikanan pukat cincin mini, tersebar sepanjang pantai Utara Jawa {terutama Propinsi Jawa Timur} dan Propinsi Kalimantan Selatan {sekitar Pulau Laut}. Dengan waktu penangkapan yang relatif pendek mereka mencari jenis-jenis ikan yang mempunyai nilai komersial tinggi dan dipasarkan secara lokal.*
- *Perikanan pukat cincin sedang; terdapat hanya di pelabuhan Pekalongan, propinsi Jawa Tengah. Waktu penangkapan berlangsung antara 6 sampai 15 hari. Hasil tangkapan dijual secara segar di pelelangan untuk dipasarkan di dalam propinsi Jawa Tengah atau propinsi lainnya di Jawa.*
- *Perikanan pukat cincin besar; terpusat di Propinsi Jawa Tengah yaitu, Tegal, Pekalongan, Batang dan Juwana-Rembang. Waktu penangkapan dapat mencapai 40 hari. Hasil tangkapan dijual secara segar atau asin dan dipasarkan sampai keluar Jawa.*

Kapal penangkap, daerah dan cara penangkapan adalah berbeda pada setiap jenis perikanan pukat cincin, tergantung dari jenis ikan yang dituju dan permintaan pasar.

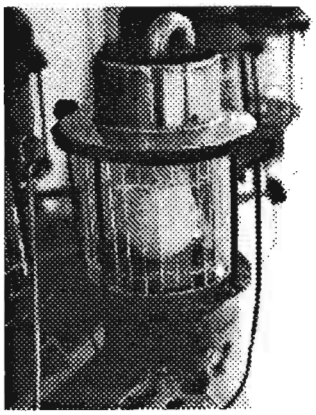
INTRODUCTION

The Republic of Indonesia covers a vast archipelagic area consisting of more than 17 000 islands stretching on about 5 000 km from East to West and about 2 000 km from North to South. With the establishing of the 200 miles Exclusive Economic Zone (E.E.Z.), the total area of marine waters under Indonesian jurisdiction is about 5.8 million km^{-2} with an E.E.Z. area of 2.7 million km^{-2} (fig. 1).

The archipelagic area, in particular, includes highly productive waters due to :

- A diversified underwater topography consisting of thousands islands, shelves, banks, basins and trenches providing excellent breeding and feeding places for a wide range of marine species;
- An area of shallow shelf (less than 200 m deep) totaling approximately 775 000 km^{-2} adjacent to deeply depressed sea-beds;
- Various ocean currents caused by monsoon winds and oceanic sea flows, which cause upwellings between and around the islands;
- An inflow of fertile fresh water from numerous rivers which drain densely forested lands and flow through highly populated islands.

PRESSURE LAMPS USED TO CONCENTRATE THE FISH
LAMPU TEKAN POMPA YANG DIGUNAKAN UNTUK MEMIKAT IKAN



HAULING OF THE NET
JARING PUKAT CICIN SEDANG DIANGKAT

In this area some regions have been exploited since a long time while some are still almost virgins.

The fishery sector occupies an important place in the economy of the islands. Above all, it is a protein resource, even if the fish consumption per capita (14 kg/year) is low compared to other countries. In 1991, the marine production was estimated to 2 500 000 tons (tab. I). The production of fish was around 2 200 000 tons, 1 400 000 of which were pelagics. The fishery sector employs 1 600 000 people which represents 3% of the Indonesian manpower.

Statistics used in this article comes from the Directorate General of Fisheries and from the Project for the large and medium seiners fisheries. Established by province and following the sampling scheme set by Yamamoto in 1976, they are reliable only in the province of Central Java. Elsewhere, as the sampling scheme was not updated since 1976, changes in the fisheries are not taken into account and data are obviously biased. Nevertheless, they can give an approximate picture of the fishing sector in Indonesia. Data is presented up to 1991 because at the time of the article more recent data was not available.

1. FRAME OF THE STUDY

The Java Sea is the eastern part of the Sunda shelf which spreads from the gulf of Thailand to the South-eastern part of Kalimantan (Indonesian part of Borneo) (Emery *et al.*, 1972). It is a huge continental shelf with an average depth of 50 m which covers an area of 360 000 km^{-2}. Westward it connects to the South China Sea through the Karimata Strait and eastward it is widely open to the Flores Sea. The Java Sea is surrounded by the three biggest islands of the archipelago which gathers 80% of the Indonesian population, 60% on the Java Island alone.

Representing only 7% of the marine territory of Indonesia the Java Island accounts for 32% of the Indonesian marine production (tab. I) and 33% of the pelagic catches. Two types of fisheries, small scale and artisanal fisheries coexist to exploit the resources. They are concentrated on the North coast of Java where more than 68% of fishing devices are found and 65% of catch are landed (fig. 2).

