AGENCY FOR AGRICULTURAL RESEARCH AND DEVELOPMENT

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JAVA SEA PELAGIC FISHERY ASSESSMENT PROJECT (ALA/INS/87/17)

THE SMALL COASTAL SEINERS OF THE JAVA SEA

THE MAIN FISHING STATISTICS

and

APPROACH of THE DYNAMICS of THE FLEET

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FOREWORD

Works and proceedings of the "Java Sea Pelagic Fishery Assessment" Project lead to issue several kinds of documents:

- Administrative documents
- Mission reports
- Data compilations and proceedings
- Articles in scientific journals as well as reading panels
- Technical and scientific reports

Within the frame of this later, a series called "Scientific and Technical Document" has been published since July 1991; it includes semester and annual statistics on catch, effort, biological and economical data, as well as achieved reports focusing on definite aspects of the pelagic fisheries in the Java Sea.

This series is of restricted distribution and provides ground for later scientific and technical writings to be published in research journals.

December 1997

This Scientific and Technical Document presents the main results regarding the small coastal seiners (also called mini seiners) fleet of the Java Sea. This fleet is operating on the North shore of Java. This program was realized by the team of the Pelfish Program (Java Sea Pelagic Fishery Assessment Project).

This Scientific and Technical Document is composed of four articles:

With the fourth first articles already published about this topic, this Scientific and Technical Document provides all the information collected by the Pelfish Program with the preliminary analysis.

Atmaja, S.B. and J.M. Ecoutin. 1996. Mini purse seine fisheries in North Java coastal waters. Fourth Asian Fisheries Forum, Beijing, China, 16-20 October 1995, Java Sea Pelagic Fishery Assessment Project, *Sci. and Tech. Doc.*, 25 : 24-27.

Ecoutin, J.M., S.B. Atmaja, M. Potier and Wijopriono. 1997. Description of the small seiner fleet in the Java Sea. *Indonesian Fisheries Research Journal*, 3(1): 47-63.

Hariati, T., M.M. Wahyono, Suwarso and D. Krissunari. 1995. North Java coast fisheries: preliminary observations on small seine nets exploitation. *in:* BIODYNEX: Biology, Dynamics, Exploitation of the Small Pelagic Fishes in the Java Sea. Potier M. and S. Nurhakim (eds), AARD/ORSTOM: 185-194.

Wijopriono, J.M. Ecoutin, S.B. Atmaja and J. Widodo. 1996. Heterogeneity of mini purse seine net fleet in Java Sea. Fourth Asian Fisheries Forum, Beijing, China, 16-20 October 1995, Java Sea Pelagic Fishery Assessment Project, *Sci. and Tech. Doc.*, 25: 46-51.

Catches of the Javanese mini-seiners fleet: the main fishing statistics

Ecoutin J.M.[1] and Atmaja B.S.[2]

This technical document groups together the data and basic results regarding the mini seiners units operating on the North shore of Java. This information was gathered by the team of the Pelfish Program[3] involved in the study on the mini-seiners from 1995 to 1997. The information is based either on what was observed within this period or on observations collected previously. Whether they are concomitant or anterior to the period of study, all the surveys are homogenous regarding the collection of information and were submitted to the same type of treatment and validation.

The document presents these surveys, the way the information was collected, the necessary processes for validation as well as the main results after these processes. This document offers neither argumentation nor interpretation. The results will be discussed and interpreted in a further study.

Materiel and methods

1. Sampling plan

In this study, daily listings of landings by mini-seiners were recorded in nine important fishing ports. Two axles were favoured for the study: a spatial axle with the study of the information collected in all the ports in 1995; a temporal axle following the landings in one port, Sarang from 1992 to 1996.

1.1. Presentation of the ports

Daily listings of landings by mini seiners were used to complete the study. During 1995, these listings were recorded in eight important ports on the north shore of Java (fig. 1). Different censuses of the mini seiner fleet operating in the Java Sea (Ecoutin *et al.*, 1997; Jung,

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[2] Address: RIMF, Jl. Muara Baru Ujung, Jakarta, 14400, Indonesia.
[3] The description of the Pelfish program (1991-1996) and the main results are given by Durand and Widodo (1997); about the present scientific results, see Potier and Nurhakim (1995), Pelfish (1996), Petit, Cotel and Nugroho (1997), Roch, Nurhakim and Widodo (1998).

