

STUDY ON THE BIG PURSE SEINERS FISHERY
IN THE JAVA SEA

(II. Evolution and Structure of the Javanese
purse seiners' fleet¹⁾)

Subhat Nurhakim²⁾, Suherman Banon²⁾, M. Potier³⁾, T. Boely³⁾

ABSTRACT : The big Purse seiner of the Java Sea, introduced around the 1970 are the principal component of the pelagic fish exploitation in that sea. Since that date, type of fishing shows a real increase. The number of vessels and the duration of trips grow continuously. But, since 1976, the design of the vessel did not evolve. Only the main characteristics change. The article discuss the development of the fleet since 1976, its main characteristic in 1985 and its future capabilities. In the current state of our knowledges, the fleet ought to reach very quickly a critical stage owing to the number and the size of the vessels and owing to the fishing pressure exerted over the pelagic fish populations of the Jawa Sea.

ABSTRAK : Telaah tentang perikanan pukat cincin besar di laut Jawa. (II. Evolusi dan struktur armada pukat cincin di Laut Jawa)¹⁾ oleh Subhat Nurhakim²⁾, Suherman Banon²⁾ M. Potier³⁾ dan T. Boely³⁾

Purse seine besar di Laut Jawa diperkenalkan sekitar tahun tujuh puluhan, merupakan unsur utama dalam pengusahaan perikanan pelagik diperairan ini. Sejak saat itu, jumlah kapal dan lamanya operasi di laut terus meningkat, walaupun sejak tahun 1976 "disain" dari pada kapal tidak mengalami perubahan, hanya beberapa karakteristiknya saja yang berubah. Dalam tulisan ini dibahas perkembangan dari armada pukat cincin besar tersebut sejak tahun 1976, karakteristik kapal pada tahun 1985 dan kemampuannya pada masa yang akan datang. Pada saat-saat ini berdasarkan informasi yang didapatkan oleh penulis, armada pukat cincin besar mungkin akan mencapai tahapan yang kritis pada waktu yang cepat, berdasarkan pada jumlah dan ukuran kapal dan tekanan penangkapan yang lebih terhadap sediaan ikan-ikan pelagik di Laut Jawa.

RESUME

Les grands senneurs de la mer de Java apparus dans les années 1970 sont la composante principale de l'exploitation des populations pélagiques de cette mer. Ce type de pêche a connu un essor considérable. Le nombre de navires et la durée des marées sont en constante augmentation. Mais le plan du navire n'a pas évolué depuis 1976, seules les caractéristiques principales allant dans le sens de l'agrandissement. L'article traite de l'évolution de la flottille depuis 1976, de ses principales caractéristiques en 1985 et de ses possibilités d'avenir. En l'état actuel de nos connaissances la flottille devrait atteindre très rapidement un stade critique à la fois par la taille atteinte et par la pression de pêche exercée sur les populations pélagiques de la mer de Java.

1) This note belongs to a serie of papers analysing more precisely a synthesis document Boely and al., 1987) that regroups all the available basic data since 1976 on the activity of the big purse seiners based in the Central Java province.

2) BPPL

3) ORSTOM

12 JUN 1989

ORSTOM Fonds Documentaire

N° : 26450, ex 1

Cote : A

M

PIWZ

INTRODUCTION

The purse seine, introduced around 1970, is one of the principal components in the pelagic fish exploitation of the Java Sea. That gear is used by two types of vessels from the northern coast of the Java Island: the "mini purse seiners" and the "big purse seiners". According to the harbours, the definition of each class can vary. Meanwhile, one can define the vessel pattern of these two types with the following characteristics:

The "mini purse seiner": vessel 10 to 15 metres long having mostly an out-board engine and a seine with a maximum length of 300 metres. The boats exploit the coastal area standing away rarely more than 15 nautic miles from the littoral. The trips last from one to three days.

The "big purse seiner": vessel from 15 to 30 metres long. All vessels have an in-board diesel engine and a seine with a length equal or more than 400 metres long. They exploit now the whole Java Sea, even taking risks in the southern part of the China Sea and in the Makassar Straits. The trips last from 5 to 25 days.