Table I

MAIN MARINE STATISTICS FOR INDONESIA AND THE JAVA SEA IN 1991
STATISTIK PERIKANAN LAUT DI INDONESIA DAN LAUT JAWA TAHUN 1991

(Source : Directorate General of Fisheries)

	1991	TOTAL INDONESIA	TOTAL JAVA SEA	RATIO JS/TI
Tons	**Marin production**	**2 500 000**	**765 000**	**31**
	Total fish	**2 200 000**	**700 000**	**32**
	Pelagic fish	**1 450 000**	**485 000**	**33**
Pelagic catch per group of species (tons)	Layang	210 000	110 000	52
	Selar	96 000	40 000	42
	Tembang	137 000	70 000	51
	Lemuru	145 000	39 000	27
	Teri	135 000	46 000	34
	Kembung	144 000	59 000	41
	Tenggiri	64 000	23 000	36
	Tongkol	150 000	41 000	27
	Cakalang	133 000	4 000	3
	Tunas	78 000	1 000	1
	Others	158 000	53 000	33
Fishing devices (number of units)	Total number	535 000	115 000	21
	Danish seine	18 000	9 300	52
	Bottom seine	3 900	700	18
	Beach seine	10 500	1 200	11
	Purse seine	6 100	2 200	36
Catch by seines (tons)	Danish seine	206 000	112 600	55
	Bottom seine	26 000	13 900	53
	Beach seine	103 000	23 000	22
	Purse seine	440 000	190 000	43

The equivalent English names of the Indonesian terms used in the table are given in annex I
Nama Indonesia dari ikan ikan yang tercantum dalam Tabel 1 disajikan pada Lampiran I

The resource has been exploited since a long time by coastal small scale fisheries which use a large variety of fishing gears. The distribution of fishing devices is mostly regional. It depends on cultural habits, sea bed configuration and constitution, and coastline shape. Javanese fishermen mainly use seines, those of Sumatra and Kalimantan gill nets and lift nets (tab. II and fig. 3). This distribution is reflected by the geographic distribution of catches (fig. 4). Gill nets and lift nets production represents more than 60% in Sumatra and Kalimantan, while purse seines and traditional seines production makes up 61% of the Javanese catches. Among the 490 000 tons of pelagic fish caught in the Java Sea, 42% is made by the purse seiners fisheries. With an average of 90 tons/year, their catch rate is high compared to other fishing gears. This value greatly differs according to the fisheries. The catch rate of the large seiners based in the province of Central Java reaches 270 tons/year/fishing gear, while the small seiners catch amounts to 36 tons/year (fig. 5).

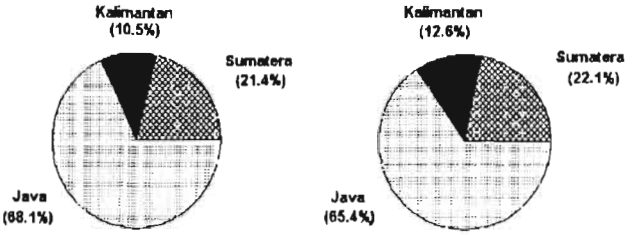
Table II

MAIN CHARACTERISTICS OF MARINE STATISTICS IN THE JAVA SEA IN 1991
KARAKTERISTIK UTAMA DARI STATISTIK PERIKANAN LAUT DI LAUT JAWA TAHUN 1991
(Source : Directorate General of Fisheries)

FISHING GEARS (N.UNITS)	SUMATRA	KALIMANTAN	JAVA	TOTAL
Danish seine	1 500	800	7 000	9 300
Bottom seine			700	7 000
Beach seine	310	560	330	1 200
Small purse seine		200	1 560	1 760
Lines	6 900	2 500	12 900	22 300
Gill nets	4 700	3 800	39 600	48 100
Lift nets	7 600	2 500	4 500	14 600
Large purse seines			470	470
Total	**21 010**	**10 360**	**67 060**	**98 430**
CATCH (TONS)				
Danish seine	25 300	14 100	73 200	112 600
Bottom seine			13 900	13 900
Beach seine	5 600	7 900	9 500	23 000
Small purse seine		6 700	56 500	63 200
Lines	25100	8 000	26 000	59 100
Gill nets	52 900	38 700	130 400	222 000
Lift nets	45 900	12 800	22 400	81 100
Large purse seines			126 900	126 900
Total	**154 800**	**88 200**	**458 800**	**701 800**
CATCH RATE (TON/YEAR/GEAR)				
Danish seine	17	18	10	12
Bottom seine			20	20
Beach seine	18	14	29	19
Small purse seine		34	36	36
Lines	4	3	2	3
Gill nets	11	10	3	5
Lift nets	6	5	5	5
Large purse seines			270	270

Figure 2

Fishing devices and fish production dispatching in the Java Sea
Distribusi penangkapan dan produksi di Laut Jawa berdasarkan pulau-pulau yang membatasinya



Fishing devices 1991 Fish production 1991

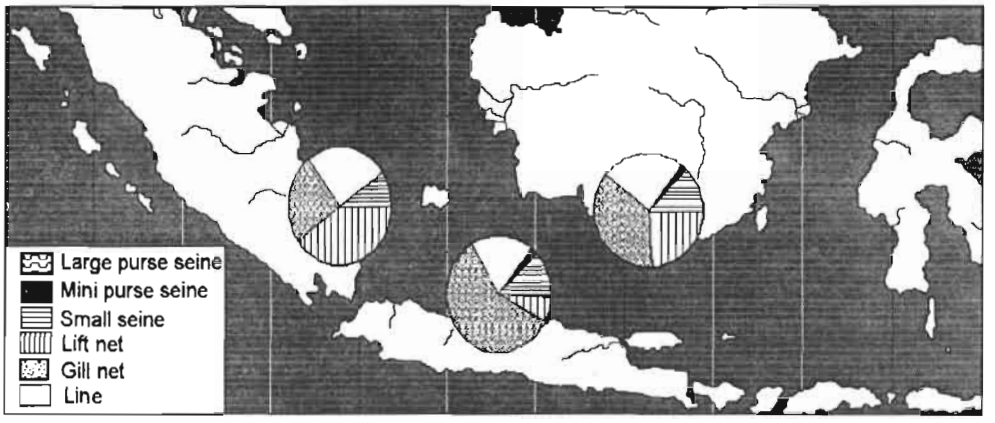


Figure 3

Fishing gear dispatching in the three islands bordering the Java Sea
Distribusi penangkapan berdasarkan alat tangkap pada tiga pulau yang membatasi Laut Jawa (1991)