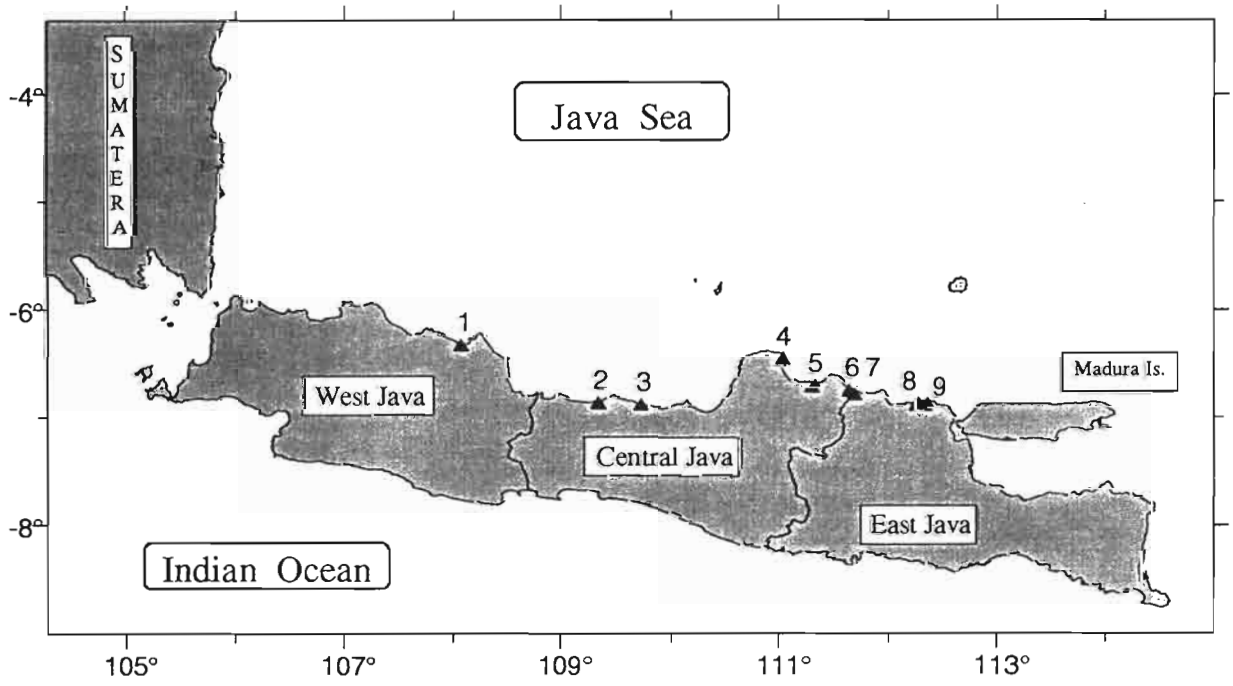
1998; Jung and Ecoutin, 1999) were used to make this choice. The sampling plan included a ninth location, the port of Brondong located in the province of East Java (fig. 1, n°8); this port was the subject of a specific monograph (Luong, 1997) and its results could not be taken into account for this work.

From West to East, these entries were recorded in:

* Eretan Wetan (fig. 1, n°1), the only port of the study located in the province of West Java, is a landing and commercial destination for fish from fleets using different fishing techniques: gillnets, Danish seines, encercling seines, ... In 1994, the medium seiners unloaded more than 2,000 tons of pelagic species at this location, or 5% of the total landings by this fleet (Potier *et al.*, 1995). This study location is both an auction place (TPI or *Tempat Pelelangan Ikan*) and a village cooperative (KUD or *Koperasi Unit Desa*). It is representative of the neighbouring villages for the study of mini seiners of the Java Sea.

* Pekalongan (n°2) is the largest fishing port in the province of Central Java. It is part of an administrative structure grouping the principal ports of the Indonesian archipelago (PPN or *Pelabuhan Perikanan Nusantara*). Several auction places operate in this port with one that only deals with landings of mini seiner units. Pekalongan is the principal landing port for the fleet of large and medium seiners[4] with approximately 50% of the landings of large seiners and 70% by the medium seiner units (year 1994, Potier *et al.*, 1995).

* Batang (n°3), not very far from the previous port, is a TPI where large, medium and small seiners exploiting the stock of pelagic fish of the Java Sea are unloaded.



Port n°1: Eretan Wetan
Port n°2: Pekalongan
Port n°3: Batang
Port n°4: Banyutowo
Port n°5: Tasik Agung
Port n°6: Sarang
Port n°7: Bulu
Port n°8: Brondong
Port n°9: Kranji

Figure 1: Geographical location of main ports of inquiries in 1995

[4] About definitions of mini, medium and large seiner, see Potier and Sadhotomo (1995).

* Banyutowo, also called Tayu (n°4), is a small TPI situated north west of the Bay of Rembang. The fishing units from the villages located between Rembang and Sarang regularly visit this port. Mini seiners dock at the end of a long pier built on a beach where the water level is very low.

* Tasik Agung (n°5) is one of the auction places of the village of Rembang. This TPI is different in that it trades pelagic fish caught mainly by mini seiner units and secondly by large and medium seiners (57 landings for 2,300 tons in 1994 or 1.5% of the total catches by this fishing fleet, Potier *et al.*, 1995).

* Sarang (n°6) is the more eastern TPI for the province of Central Java. Many fishing techniques were observed there. For this reason, the port of Sarang can be compared to that of Eretan Wetan (n°1).

* Bulu (n°7) is a landing place located in the province of East Java. It is different in that the mini seiner units that unload their catch here almost exclusively originate from this village and few fishing units registered in Bulu moved to other locations on the north shore of the island of Java during the year.

* Kranji (n°9) is a small TPI located east of the port of Brondong (Luong, 1997) where fishing units using many fishing techniques land.

1.2. Temporal stratum

In 1996 the surveys were carried out in five of the ports that had already been studied in 1995, three of which were covered by a-year-lasting survey (tab. 1).