The study will essentially turn on that last class, of which the vessels are based in the Central Java province. It inserts in a more broad program of general study concerning the big purse seiners activity in the Java Sea. In this article, one will discuss especially the fleet's structure. The others essential points of this "Fishing System" will be discuss in further notes, in particular: Fishing method, Catches, Sampling, Effort, etc. . . .

In a first time, we will describe the evaluation of the fleet since 1976, years when we start to own some relative accurate data, then its main characteristics in 1985. Lastly we will try to describe the different possible advices to obtain a better knowledge of the fleet and its activity.

AVAILABLE DATA - METHOD

The data on which is based this article came from two sources : the Fisheries Administration and the Harbour Master.

The first one, works out a form called SL-O where is registered the vessels with their names, the owner's name, the registration number and their main characteristics (length, width, height, power, gross tonnage, year of ship building). An annual registration on those forms is obligatory for the vessels before to obtain the fishing licence, that is delivered yearly for each vessel.

The second one, registers, when a new vessel enters in its port of registry for the first time, its main characteristics which allows it to get the sea letter without which it cannot obtain the fishing licence. That document is also renewed yearly. Under 50 gross tonnage, that letter is delivered in the regency offices, over that value the registration is carried out at the provincial level. The data have to be collected in these offices.

The comparison of all documents linked to the study of the "Buku Bakul" * where are registered the vessel's name having landed, allows us to produce the list of active vessels during the year and, then, to know the main characteristics of the fleet. Those values are interesting to know in the view of a good management of the resource. Meanwhile, the collected data are often incomplete. Those gathered from Harbour Masters do not produce continuous series and are in some harbours surely false. At the Fisheries Administration level, the characteristics of some vessels lack or are approximate. Some vessels already selled still appear in the lists when some new units already in exploitation lack. We can find some vessels registered in two different harbours for the same year. In cer-

*) Basic form where is registered daily the name of the vessels with the quantities unloaded, by category, and the name of the buyers.

tain harbours the annual series are not available (Table 1). A more rational management of the registers ought to allow to palliate quickly to those problems.

The described evolution is rather Pekalongan vessels'. Meanwhile, according to the importance of that harbour's vessels in the fleet, we can consider what is representative of this one.

FLEET EVOLUTION SINCE 1976

The purse seiners appeared around the 1970 in the Batang harbour. At the time of the trawl ban in the Java Sea in 1980 and 1981, that type of fishing showed a real increase. Now, the most part of the fleet is grouped in five harbours of the Central Java province: Tegal, Pekalongan, Batang, Juwana and Rembang. A few units are registered in the Eastern Java province in Brondong harbour (Fig 1).

Until 1981, the vessels exploit the traditional fishing ground of the Javanese fishermen located north Tegal and Pekalongan and in the vicinity of the Karimunjava and Bawean Islands. Since 1982, they extend largely their activity areas, covering now the whole Java Sea, the Southern part of the China Sea and the mouth of the Makassar Straits around Samber Gelap Islands (Fig. 2)

In the first years of the fishery, the vessels were built along the northern coast of Java in Batang, Juwana and Tegal. In 1975 we find some vessels built in Bagan Siapi-API in Sumatra and as far as 1980 the most part of the new units come from there. In 1985, due to the high cost of the shipbuilding in the Java, all the vessels are built in that place. The inside fittings (fishholes, engine compartment) and the fitting out of the vessels are carried out in the port of registry, according to the owner and fishing master's wishes.

According to the data collected from the Fisheries Administration, the vessel pattern of this category presented in 1985 the following characteristics:

- shipbuilding : wooden vessel,
- total length : 16 to 25 metres,
- engine power : 60 to 160 HP,
- gross tonnage : 5 to 40 GT,
- crew : 30 to 40 men,
- fishing gear : purse seine from 400 to 600 metres long,
- capacity : until 30 tons of fish.

Some of these characteristics have to be taken with caution. Indeed, for administrative, fiscal and social reasons the length, the power and the gross tonnage of the biggest vessels are often underestimated. That is particularly true for the new units.