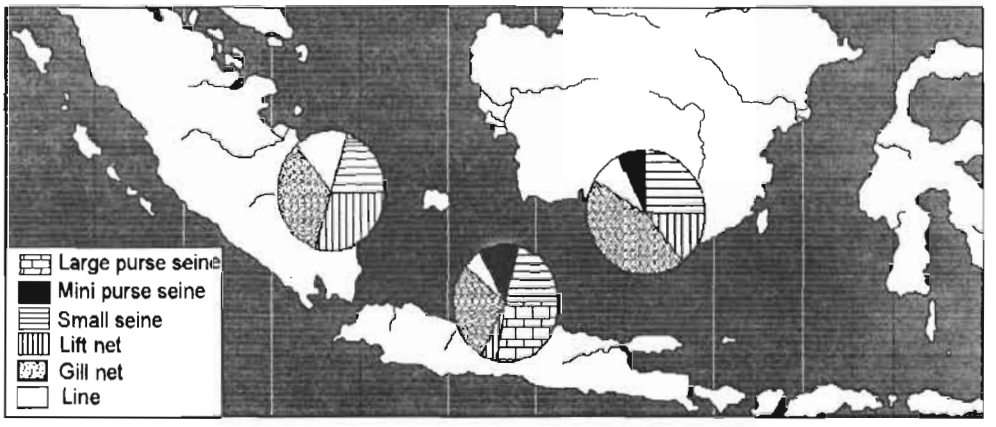


Figure 4

Fish production according tp the fishing devices in the three islands bordering the Java Sea
Produksi ikan berdasarkan alat tangkap pada tiga pulau yang membatasi Laut Jawa (1991)

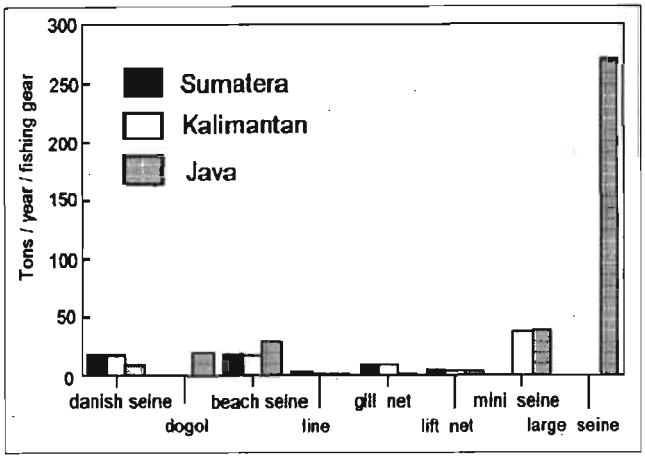


Figure 5

CATCH RATE OF THE VARIOUS FISHING GEAR IN THE THREE ISLANDS BORDERING THE JAVA SEA

LAJU TANGKAP DARI BEBERAPA ALAT YANG BERBEDA PADA TIGA PULAU YANG MEMBATASI LAUT JAWA

(1991)

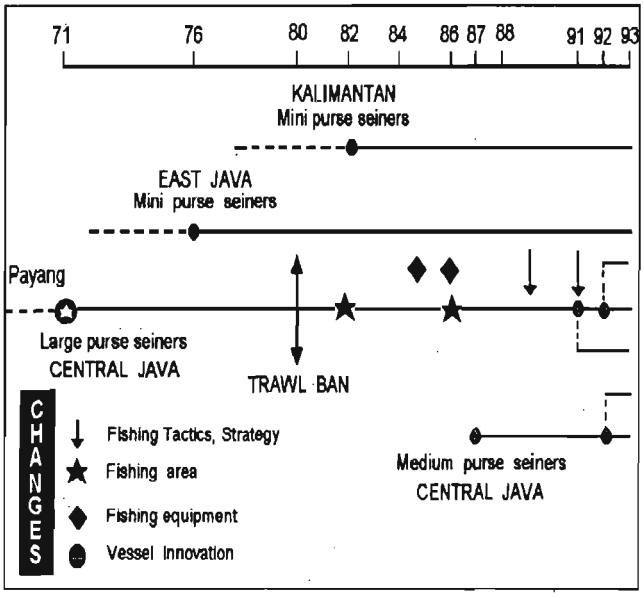


Figure 6

HISTORICAL DEVELOPMENT OF THE PURSE-SEINE FISHERIES IN THE JAVA SEA

SEJARAH PERKEMBANGAN PERIKANAN PUKAT CINCIN DI LAUT JAWA

2. DEVELOPMENT OF THE SEINERS FISHERIES

Since the beginning of the XXst century, the encircling nets "***lampara***" and Danish seines "***payang***" are used around fish aggregating devices or "***rumpons***". Due to the influence of the monsoon, the catch rate of these devices is low and the fishing period short. The development of the fisheries led to the motorization of the fishing vessels. The fishing pressure over the coastal stocks drastically increased.