It was possible for the TPI of Sarang to reconstitute the landings of each or part of the years 1992, 1993 and 1994. This reconstruction was realised by using data from *buku bakul* equivalent to those used in 1995 and 1996. The preparation of the above mentioned survey sheets are therefore similar to the survey and treatment process of the reference year (1995).

Table 1: Sampling plan of landings by mini seiners fleet between 1992 and 1996 (A, studied month; B, validated data, except Bulu)

Ports		1992	1993	1994	1995	1996
Eretan Wetan	A				12	4
	B				788	60
Pekalongan	A				12	6
	B				2119	1443
Batang	A				12	
	B				3925	
Banyutowo	A				11	12
	B				935	766
Tasik Agung	A				12	12
	B				8063	6436
Sarang	A	9	11	8	12	12
	B	5088	6389	4825	7420	6808
Bulu	A				2	4
	B				856	1035
Kranji	A				12	
	B				838	
Total	B	5088	6389	4825	24944	16548

Other data may be used in comparison with the years of reference; those are data collected in 1991 at Sarang, 1992 at Eretan Wetan and hronological series 1992-1996 for Tasik Agung. These data were either not collected by the programme Pelfish and consequently do not follow the protocol of collecting data, or not quite similar to the reference data. The results of those specific data are not presented in this technical document and will be used within their own limits in a further study.

2. Presentation of the surveys

When the catch of fish is unloaded from a mini-seiner unit, it is generally divided into different categories depending on:

- the species,
- its importance in the unloading,
- its selling price,
- the state and quality of the fraction in the unloading,
- the possibility of grouping together the species according to their sizes.

Some selling categories correspond to grouping of species of similar prices or even grouping of various species to form a satisfactory selling unit.

The fishermen usually prepare the categories. When a category presents an important volume, it is sold by auction 30 to 50 kg a basket.

Each sale of fish unloading category is registered by the administration of each TPI (*Tempat Pelelangan Ikan*) in a book called *buku bakul* in Indonesia. A description of the sales methods by the TPI is proposed by Luong (1997) in his study on fishing activity in the port of Brondong (East Java).

Referring to the *buku bakul,* the investigator groups together the various sales statements to reconstitute the unloading for each fishing unit and he carries over these groupings on sheets specific to the study of fishing mini-seiners statistics. These sheets show indications allowing the identification of the units (boat identification, owner's and captain's names, origin of the fishing unit), information on the fishing site (fishing location, time at sea, possible use of a fishing aggregating device), as well as the composition of catches by categories of species; the investigator groups together under the same name, a same category, various sales fractions of a species or close species (see further). Generally 6 or 8 categories of species are reported on the survey sheet. Lightweight, low-priced or uncommon species are often grouped together under a category "miscellaneous" (*lain-lain* in Indonesian, see further). Finally, the investigator gives an indication of the weight, often the sale value of the landing of this category as registered by the TPI.

3. Corrections and validations of surveys

All the information gathered by the investigators of the mini-seiners project was keyed in, corrected and validated by different programs under Dbase/FoxBase software[5].

The main corrections concerned, on the one hand the spelling of the names of the fishing units, captains and locations, on the other hand the vernacular names of the species. Indeed, depending on the investigation sites, the TPI agents register the landed fractions either in Indonesian, thus following the protocol of the Indonesian Fishing Department, or in

[5] Microsoft Foxbase version 2.6.

Javanese, or according to the local practice. Depending on the type of correction required (automaticalally or manually), the whole data was systematically proofread.

The main validations focused on the study of quantitative data limiting values: landing in weight or value for a species far from the likely values for this very species in an area and a given season; ex-vessel prices information for a species far from the values observed in the same period.

Some surveys could be corrected, others could not be validated for all the studies concerning the landing analysis but kept for further investigation on the mini seiners fleet. Finally some surveys were erased from the data files.

4. Listing of species or grouping of species

For the editing of the fishing statistics of the mini seiners fleet operating in the Island of Java, the species that were observed and validated were grouped together within about ten categories, which allowed the edition of usable-sized tables. The full list of these groupings is given in Annex 1, as well as the correspondence between scientific names and vernacular names, as follows:

- *banyar* groups together all fishes of *Rastrelliger* genus,
- *bentong*, all the species of *Selar* and *Selaroides*,
- *layang*, all the *Decapterus*,
- *tanjan*, all the species belonging to the *Clupeides* family,
- *tenggiri,* all *Scomberomorus*,
- *tongkol,* all small inshore tuna,
- *cumi-cumi*, all the cephalopods,
- the item *campuran* group together all the species that are not mentioned above but were identified while unloading and were part of a sales fraction,
- *lain-lain*, all fractions described as mixed species when sold or those whose names given to describe the species are unknown.

The category *jumlah* represents the total of the landings.

Presentation of the results

Three variables have been worked out from the validated surveys and then presented in the records. It amounts to a calculation of the mean landing estimated on the one hand according to weight (kg/landing), on the other hand according to value (Rp/landing) as well as the prices at the TPI. The various results can be found respectively in Annexes 2, 3 and 4.

The basic stratum for this study is composed of the collection of surveys validated for a given month per port of investigation and per year of study.