The evolution of the fleet assumes by a continuous growth of the number of vessels registered since 1976 (Table II). But this increase is not linear, it occurs by steps, each of them depicting a precise event. The first step recorded in 1980 - 1981 correspond to the trawl ban in the Java Sea and to the reconversion of some trawlers in purse seiners. The second one corresponds to the spreading of the fishing grounds and the increase of the distance to reach them (1984 - 1985), what produces the advent of new vessels better adjust to the lengthening of the duration of the trips. They add to the vessels already existing. We find a parallel evolution for the main characteristics of these vessels : power (Table III) and gross tonnage (Table IV).

This general evolution can be modulated according to the harbours. If Pekalongan follows faithfully the proposed scheme, Tegal, Batang and Pemalang harbours show a decrease in the number of vessels registered there. Rembang stays stable over the period. Since 1984, year of its opening to the big purse seiners, the harbour of Juwana knows a very quick increase of its vessels' number.

The activity of these purse seiners, first clearly seasonal, seems now to spread out over the whole year linked with the spreading of the fishing grounds and the advent of big units. Meanwhile, the most active period is the last trimester (musim ikan), the activity reducing in May–June. This phenomenon is easily watched in comparing the activity of old vessels (traditional exploitation) based in Rembang and Juwana, with that of new units based in Pekalongan and Tegal (Fig. 3). That scheme find again in the annual number of months of activity. It fluctuates from 7 months (Juwana, Rembang) to 8.5 months (Pekalongan, Tega, Batang) (Table V).

The duration of the trips varies according to the season and the fishing grounds prospected. It spread out from 5 to 25 days. The current trend is to the lengthening linked with the extension of the distance to reach the fishing grounds. The only limit is the fuel and the supplies on board.

The catch per unit effort of the fleet, stable from 1976 to 1980, reduces in 1981 and 1982 in a parallel way to the growth of the number of vessels. The extension of the fishing grounds since 1983 is linked with a large increase of the C.P.U.E. what is explained either by a better efficiency of the new vessels or the exploitation of areas until now unexploited.

STRUCTURE OF THE FLEET IN 1985

In 1985, the total number of active vessels in the Java Sea from the Central province was 520. Meanwhile, more than 60% of this fleet is concentrated in the Pekalongan harbour (Table VI), the rest being distributed almost uniformly in the others harbours.

1. Main characteristics

In 1985, the mean age of the vessels is 5 years, the maximal duration of their life does not exceed 15 years (Table VII). In Pekalongan, the fleet is compounded of two age classes corresponding to some vessels built in 1979–1980, then 1984–1985. In Tegal, this scheme is identical but less visible. In these two harbours, the mean age is very low and it is very rare that one vessel remains more than six or seven years in these landing places. In the others fishing harbours, the mean age is more high, the older vessels of the two former harbours being often sold there. This exploitation can still endure 7 or 8 years before to be definitively laying up. The renewing rate is high in Pekalongan and Tegal. In 1985, it was respectively of 22% and 10%.

The average power is 140 CV, but on board the new units it can reach easily 190 CV when the old vessels are often equipped with engine that do not exceed 120 CV (Table VIII). More, on board new units an auxiliary engine is often connected with the main engine what increases the power.

The average gross tonnage is 29 GT (Table IX), the big units reaching 40 tons burden. Meanwhile, this value is certainly underestimated, the new vessels reaching effectively 100 tons burden. This underestimation can be explained by administrative, fiscal, and social reasons.

2. Others characteristics

On board those vessels the crew is numerous, nearly all the fishing stages being carried out manually. According to the seasons the number of fishermen varies from 30 to 40. Selected by the fishing master, the crew is often formed by members of a same village or even a same family. The technical level is very low even amongst the fishing masters. Meanwhile, since two or three years some young fishing masters, who know read charts and use modern navigation systems, begin to be in command of the new vessels. All are trained in the technical state schools. That new generation of fishing masters produces the modernisation of the vessels and the advent of navigation apparatus such little echo-sounders and SSB (single side band).

Now, 50% of the new units own one SSB which allows them to communicate daily their position and catches allowing a better efficiency of the fleet.