In 1968, in order to overcome these constraints some fishery owners from Batang, a small fishing port located in Central Java, introduced the purse seine in Indonesia. At first, a seine imported from Japan by the Lembaga Penelitian Perikanan Laut was put on a small fishing boat usually fishing with "***payang***". After a rather long test, the size of the gear was adapted to local conditions and a commercial exploitation started mid-1973 with three vessels.

This new fishing technic allowed bigger catches than traditional gear and longer fishing times. This explains why purse seine exploitation spreads very quickly along the northern coast of Java.

Around 1975, in Central Java, a new type of fishing vessel derived from trawlers operating there was adopted by the fishery. In 1980, the flotilla was constituted of 250 vessels. Until 1980 the exploitation was limited to the onshore waters of the Java Island, traditional fishing grounds for the Javanese fishermen. In 1980-1981, with the trawl ban, numerous trawlers were transformed into purse seiners. The fishery expanded very quickly as these vessels extended their fishing zone eastward and their number increased. In 1985-86 they overpassed the boundaries of the Java Sea and began to exploit the Makassar Strait and the southern part of the South China Sea (fig. 6). At the time being, the purse seine is found in almost every province of Indonesia and the trend to replace traditional seine nets by purse seine in small scale fisheries is strong. The North coast of Java still represents the main Indonesian area for the seiners exploitation with 42% of the fishing vessels and 31% of the landings (tab. III).

Table III

Provincial repartition of landings and number of purse seiners vessels in the Indonesian archipelago in 1991.

Penyebaran hasil tangkapan dan jumlah kapal pukat cincin berdasarkan propinsi di Indonesia tahun 1991

(Source : Directorate General of Fisheries)

In this table production and number of purse seiners are gathered by province and by main Island. The figures given for Bali Island are erroneous. The catch by device is high in Irian Jaya as some industrial tunas purse seiners operate there. The last third lines give informations about the three main purse seine fisheries in Indonesia

Province	Catch	Number of Units	Catch/unit
Aceh	19 700	499	39.4
North Sumatra	57 700	632	91.2
Riau	900	59	15.2
Jambi			
West Sumatra	5 200	29	179.3
Bengkulu			
South Sumatra			
Lampung			
Sumatra	**83 500**	**1 219**	**68.4**
West Java	5 500	42	130.9
DKI Jakarta	2 700	158	17
Central Java	137 000	704	194.6
East Java	74000	1 656	44.6
Java	**219 200**	**2 560**	**85.6**
West Kalimantan	1 300	12	108.3
Central Kalimantan		64	
South Kalimantan	6 700	132	50.7
East Kalimantan	1 000	128	7.8
Kalimantan	**9 000**	**336**	**26.7**
North Sulawesi	11 900	356	33.4
Central Sulawesi	9 000	76	118.4
South Sulawesi	27 400	653	42
South-East Sul.	1 700	12	141.7
Sulawesi	**50 000**	**1 097**	**45.6**
Bali	28 400	70	
W.Nusatenggara	8 000	163	49
E.Nusatenggara	7 700	170	45.3
East Timor		2	
Maluku	18 600	425	43.8
Irian Jaya	17 300	11	1 572.7
Total	441 700	6 053	73
Java large Seiners	126 900	468	271.1
Malaka Strait	51 700	782	66.1
Bali Strait	25 000	355	70.4

3. TYPOLOGY OF THE JAVANESE SEINERS FISHERIES

Large pelagic resources are found in the eastern part of the Java Sea, while in the western part these resources seem to be more limited. Therefore purse seines fisheries are found in the provinces of Central and East Java, and in South Kalimantan where the conditions required for such a development are fulfilled. At least three types of purse seiners fisheries coexist in the Java Sea. Their typology is based on geography, human behavior and availability of large fish resources. These factors determine the presence and the evolution of the fisheries.

The cultural and historical habits linked with the economical ones determine the type of fisheries (small scale, artisanal) which exists (tab. IV). In the three islands surrounding the Java Sea, some places have a long maritime tradition (Palembang in Sumatra, Banten, Pekalongan, Tuban in Java), but, unlike in Java which is densely populated, in Sumatra and in Kalimantan, there is no hinterland where marine products can be easily sold. Big investors primarily involved in trawling are found in the Central Java fishery sector. After the trawl ban, they invested in purse-seining and favored the expansion of the fishery which became artisanal. In East Java where such investors are not found the purse-seine fishery is still done on a small scale.

Geography determines the type and the size of the vessels and consequently the size of the gear used by the different fisheries. Around the islands bordering the Java Sea, shallow waters extend far from the coastline and in order to land, large vessels have to find landing places located at the mouth of the rivers. There are large rivers in Sumatra, Kalimantan and in the province of Central Java. Most Javanese rivers have a ria. In East Java where the rivers are scarce and small, the vessels have to land on the beach. Due to these physical conditions, the Javanese vessels have a flat bottom and present shallow draught.