In annex 2 (catches in weight per landing) complementary footnotes are provided in order to help clarify difficulties.

Annexes 3 and 4 give no commentary except for specific difficulties regarding the other two variables.

- catch per landing (in kg)

For each grouping but *jumlah* the tables show the maximum observed value (the minimum value being 0, allowing for exceptions, is not given), the mean and standard

deviation, calculated on the whole stratum, the number of surveys analysing this category (registered landing superior to 0) as well as the percentage of the category present in the study stratum (annex 2).

For the category *jumlah*, the one that represents the observed full landing, the minimal values are shown (there can not be no landing) as well as the maximal values observed in the stratum, mean and standard deviation, and the full number of surveys of this monthly stratum.

The same values as those above mentioned will be found for each category but they will be worked out on all the surveys realised within the year.

The mean and standard deviation are not given for all the categories, except *jumlah*, if there are not at least five surveys in the stratum studied.

- revenue per landing (in 1.000 Rp)

Similar calculations have been made when the investigators have given information on transactions values registered at TPI (annex 3). Usually the information is always accessible via the *buku bakul* but depending on the investigator's training skills, the feedback of this kind of data has proved more or less difficult.

- Ex-vessel price (in Rp per kg)

Sales prices by kg have been calculated when the investigator has given indications of weight and value for a species in a loading.

Mean values and standard deviations of prices per kg for each species have not been calculated according to all the data of the temporal stratum but according to the non-nil data of this stratum. For each species category, the tables presented annex 4 show the minimal and maximal observed value, the mean and standard deviation as well as the numbers present in this category when the price may be calculated.

Acknowledgements:

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We would like to thank all the surveyors team from different TPI from where we had to collect data. This work could not be presented without Miss Rika who realized all the keyboarding and validation.

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Annex 1:
List of species and their grouping in this study

Used name	Vernacular name	Scientific name
Banyar	*Banyar*	*Rastrelliger kanagurta*
	Kembung	*Rastrelliger spp.*
	Jamaka	*R. kanagurta*
	Kemaren	*R. kanagurta*
	Kemari	*Rastralliger spp.*
Bentong	*Bentong*	*Selar spp.*
	Selar	*Selaroides spp.*
	Mandring	*Selar crumenophtalmus*
	Como	*Selaroides spp.*
	Gontor	*Selaroides leptolepis*
Campuran	*Campuran*	Group of identified species during the
	Bawal, Dorang	*Formio spp.*
	Kakap	*Lutjanus spp..*
	Bambangan	*Lates spp.*
	Petek	*Leiognathus spp.*
	Manyung	*Arius spp.*
	Alu-alu	*Sphyreana spp.*
	Kerapu	*Epinephelus spp.*
	Udang	*Paeneus spp.*
	Layur	*Trichiurus sp.*
	Parang-parang	*Chirocentrus dorab*
	Pari, Peh	*Dasyatis spp.*
	Sunglir	*Elagatis spp.*
	Terbang	*Cypsilurus spp.*
	Teri	*Stolephorus spp.*
Cumi-cumi	*Cumi-cumi*	*Sepia spp., Loligo spp.*
	Mus, Sotong	
Jumlah	*Jumlah*	Total
Lain-lain	*Lain-lain*	Group of mixed or unknown species
Layang	*Layang*	*Decapterus spp.*
	Bloco	*Decapterus spp.*
	Korok	*Decapterus spp.*
	Unyir	*Decapterus spp.*
Tanjan	*Tanjan*	*Sardinella spp.*
	Tembang	*Sardinella spp.*
	Belo	*Anodontostoma sp.*
	Japuh	*Dussumieria acuta*
	Juwi	*Sardinella spp.*
	Lemuru	*A.sirm, S. lemuru*
	Siro	*Amblygaster sirm*
Tenggiri	*Tenggiri*	*Scomberomorus spp.*
Tongkol	*Tongkol*	*Auxis spp.*
	Cakalang	*Katsuwomus pelamis*

Annex 2

The catches per landing (in kg)