The estimation of the cost of a such vessel varies greatly from one harbour to another, the average estimation is around 60 millions rupiah that we can divide amongst different chapters (August 1986):

- Main shipbuilding (Bagan Siapi-api)	30 millions R.
- Inside fittings	6 millions R.
- Engine	7 millions R.
- Purse seine	18 millions R.
- Total	61 millions R.

As in numerous artisanal fisheries around the world, the fisherman is paid by share. One example of the payment per trip is given in Fig. 4.

CONCLUSIONS AND RECOMMENDATIONS

If the general picture of the Javanese purse seiner did not modify since 10 years, its characteristics changed heavily in the way of the enlargement of its size, its power and its tonnage. The current type seems for that vessel to be a maximum. Now the big purse seiners' fleet is the main cause of the catches in the Java sea and the pressure what it exerts on the fish population grows heavily since two years. When we know that this fishing applies to species with a short life and, therefore, sensitive at any change in the fishing pressure and environment, it is urgent to dispose of accurate data of effort and catches to determine what is the stage of exploitation already reached.

For these reasons, the necessity to own accurate data about that fleet becomes, therefore, very important. The only available source being the form SL-O, this ought to answer to the following questions.

- Number of vessels effectively registered in the harbours and number of units which are really active.
- Real characteristics of the registered vessels. Now, we do not possess these informations for all vessels and, in the most part of the cases, the values are underestimated. Changes in the administration constraints ought to obtain some more accurate data.

Inside that fleet we can determine two type of vessels based in different harbours. In the dynamic landing places with some facilities approaches and favourable economic environment we find new units with size larger than previously and that correspond to the new strategy of that fleet that is to exploit the whole Java Sea. Their new characteristics allow them to ship a purse seine more large, to stay more long at sea, to avoid the seasonal decrease of the catch in May and June and to follow the migration of the fish. Then, their efficiency is more high than the old vessels concentrated in Rembang and Juwana, that pursue the traditional exploitation of the old fishing grounds close to the harbours with a reduced activity in May - June and shorter trips.

The fleet seems, therefore, to have reach a maximum growth by the size of the vessels, the extension of the areas prospected or the capacity of the fishing harbours to absorb the landings. Any new development comes up, in the current stage, against technical problems difficult to solve. The main technical difficulties are:

- The preservation system of the fish used on board the vessels (ice and pickle) , valuable for short trips, does not seem adequate when the trip reach 25 to 30 days. The fish processed by that mean on board the new units is not always in good preservation state and the financial losses can be high.

— The lack of power of the vessels does not allow them to encircle the shoals "at sight", and the time spend to the search of the fish is relatively low. Indeed, the activity stays very traditional and consist of fishing around rafts, with one or two sets by day, usually at night.

— The navigation system stays archaic and consist of , most often, one compass what does not allow to spread out the prospected areas that stay close to the islands scattered in the Java Sea.

Meanwhile, the emergence of young fishing masters trained in schools must allow the situation evolves. But the opportunity of the creating a new vessels' generation remains to set. We have to notice the experince attempted by P.T. Tirta Raya Mina with three modern purse seiners built with New-Zealand design was a failure. It would be, without doubt, better to attempt to improve the different technical points described above that reduces the efficiency of the current vessels.

The growth number of vessels sets the problem of the landings. The current harbours, even the most modern and efficient Pekalongan, reach their maximum capacities. In some harbours, the landings operations can endure until 4 days, what produces a lost of time and fish quality. The improvement or the extension of these harbours could allow to solve these difficulties.

In conclusion the large growth of the fleet in number, in fishing power and the extension of the fishing grounds to the whole Java Sea put the question of the resource accessibility and of the equilibrium of the pelagic fish stocks in the Java Sea. It could produce, at the end, some overexploitation phenomena dangerous for the economy of the northern coast of the Java Island.

The fleet cannot grow indefinitely, the resources and the fishing grounds being limited. The Fisheries Administration will have to control the number of fishing licences delivered to the fishermen. For that one must dispose at provincial level of accurate data. At this moment it is not the case.