Table IV

SYNTHESIS OF THE FACTORS AFFECTING THE EMERGENCE OF THE SEINERS FISHERIES IN THE THREE ISLANDS BORDERING THE JAVA SEA

SYNTESA DARI FAKTOR-FAKTOR YANG MEMPENGARUHI KEBERADAAN PERIKANAN PUKAT CINCIN PADA TIGA PULAU YANG MEMBATASI LAUT JAWA

(- negative impact, + positive impact)

		SUMATRA	KALIMANTAN	JAVA		
		SOUTH	SOUTH	WEST	CENTRAL	EAST
Fish resources		-	+	-	+	+
Geography	rivers	+	+	+	+	-
	coastline	-	+	+	+	+
Cultural habits	tradition	+	-	+	+	+
Econom. factors	investor	-	-	-	+	-
	market	-	-	+	+	+
Results		No	small	small	large	small

The seines previously used were of **"lampara"** and Danish **"payang"** types (fig. 7a and 7b). The present type of seine derived from the old ones. It consists of two trapezoidal and symmetrical wings, flanking a central bunt where fish is concentrated before broiled on board. Because of this shape, the nets have to be hauled on board simultaneously from both wings (fig. 8). It is a ring net rather than a purse-seine one (fig. 9).

The differences between the two types of nets are :

■ Ring net :	■ Purse-seine :
Central bunt	Bunt at one side
purse line in two pieces	purse line in one piece
hauling from the two sides	hauling from one side

In the fisheries the general scheme of the net is the same. It only differs by the size from 300 m for the smallest ones to 600 m for the largest ones.

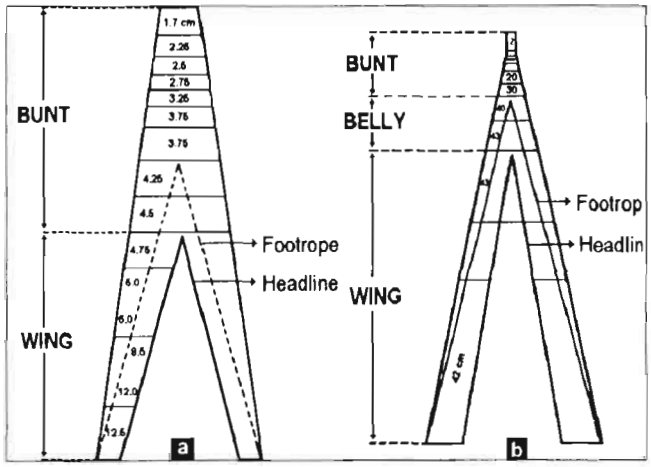


Figure 7

DESIGN OF THE TRADITIONAL SEINE NETS IN INDONESIA

a) Danish seine(from Unar 1968)

b) Encercling net (from Subani and Barus 1988)

RANCANGAN PUKAT TRADISIONAL DI INDONESIA

a) Payang

b) Lampara

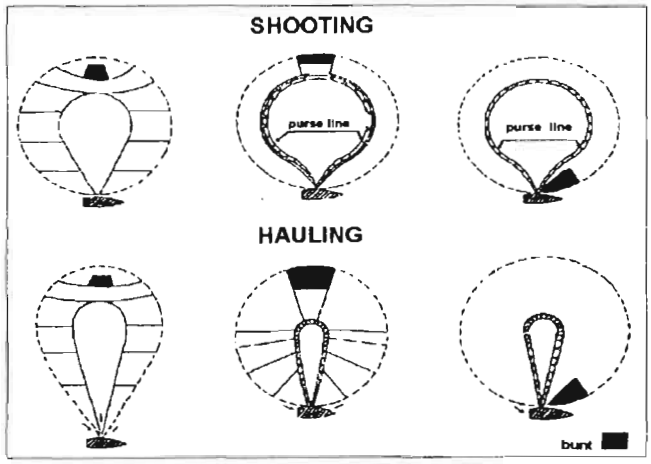


Figure 8

MAIN TYPES OF SURROUNDING NETS AND THEIR MANOEUVRE

JENIS UTAMA DARI JARING LINGKAR DAN CARA PENGOPERASIANNYA.