Banyutowo 1995 (kg /landing)		MONTH												
		1	2	3	4	5	6	7	8	9	10	11	12	Total
Banyar	Maximum	353	254	479	877		317	404	781	1035	718	616	766	1035
	Mean	48	74	76	99		82	54	128	94	49	40	124	74
	St. deviation	65	72	116	170		95	96	153	167	120	105	180	132
	Occurrence	53	40	35	29		25	25	70	43	33	28	28	409
	%Occur./land.	60	74	68	51		65	47	77	35	19	18	42	43
Bentong	Maximum	645	140	185	67		41	0	0	470	0	366	501	645
	Mean	92	18	12	0		0	0	0	0	0	32	35	19
	St. deviation	124	33	38	0		0	0	0	0	0	75	95	64
	Occurrence	59	18	9	1		3	0	0	4	0	29	12	135
	%Occur./land.	67	33	17	1		7	0	0	3	0	19	18	14
Layang	Maximum	1096	967	667	1207		366	1330	1620	2201	1880	2198	1052	2201
	Mean	150	186	103	246		91	300	364	512	417	382	350	328
	St. deviation	178	183	127	245		97	264	313	423	399	313	273	333
	Occurrence	63	47	36	42		27	51	79	107	131	127	53	763
	%Occur./land.	72	87	70	75		71	96	87	89	77	84	80	81
Tanjan	Maximum	307	876	696	1765		1181	763	2696	1582	3015	3985	969	3985
	Mean	7	35	93	118		130	82	458	222	313	148	0	180
	St. deviation	36	139	159	283		280	138	516	292	532	398	0	379
	Occurrence	5	7	26	18		11	27	78	66	71	43	4	356
	%Occur./land.	5	12	50	32		28	50	86	55	42	28	6	38
Tongkol	Maximum	276	0	0	60		0	340	634	80	306	224	0	634
	Mean	7	0	0	0		0	29	44	0	0	0	0	8
	St. deviation	36	0	0	0		0	61	111	0	0	0	0	45
	Occurrence	5	0	0	2		0	18	26	2	2	4	0	59
	%Occur./land.	5	0	0	3		0	33	28	1	1	2	0	6
Lain-lain	Maximum	98	180	155	0		15	0	0	0	0	0	271	271
	Mean	11	10	22	0		0	0	0	0	0	0	0	3
	St. deviation	23	29	38	0		0	0	0	0	0	0	0	19
	Occurrence	26	11	22	0		2	0	0	0	0	0	2	63
	%Occur./land.	29	20	43	0		5	0	0	0	0	0	3	6
Jumlah	Minimum	38	63	30	56		36	40	59	64	46	21	29	21
	Maximum	1246	1186	1100	2200		1181	1675	3072	3738	4095	4110	2115	4110
	Mean	314	316	319	466		307	465	994	835	783	607	546	613
	St. deviation	226	214	256	408		261	353	640	658	637	479	411	544
	Landing	87	54	51	56	0	38	53	90	120	169	151	66	935

During the month of May, these informations can not be collected.

Banyutowo 1996 (kg /landing)		MONTH												
		1	2	3	4	5	6	7	8	9	10	11	12	Total
Banyar	Maximum		21	756	695	925	491	468	340	429	651	279	3055	3055
	Mean		0	129	74	84	97	90	55	72	67	39	89	77
	St. deviation		0	150	103	151	112	117	77	106	104	65	376	157
	Occurrence		1	55	48	36	37	38	27	53	104	32	28	459
	%Occur./land.		9	78	70	67	78	57	61	51	64	45	38	59
Bentong	Maximum		228	1309	393	148	538	360	180	1160	1028	472	553	1309
	Mean		0	42	28	23	92	70	29	205	156	94	118	102
	St. deviation		0	162	67	40	121	86	44	239	206	116	124	166
	Occurrence		2	19	19	20	29	41	18	73	122	45	57	445
	%Occur./land.		18	27	27	37	61	62	40	71	75	64	78	58
Cumi-cumi	Maximum		0	0	0	0	0	16	30	21	0	0	0	30
	Mean		0	0	0	0	0	0	0	0	0	0	0	0
	St. deviation		0	0	0	0	0	0	0	0	0	0	0	2
	Occurrence		0	0	0	0	0	1	2	2	0	0	0	5
	%Occur./land.		0	0	0	0	0	1	4	1	0	0	0	0
Layang	Maximum		479	607	736	1098	1590	1540	1137	1477	1100	747	1511	1590
	Mean		171	43	133	164	132	316	325	313	281	228	207	225
	St. deviation		123	101	163	239	255	377	291	316	253	220	237	268
	Occurrence		11	29	53	36	22	61	42	84	141	58	64	601
	%Occur./land.		100	41	77	67	46	92	95	82	87	82	87	78
Tanjan	Maximum		0	460	477	296	224	736	141	304	434	1139	296	1139
	Mean		0	64	37	0	11	71	23	19	33	36	48	35
	St. deviation		0	121	96	0	41	153	38	59	83	143	76	95
	Occurrence		0	30	17	2	7	20	18	15	35	13	30	187
	%Occur./land.		0	42	25	3	14	30	40	14	21	18	41	24
Tenggiri	Maximum		0	0	0	0	0	0	0	0	45	38	8	45
	Mean		0	0	0	0	0	0	0	0	1	1	0	0
	St. deviation		0	0	0	0	0	0	0	0	4	5	1	2
	Occurrence		0	0	0	0	0	0	0	0	3	2	2	7
	%Occur./land.		0	0	0	0	0	0	0	0	1	2	2	1
Tongkol	Maximum		0	18	0	269	51	0	0	0	94	332	242	332
	Mean		0	0	0	0	3	0	0	0	0	0	0	2
	St. deviation		0	0	0	0	10	0	0	0	0	0	0	19
	Occurrence		0	1	0	2	5	0	0	0	1	2	4	15
	%Occur./land.		0	1	0	3	10	0	0	0	0	2	5	1
Campuran	Maximum		0	0	0	0	0	0	0	133	143	119	78	143
	Mean		0	0	0	0	0	0	0	0	4	6	0	2
	St. deviation		0	0	0	0	0	0	0	0	18	18	0	12
	Occurrence		0	0	0	0	0	0	0	3	15	9	2	29
	%Occur./land.		0	0	0	0	0	0	0	2	9	12	2	3
Lain-lain	Maximum		0	377	496	262	157	0	0	0	272	105	275	496
	Mean		0	20	28	18	10	0	0	0	7	6	14	10
	St. deviation		0	57	77	48	28	0	0	0	28	18	39	38
	Occurrence		0	26	23	17	10	0	0	0	19	14	18	127
	%Occur./land.		0	37	33	32	21	0	0	0	11	20	24	16
Jumlah	Minimum		68	24	36	25	30	51	28	49	60	37	60	24
	Maximum		479	1403	1122	1249	1618	1900	1211	2064	1922	1288	3055	3055
	Mean		200	297	300	301	345	548	432	611	549	416	484	452
	St. deviation		118	274	223	317	265	426	271	420	373	264	421	362
	Landing	5	11	70	68	53	47	66	44	102	162	70	73	766