REFERENCES

- Anonymous. 1986. Fisheries statistics of Indonesia. 1984, Direktorat Jenderal Perikanan. Departemen Pertanian. Jakarta. 98 p.
- Boely (T.), Potier (M.), Subhat Nurhakim, Suherman Banon, Suwarso, Tuti Hariati. Compilation of the data on the big purse seiners fishery in the Java sea. 1976 – 1985. Mar. Res. Fish. Inst. (in prep).
- Djadjuri (H.), 1978. Perikanan purse seine di Batang dan pembuatan kapal purse seine di Batang. Simposium Modernisasi Perikanan Rakyat. Lap. Pen. Perikanan laut.
- Hadisubroto. 1975. Perikanan pelagic dan perkembangan kapal motor purse seine yang mendaratkan hasilnya di Tegal. Lp. Pen. Perikanan Laut, 2/75 : 102–129.
- Suherman (B.A.), Bambang Sadhotomo. 1985. Analysing of the fishing effort of the purse seine fishery in the Java Sea. Lap. Pen. Perikanan Laut, 32 : 65 – 72.

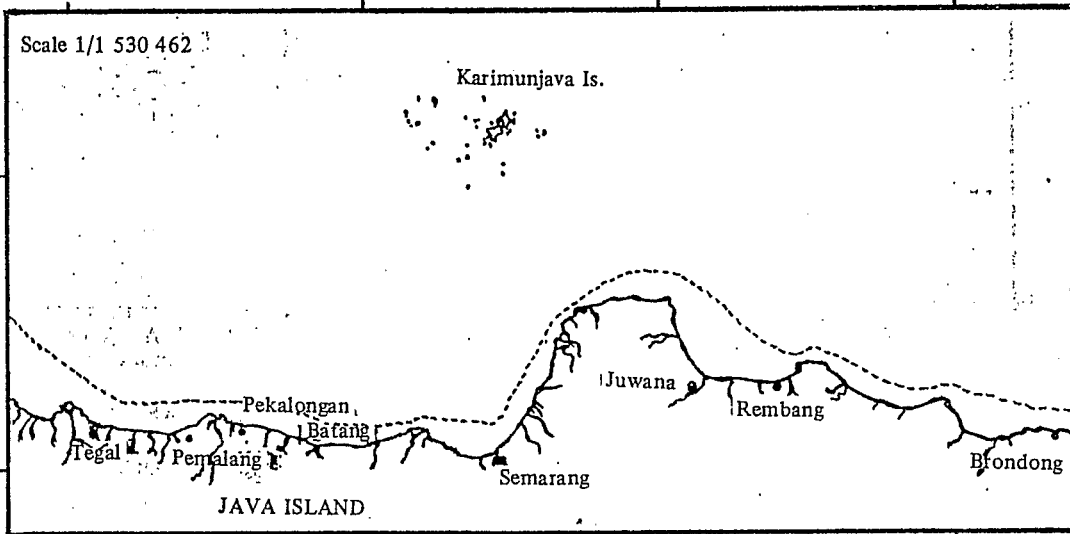


Fig. 1. Location of the harbours where are registered the big purse seiners of the Java Sea.

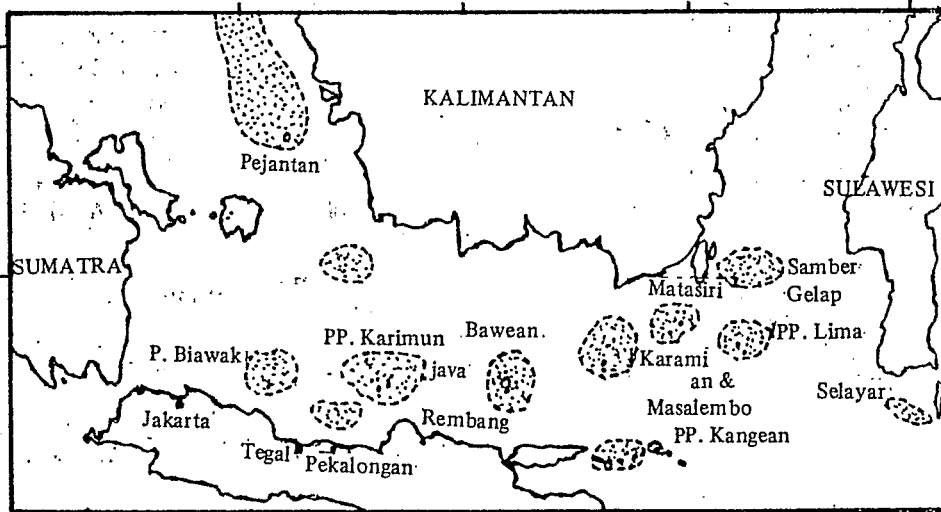


Fig. 2. Location of the main fishing grounds in the Java Sea.