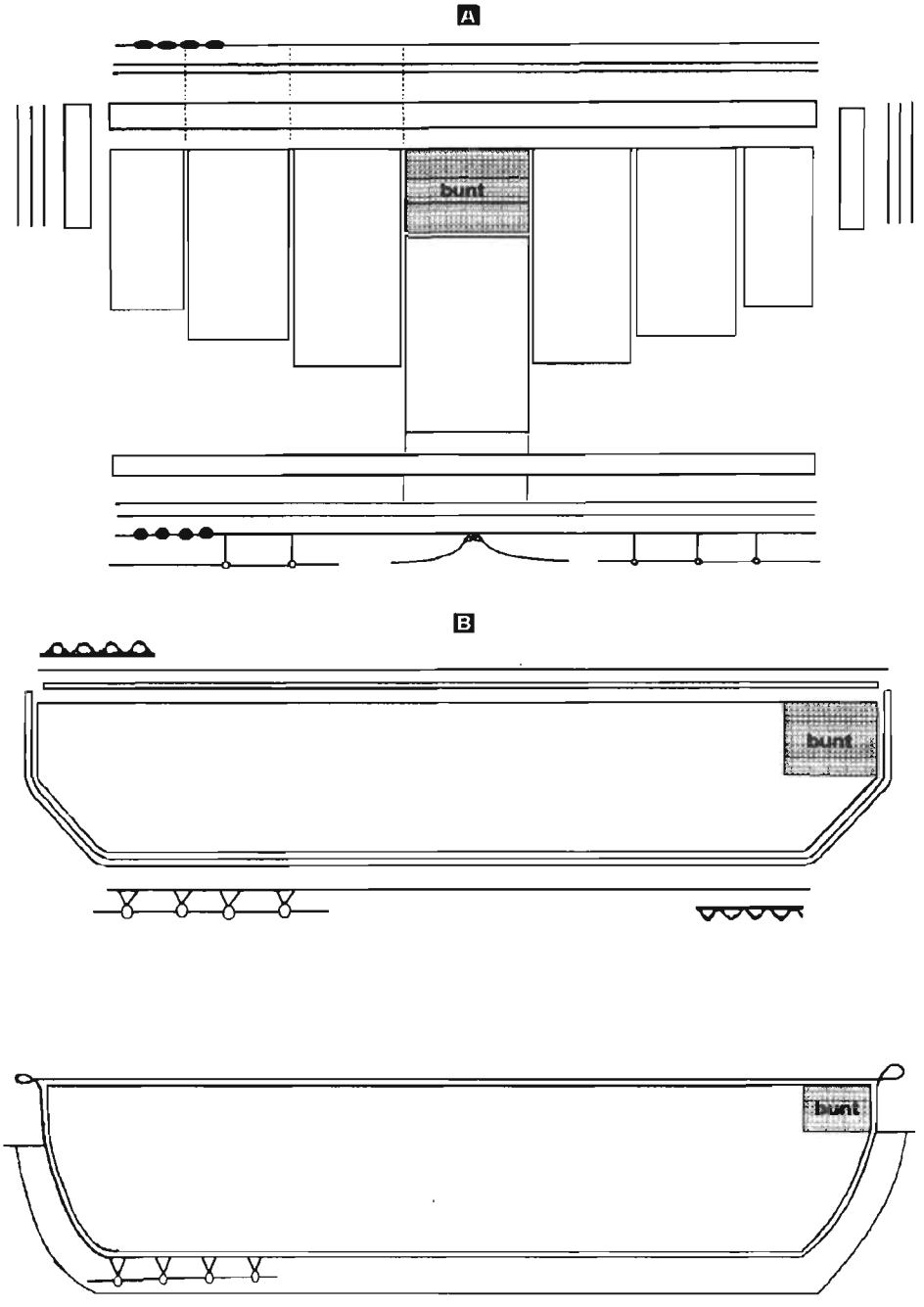


Figure 9

Design of a ringnet used in the Java Sea (A) and a Purse-seine net used in artisanal fisheries in Africa (B)

Rancangan dari "ringnet" yang dipergunakan di Laut Jawa (A) dan "purse seine" yang dipergunakan oleh perikanan artisanal pada Afrika (B)

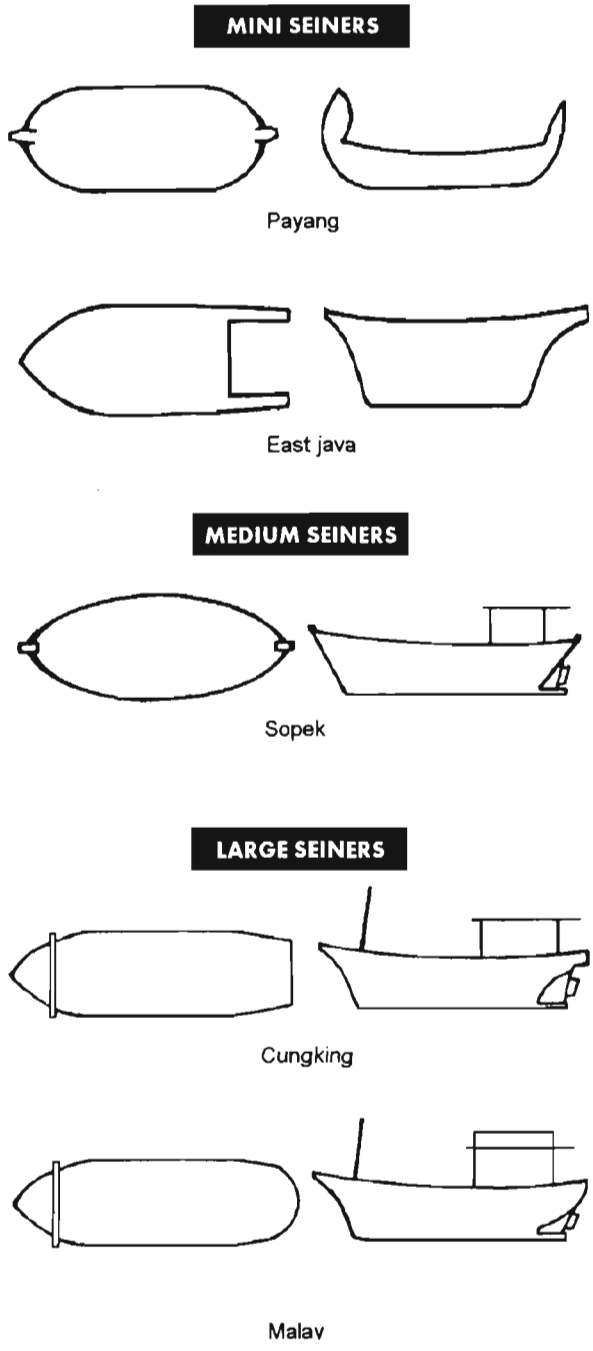


Figure 10

VARIOUS TYPES OF VESSELS FOUND IN THE JAVANESE PURSE-SEINERS FISHERIES

PERBEDAAN JENIS PERAHU PADA PERIKANAN PUKAT CINCIN DI JAWA.