During the month of January, only 5 landings were recorded in this place.

Batang 1995 (kg /landing)		MONTH												
		1	2	3	4	5	6	7	8	9	10	11	12	Total
Banyar	Maximum	1700	2370	1561	2165	2650	3640	730	3090	730	1360	2617	410	3640
	Mean	126	170	140	146	234	217	242	226	103	179	155	90	173
	St. deviation	269	354	204	234	265	357	188	318	126	235	330	112	263
	Occurrence	58	53	297	535	457	227	46	129	108	176	107	32	2225
	%Occur./land.	37	66	50	53	65	59	82	67	60	56	47	55	57
Bentong	Maximum	2688	1485	1513	3160	2095	2197	687	1096	1490	2108	2165	130	3160
	Mean	220	111	138	152	94	93	188	113	124	80	62	10	120
	St. deviation	448	216	223	211	164	205	199	179	204	219	216	29	220
	Occurrence	90	35	277	617	286	131	34	87	83	70	43	7	1760
	%Occur./land.	58	43	46	62	40	34	60	45	46	22	18	12	45
Layang	Maximum	3267	2158	4705	3000	1640	1300	820	1760	1350	1005	875	410	4705
	Mean	250	272	319	219	123	114	163	110	84	116	91	88	179
	St. deviation	475	437	454	351	186	152	211	196	169	157	118	113	310
	Occurrence	76	56	377	511	324	181	29	83	54	131	108	26	1956
	%Occur./land.	49	70	63	51	46	47	51	43	30	42	47	44	50
Tanjan	Maximum	1528	1434	2307	2300	1201	1858	1517	1126	868	2725	6996	878	6996
	Mean	97	117	147	86	68	74	88	70	144	394	353	213	135
	St. deviation	244	219	254	190	116	174	254	152	176	467	792	211	308
	Occurrence	47	49	293	368	247	109	13	58	93	201	117	38	1633
	%Occur./land.	30	61	49	37	35	28	23	30	51	64	51	65	42
Tongkol	Maximum	166	0	330	900	0	1211	0	334	0	0	204	0	1211
	Mean	3	0	4	1	0	13	0	0	0	0	0	0	3
	St. deviation	20	0	27	29	0	83	0	0	0	0	0	0	33
	Occurrence	5	0	16	5	0	18	0	3	0	0	1	0	48
	%Occur./land.	3	0	2	0	0	4	0	1	0	0	0	0	1
Lain-lain	Maximum	200	153	1845	2758	591	2346	200	441	135	475	0	0	2758
	Mean	9	8	44	33	11	11	0	4	0	0	0	0	19
	St. deviation	23	23	135	132	54	123	0	35	0	0	0	0	98
	Occurrence	48	14	165	231	46	19	1	5	3	1	0	0	533
	%Occur./land.	30	17	27	23	6	4	1	2	1	0	0	0	14
Jumlah	Minimum	42	49	19	33	57	85	100	52	50	46	58	42	19
	Maximum	10309	3598	7842	7792	5255	7436	2010	5298	2220	4792	9681	1072	10309
	Mean	779	679	804	637	529	523	685	525	456	771	680	401	635
	St. deviation	1138	787	680	659	447	654	459	555	347	729	1244	282	699
	Landing	155	80	592	991	703	382	56	192	179	310	227	58	3925