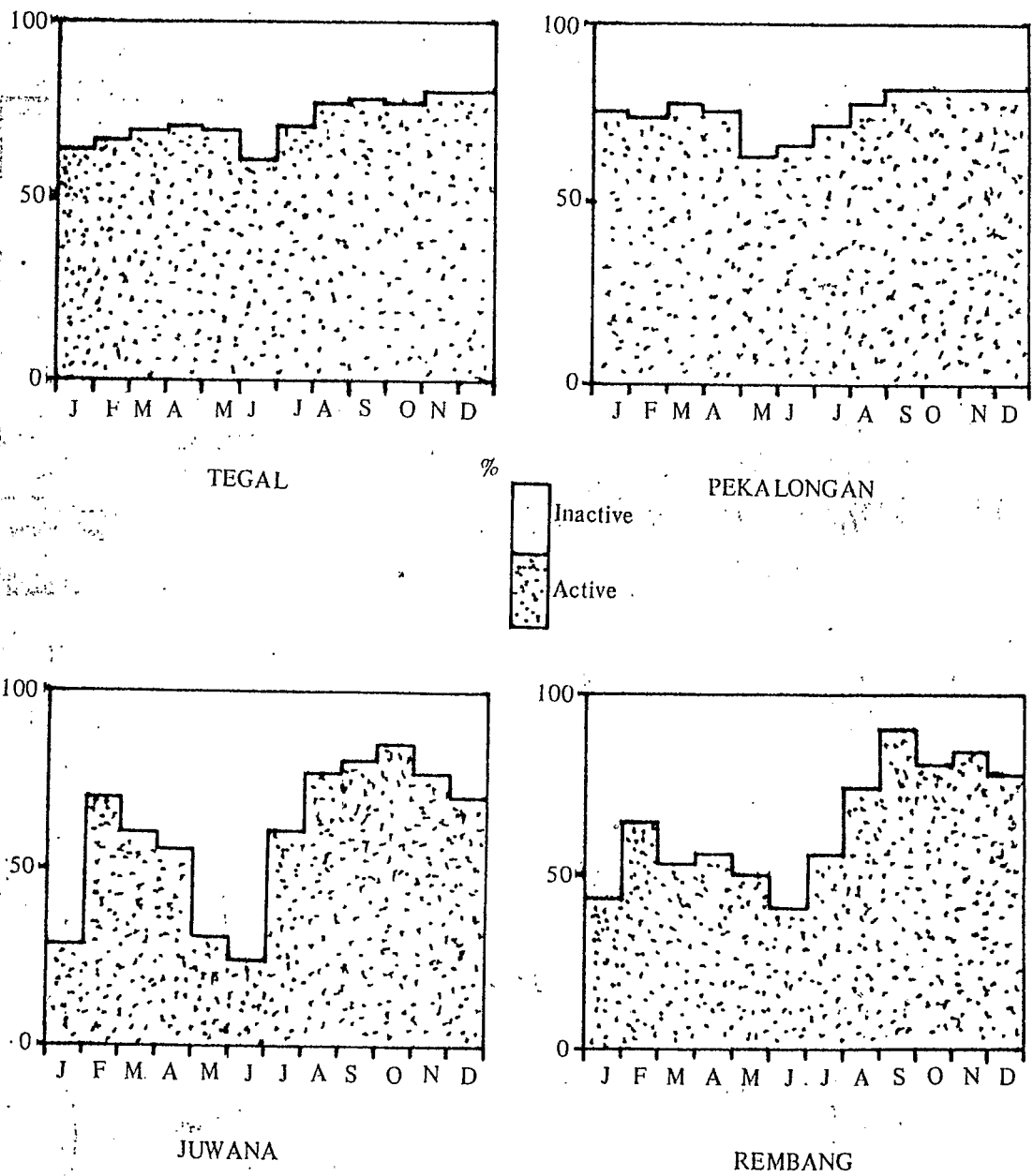