3.1. Mini seiners fisheries

The mini-seiners are wooden vessels between 10 and 18 meters long. They have a 25 to 60 lateral or terminal outboard engine with a long and tip-up shaft. The carrying capacity is around 1 to 2 tons.

Mini seiners fisheries use two types of vessels, semi dugout and planked vessels (fig. 10). They are locally built on temporary dockyards. The hull is made of tek and the vessel is built in two months at a cost of around 40 million Rp.

Their exploitation is based on inshore and offshore resources. Depending on their fishing grounds they can catch small pelagics as anchovies, mackerels, scads, sardinella and small tunas. They exploit the inshore waters along the North coast of Java and the South-East part of Kalimantan. Most of the fisheries are located in East Java and around the Laut Island in South Kalimantan.

In 1991, 63 000 tons of fish have been landed by the mini-seiners fisheries with a catch/rate of 36 tons/year/fishing gear (tab. V).

The fishing area is located along the coast around 30 miles away from the shore. According to the monsoon and the target species, the fishing vessels move inside

this area. They stay from 1 to 3 days at sea, and land only fresh fish mostly for local consumption. For the most part, the sale is made at sea or on the beach during the landing.

3.2. Medium seiners

This fishery appeared in the province of Central Java in 1987. At the beginning, the owners were mainly investors coming from activity sectors other than fishing or they were former fishermen with a small capital. In 1991 the fleet consisted of 142 units landing 17 300 tons (123 tons/gear/year). In 1992 ethnic Chinese entered in the fishery and gave it a boost. Medium seiners are only found in the Pekalongan harbor.

The medium seiner is a wooden vessel fitted with an inboard engine of 35 to 100 HP, and with the traditional hull shape of the North coast of Central Java (fig. 10). It has a high flared bow and a pointed stern. The length is between 15 and 20 m and the hold capacity between 20 and 25 tons. The vessels are locally built at Pekalongan and Batang in permanent dockyards. The hulls are constructed of wide Java tek plants. The planks are first laid in place, the frames are fitted latter. The price of such a vessel is around 125 million Rp.

The fishery exploits the offshore resources of the Java Sea. The exploitation is based on the catch of scads (*Decapterus russelli, Decapterus macrosoma*) and mackerels (*Rastrelliger kanagurta*). The fishing grounds are located in the Java Sea from the North of Indramayu to Bawean and Matasiri islands (fig. 2a, p. 17) over depths of 30 to 45 m. The boats fish around the islands and move to other fishing grounds according to the movements of the target fish. They stay at sea between 8 and 15 days and only land fresh fish sold under auction for local and Java Island fish market.

3.3. Large seiners

It was the first purse-seiners fishery established in Indonesia. It extended after the trawl ban when trawlers were transformed in seiners. In 1991, the catch reached 109 000 tons for a fleet of 326 vessels (334 tons/gear/year). The vessels are found in the province of Central Java, mostly in Pekalongan, Juwana and Tegal harbors.

The vessels are not built on the North coast of Java, but in Sumatra at Bagan Siapi-Api. They are of **"Cungking"** type (fig. 10). They are delivered as bare hulls to the fishing ports and are fitted out under the supervision of the owners. This includes machinery installation and fitting of the hold insulation, lining and partition. They are flat bottomed vessels with shallow draught and an inboard engine of at least 160 HP. The older vessels of this type have a vertical transom stern. Often, the new ones now have a rounded counter stern (fig. 10). This shape is more efficient for propulsion. They have a deckhouse. They are between 20 and 35 metres long. Most vessels of this size have a fish hold capacity of 50 to 80 tons, and a crew of 30 to 40 men. They are built in four months and fittings are made in two months. Such a vessel fully equipped costs around 300 million Rp (1993).

This fishery exploits the same resources as the medium seiners fishery do. Its exploitation being more offshore than the medium seiners, the catch of *Decapterus macrosoma* is higher than the one of *Decapterus russelli*.

The vessels exploit the whole Java Sea in areas more than 50 m deep, the Makassar Strait and the southern part of the South China Sea. They can stay at sea up to 40 days but the average trip is 25 days long. They land fresh and salted fish which is sold under auction and is used for local and national fish markets and turned into numerous products.

Table V

NUMBER OF UNITS, CATCH AND CATCH/RATE OF THE SEINERS FISHERIES BY PROVINCE AROUND THE JAVA SEA IN 1991.

JUMLAH UNIT, HASIL TANGKAPAN DAN LAJU TANGKAP PERIKANAN PUKAT CINCIN SEKITAR LAUT JAWA BERDASARKAN PROPINSI PADA TAHUN 1991

(Source : Directorate General of Fisheries and Java Sea Project).

		SEINES (UNITS)	CATCH (TONS)	CATCH RATE (TON/UNIT)
Mini seiners	West Java	12	2 300	191
	DKI Jakarta	158	2 700	17
	Central Java	236	10 100	42.8
	East Java	1 156	41 400	35.8
	Central Kalimantan	64		
	South Kalimantan	132	6 700	50.7
Medium seiners	Central Java	140	17 300	123
Large seiners	Central Java	326	109 000	334

CONCLUSION

It seems that the widespreading of the purse seining in the Indonesian pelagic fisheries is still strong. This gear allows a better catch and fishing along the year. The Indonesian fishermen who use traditional seines nets tend to adopt it broadly.

This gear is more efficient than fishing gears such as **"lampara"** and **"payang"**, thus fishing pressure on the stocks of pelagic fish will be higher. This fact is more evident for coastal pelagic fish already heavily fished by the small scale fisheries.