Eretan Wetan 1995 (kg /landing)		MONTH												
		1	2	3	4	5	6	7	8	9	10	11	12	Total
Banyar	Maximum	2410	940	100	680	1140	1220	940	950	960	1600	720	200	2410
	Mean	381	234	34	66	94	201	121	137	193	150	82	80	137
	St. deviation	572	337	39	110	146	249	174	186	190	273	128	104	227
	Occurrence	27	10	10	53	117	57	60	44	93	63	47	3	584
	%Occur./land.	84	71	52	56	71	82	88	81	91	63	66	100	74
Bentong	Maximum	940	360	500	710	600	1820	660	2000	400	1000	1000	280	2000
	Mean	237	0	74	68	38	159	75	119	61	85	117	0	87
	St. deviation	242	0	121	134	88	300	124	339	80	160	177	0	180
	Occurrence	25	4	13	46	69	36	35	25	65	44	49	2	413
	%Occur./land.	78	28	68	49	42	52	51	46	63	44	69	66	52
Layang	Maximum	3600	1700	200	300	2420	1600	2600	2660	3200	4400	2400	400	4400
	Mean	1101	180	0	11	25	60	110	295	333	301	321	0	201
	St. deviation	991	452	0	44	195	223	444	653	586	577	600	0	520
	Occurrence	28	6	2	8	18	17	13	19	54	49	41	2	257
	%Occur./land.	87	42	10	8	11	24	19	35	52	49	57	66	32
Tanjan	Maximum	4220	4000	4680	5400	3400	2300	1900	2400	5100	3400	6000	2200	6000
	Mean	436	356	884	537	276	451	305	391	1020	313	491	0	478
	St. deviation	938	1052	1148	920	559	585	484	590	1086	495	1087	0	818
	Occurrence	15	9	16	68	93	45	38	33	89	58	41	3	508
	%Occur./land.	46	64	84	73	57	65	55	61	87	58	57	100	64
Tongkol	Maximum	100	0	0	0	140	200	190	20	170	600	600	0	600
	Mean		0	0	0	2	0	0	0	0	0	0	0	3
	St. deviation		0	0	0	15	0	0	0	0	0	0	0	33
	Occurrence	2	0	0	0	7	2	3	1	3	1	2	0	21
	%Occur./land.	6	0	0	0	4	2	4	1	2	1	2	0	2
Lain-lain	Maximum	2100	140	930	2010	1550	4100	3200	880	1560	1320	1140	90	4100
	Mean	502	19	145	220	107	195	145	124	211	103	181	0	167
	St. deviation	682	39	224	333	178	554	428	168	257	207	275	0	333
	Occurrence	27	5	18	86	136	57	45	45	82	56	55	1	613
	%Occur./land.	84	35	94	92	83	82	66	83	80	56	77	33	77
Jumlah	Minimum	70	70	140	10	20	10	20	20	20	20	50	610	10
	Maximum	6556	4200	5420	5460	3720	4900	6730	4060	5500	4400	6440	2300	6730
	Mean	2660	852	1154	901	542	1069	758	1066	1819	957	1202	1367	1072
	St. deviation	1652	1163	1201	991	667	1081	1054	1006	1228	812	1269	859	1142
	Landing	32	14	19	93	163	69	68	54	102	100	71	3	788

Eretan Wetan 1996 (kg /landing)		MONTH				
		1	2	3	4	Total
Banyar	Maximum	80	0	700	800	800
	Mean	0	0	112	64	66
	St. deviation	0	0	226	142	149
	Occurrence	3	0	7	24	34
	%Occur./land.	50	0	77	54	56
Bentong	Maximum	220	10	460	860	860
	Mean	0	0	98	67	73
	St. deviation	0	0	159	173	162
	Occurrence	4	1	5	18	28
	%Occur./land.	66	100	55	40	46
Layang	Maximum	140	0	0	10	140
	Mean	0	0	0	0	6
	St. deviation	0	0	0	0	23
	Occurrence	4	0	0	1	5
	%Occur./land.	66	0	0	2	8
Tanjan	Maximum	385	140	1180	3000	3000
	Mean	0	0	0	749	609
	St. deviation	0	0	0	851	783
	Occurrence	4	1	4	35	44
	%Occur./land.	66	100	44	79	73
Tongkol	Maximum	0	0	40	0	40
	Mean	0	0	0	0	1
	St. deviation	0	0	0	0	5
	Occurrence	0	0	1	0	1
	%Occur./land.	0	0	11	0	1
Lain-lain	Maximum	260	120	180	1600	1600
	Mean	0	0	62	127	110
	St. deviation	0	0	68	251	220
	Occurrence	4	1	8	33	46
	%Occur./land.	66	100	88	75	76
Jumlah	Minimum	100	270	5	40	5
	Maximum	645	270	2460	3270	3270
	Mean	360	270	563	1008	864
	St. deviation	198	0	821	914	875
	Landing	6	1	9	44	60