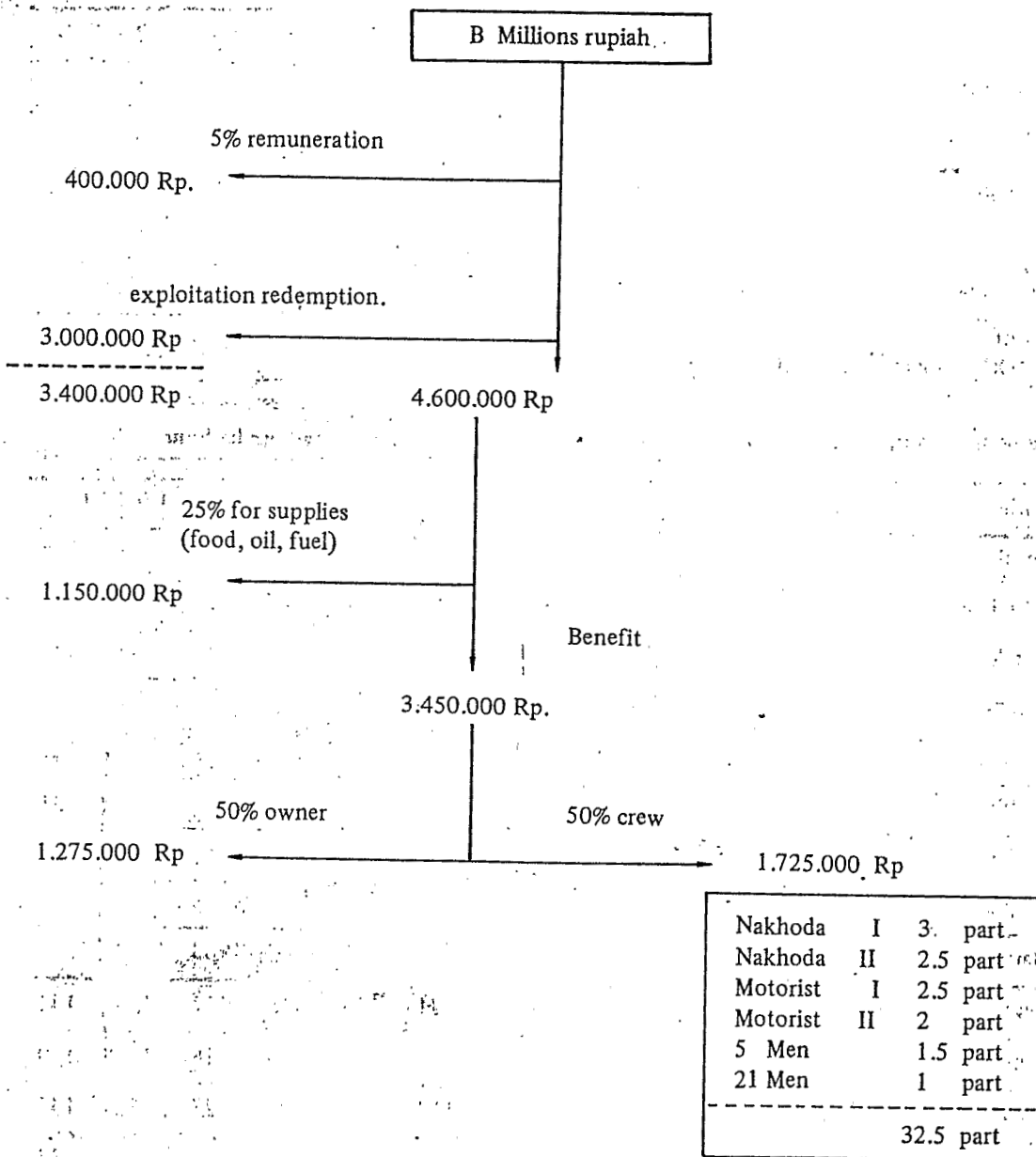