As for all renewable resources, a careful management of these fisheries is needed in order to avoid overexploitation. Furthermore, stocks of small pelagic are subject to high variations related to environmental conditions. If a heavy fishing pressure is applied to these stocks, they can decrease quickly and even collapse provoking a crisis along the northern coast of Java Island.

We can notice that purse seine is used in Indonesia mainly for the exploitation of small pelagics and rarely for big fishes such as tunas as it is done in other parts of the world.

The absence of a well developed cannery industry can explain this situation. Small pelagics are only for Indonesian consumption and *Sardinella lemuru* is the sole species which is locally canned (Bali Strait).

Mini seiners fisheries are small scale ones, while medium and large seiners fisheries are artisanal. For these last ones, the passage to industrial level would lead to large technological and socio-economic changes.

BIBLIOGRAPHY

ANONYMOUS, 1993. Statistik Perikanan Indonesia (Fisheries Statistics of Indonesia) 1991. Departemen Pertanian. *Direktorat Jenderal Perikanan.* 21.

BEN YAMI M., La senne coulissante avec de petits bateaux. *Coll. FAO, Formation,* **13**, 97p.

BOELY T., POTIER M. and NURHAKIM S., 1988. Study on the big purse seiners fishery in the Java Sea, III. The Fishing Method. *J. Mar. Res. Fish.* Inst., **47**, 69-86.

DJADJURI H., 1978. Perikanan purse seine di Batang dan pembuatan kapal-kapal purse seine di Batang. Simposium Modernisasi Perikanan Rakyat. *Lem. Pen. Perikanan Laut,* 12p.

DREMIERE P.Y. *et* GEORGE J.P., 1991. Technologie des pêches. *ALA/INS/87/17. Rapp. mission.*, 36p.

EMERY K.O., UCHUPI E., SUNDERLAND J., UKTOLSEJA H.L. and YOUNG E.M., 1972. Geological structure and some water characteristic of the Java Sea and adjacent continental shelf. *United Nations ECAFE, CCOP Tech. Bull.*, **6**, 197-223.

POTIER M., SADHOTOMO B., ATMAJA S.B. and SUWARSO. 1992. Big purse seiners fishery. Statistical collection. Year 1991. *ALA/INS/87/17, Scien. and Tech. Doc.*, **9**, 29p.

SUBANI W. and BARUS H.R., 1988. Alat penangkapan ikan dan udang laut di Indonesia. (Fishing gears for marine fish and shrimp in Indonesia. *J. Mar. Res. Fish.* Inst., **50**, 248p.

TEMPLE C.R. and SARI A., 1992. Landell Mills Limited. Fifth technical report. 05/92. Purse seiner performance and capacity trials. *ALA/INS/87/17, Rep. mission*, 27p.

UNAR M., 1968. The "chantrang" danish seine fishery of the North coast of Java. *Proc. IPFC.*, **13** (3), 546-553.

WUDIANTO and LINTING M.L., 1986. Telaah perikanan pukat cincin (purse seine) di daerah Tegal. *J. Mar. Res. Fish.* Inst., **34**, 57-68.

YAMAMOTO T., 1980. A standard statistical system for current fishery statistics in Indonesia. A report prepared for the Fisheries development and management project, Indonesia. FI:DP/INS/72/064, Field document , *FAO, Rome*, **7**, 97p.

ANNEX I

INDONESIAN, ENGLISH AND SCIENTIFIC NAMES OF THE MAIN PELAGIC SPECIES CAUGHT IN INDONESIA.

NAMA INDONESIA, INGGRIS DAN NAMA ILMIAH DARI IKAN-IKAN PELAGIS UTAMA YANG TERTANGKAP DI INDONESIA.

INDONESIAN NAME	ENGLISH NAME	SCIENTIFIC NAME
Alu-alu	Barracudas	*Sphyraena spp.*
Cakalang	Skipjack	*Katsuwonus pelamis*
Cucut	Shark	
Daun Bambu	Queen fish	*Chorinemus spp.*
Golok-golok	Wolf herring	*Chirocentrus dorab*
Ikan terbang	Flying fish	*Cypselurus spp.*
Japuh	Rainbow sardine	*Dussumieria acuta*
Kembung	Indian mackerel	*Rastrelliger kanagurta* *Rastrelliger brachysoma*
Kuwe	Jack, Trevallie	*Caranx spp.*
Layang	Scads	*Decapterus russelli* *Decapterus macrosoma* *Decapterus kurroides*
Lemuru	Indian oil sardinella	*Sardinella longiceps* *Amblygaster sirm*
Selar	Trevallies	*Selar spp.* *Selaroides leptolepis*
Sunglir	Rainbow runner	*Elagatis bipinnulatus*
Tembang	Fringescale sardinella	*Sardinella fimbriata* *Sardinella gibbosa*
Tenggiri	Narrow barred king mackerel	*Scomberomorus commerson*
Tenggiri papan	Indo pacific king mackerel	*Scomberomorus guttatus*
Teri	Anchovies	*Stolephorus spp.*
Terubuk	Chinese herring	*Hilsa macrura*
Tetengkek	Hardtail scad	*Megalapsis cordyla*
Tongkol	Eastern little tunas	*Euthynnus affinis, Auxis spp.*
Tuna	*Tunas*	*Thunnus obesus* *Thunnus albacares*