Fig. 3. Monthly activity (in percentage) of the big purse seiners registered in the harbours located along the northern coast of Java Island.

EXAMPLE TAKEN FROM A SELLING OF 8 MILLIONS RUPIAH



$1 \text{ part} = 1.725.000 / 32.5 = 44.805 \text{ Rp.}$

Fig. 4. Example of payment by share for one trip on board the big purse seiners of the Java Sea.

Table 1. Data's origin in the harbours of the Central Jaya province.

Harbour	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985
Tegal						x	x	x	x	x	x
Pemalang						x	x	x	x	x	x
Pekalongan		o	o	o	o	o	o	o	o	o	o
Batang							o	o	o	o	o
Juwana									x	x	x
Rembang											x

x. SL - O.

o Other origin of the informations.

Table II. Annual evolution of the number of big purse seiners registered per harbour

Harbour	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985
Tegal				61	57	68	104	86	81	58
Pemalang				5	6	7	13	13	8	2
Pekalongan	68	50	118	182	222	238	249	232	264	336
Batang						63	33	43	37	46
Juwana								27	28	47
Rembang										31

Table III. Annual evolution per harbour of the mean engine power (HP)

Harbour	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985
Tegal				96	104	115	118	117	125	144
Pemalang				87	96	104	118	118	105	130
Pekalongan	93	99	109	117	118	119	121	127	132	147
Batang										122
Juwana								73	113	113
Rembang										120

Table IV. Annual evolution per harbour of the mean gross tonnage (G.T.)

Harbour	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985
Tegal				17	22	25	26	27	28	30
Pemalang				15	16	16	17	17	16	17
Pekalongan	14	15	15	22	23	25	26	27	29	30
Batang							20	21	23	24
Juwana								17	21	21
Rembang										29

Table V. Number of months of activity and mean number of trips by month of the bigpurse seiners registered in the different harbours located along the northern coast of Jaya Island in 1985.

Vessels	Tegal	Pemalang	Pekalongan	Batang	Juwana	Rembang
Number of months of activity	8.3	5.5	8.4	9.0	6.7	7.4
Mean number of trips by month	1.5	0.8	1.3	1.7	1.4	1.5

Table VI. Number and percentage of big purse seiners in the harbours located along the northern coast of Jaya Island in 1985.

Vessels	Tegal	Pemalang	Pekalongan	Batang	Juwana	Rembang	Total
Number	58	2	336	46	47	31	520
%	11.2	0.4	64.6	8.8	9.0	6.0	--

Table VII. Characteristics of the fleet in 1985. (Age).

Age (Years)	0	1	2	3	4	5	6	7	8	9	10	11	15	Total
Tegal	* 6	1	4	17	5	11	2	2	1					49
Pemalang							1		1					2
Pekalongan	* 32	75	25	8	7	14	49	14	3	2		1	1	231

Batang	*	2	1	5	2	7	4	7	4	1						33
Juwana	*		1		6	4	5	3	2	4	3					28
Rembang	*						1		7	18	1					27
Total		40	76	31	30	20	36	62	26	18	25	4	1	1	370	

* Number lower than the 1985 total. The shipbuilding year is not always registered.

Table VIII. Characteristics of the fleet in 1985. (Engine power).

Power (hp)	60-69	70-79	80-89	90-99	100-109	110-119	120-129	130-139	140-149	150-159	160-169	Total
Tegal	*	1		1			16		1		31	50
Pemalang						1				1		2
Pekalongan	*	1			2		73			1	160	237
Batang	*		2		9	1	14			7	7	40
Juwana	*		1		3	10	3	4	3		2	28
Rembang	*					2	24		1			27
Total		2	3		4	21	7	31	3	2	11	200

* Incomplete data (see V. 5.a)

Table IX. Characteristics of the fleet in 1985. (Tonnage)

Tonnage (GT)	5-9	10-14	15-19	20-24	25-29	30-34	35-39	Total
Tegal	*			5	4	9	21	49
Pemalang				1	1			2
Pekalongan	*	1		6	11	72	123	214
Batang	*			8	10	15	3	36
Juwana	*			4	24			28
Rembang	*				5	8	14	27
Total		1		24	55	104	161	356

* Incomplete data (see V. 5.a).