Kranji 1995 (kg /landing)		MONTH												
		1	2	3	4	5	6	7	8	9	10	11	12	Total
Banyar	Maximum	0	0	826	648	720	304	786	925	2091	1207	706	1078	2091
	Mean	0	0	0	125	138	0	13	45	201	65	33	25	72
	St. deviation	0	0	0	222	163	0	90	149	346	171	115	127	200
	Occurrence	0	0	4	5	24	2	5	12	52	53	17	6	180
	%Occur./land.	0	0	50	35	68	33	6	13	40	24	12	6	21
Bentong	Maximum	79	0	0	33	372	0	0	0	221	67	306	0	372
	Mean	0	0	0	0	28	0	0	0	0	0	0	0	2
	St. deviation	0	0	0	0	85	0	0	0	0	0	0	0	23
	Occurrence	1	0	0	1	5	0	0	0	1	1	2	0	11
	%Occur./land.	2	0	0	7	14	0	0	0	0	0	1	0	1
Layang	Maximum	0	0	0	0	266	0	92	1602	4818	4559	3458	1180	4818
	Mean	0	0	0	0	0	0	0	84	349	282	150	46	165
	St. deviation	0	0	0	0	0	0	0	297	818	646	474	189	525
	Occurrence	0	0	0	0	1	0	1	8	39	60	24	7	140
	%Occur./land.	0	0	0	0	2	0	1	8	30	27	17	7	16
Tanjan	Maximum	2125	511	0	556	1499	2760	4636	7001	8442	8881	931	1790	8881
	Mean	0	0	0	0	0	0	1194	1729	956	977	0	0	716
	St. deviation	0	0	0	0	0	0	864	1529	1349	1577	0	0	1266
	Occurrence	1	1	0	1	1	4	73	84	78	93	2	3	341
	%Occur./land.	2	33	0	7	2	66	94	91	60	43	1	3	40
Tenggiri	Maximum	0	0	0	897	467	0	0	0	46	3541	2774	284	3541
	Mean	0	0	0	166	73	0	0	0	0	29	120	0	33
	St. deviation	0	0	0	251	120	0	0	0	0	244	403	0	212
	Occurrence	0	0	0	9	17	0	0	0	2	25	41	4	98
	%Occur./land.	0	0	0	64	48	0	0	0	1	11	30	4	11
Tongkol	Maximum	7116	0	563	358	37	228	586	223	973	2529	13893	5812	13893
	Mean	798	0	0	0	0	0	0	0	31	78	668	696	243
	St. deviation	1313	0	0	0	0	0	0	0	128	261	1555	1048	827
	Occurrence	27	0	2	3	1	1	3	2	16	33	63	82	233
	%Occur./land.	79	0	25	21	2	16	3	2	12	15	46	92	27
Campuran	Maximum	443	62	220	196	605	0	0	0	507	742	677	0	742
	Mean	52	0	0	68	133	0	0	0	0	27	29	0	22
	St. deviation	112	0	0	78	164	0	0	0	0	77	82	0	74
	Occurrence	8	1	3	7	23	0	0	0	4	39	25	0	110
	%Occur./land.	23	33	37	50	65	0	0	0	3	18	18	0	13
Lain-lain	Maximum	1312	402	510	412	522	70	540	620	1852	4010	3543	1413	4010
	Mean	93	0	0	0	52	0	0	23	214	223	334	78	165
	St. deviation	292	0	0	0	111	0	0	98	364	440	635	203	396
	Occurrence	5	1	3	4	12	1	3	6	48	98	68	22	271
	%Occur./land.	14	33	37	28	34	16	3	6	37	45	50	24	32
Jumlah	Minimum	149	62	64	204	107	206	74	24	13	79	112	80	13
	Maximum	7116	511	1247	1109	1499	2760	4636	7001	8442	8881	14009	5812	14009
	Mean	1007	325	566	509	476	1154	1235	1867	1761	1682	1344	880	1419
	St. deviation	1278	234	429	306	324	1052	849	1431	1455	1491	1535	1073	1387
	Landing	34	3	8	14	35	6	77	92	129	216	135	89	838

Pekalongan 1995 (kg /landing)		MONTH												
		1	2	3	4	5	6	7	8	9	10	11	12	Total
Banyar	Maximum	1466	2850	3420	1603	510	724	120	360	1320	1338	1350	611	3420
	Mean	98	321	117	44	52	65	0	14	49	67	20	129	70
	St. deviation	249	648	318	121	72	92	0	53	158	179	139	200	211
	Occurrence	48	34	282	322	191	214	4	18	75	144	19	9	1360
	%Occur./land.	60	69	71	59	77	89	66	22	46	66	19	90	64
Bentong	Maximum	1174	1260	2191	2250	885	661	92	139	245	534	480	90	2250
	Mean	163	69	38	34	60	47	0	9	25	17	47	0	42
	St. deviation	203	185	129	128	116	90	0	22	40	47	83	0	116
	Occurrence	68	27	189	220	161	138	3	27	100	110	67	4	1114
	%Occur./land.	86	55	48	40	65	57	50	33	61	50	69	40	52
Cumi-cumi	Maximum	0	0	149	0	0	0	0	0	0	28	60	11	149
	Mean	0	0	3	0	0	0	0	0	0	1	2	0	1
	St. deviation	0	0	12	0	0	0	0	0	0	4	8	0	6
	Occurrence	0	0	41	0	0	0	0	0	0	14	8	1	64
	%Occur./land.	0	0	10	0	0	0	0	0	0	6	8	10	3
Layang	Maximum	360	1590	580	0	13	37	0	0	0	298	0	78	1590
	Mean	22	66	0	0	0	0	0	0	0	0	0	0	3
	St. deviation	56	269	0	0	0	0	0	0	0	0	0	0	47
	Occurrence	24	5	4	0	2	4	0	0	0	3	0	2	44
	%Occur./land.	30	10	1	0	0	1	0	0	0	1	0	20	2
Tanjan	Maximum	553	870	2758	4860	5580	5940	570	2880	3660	5880	3780	570	5940
	Mean	62	52	277	454	596	613	324	272	576	363	262	0	414
	St. deviation	114	145	390	754	708	959	217	476	813	617	443	0	683
	Occurrence	37	16	313	429	213	166	6	54	147	196	85	4	1666
	%Occur./land.	46	32	79	79	86	69	100	66	90	89	88	40	78
Tenggiri	Maximum	540	30	139	690	150	36	6	26	516	1106	211	28	1106
	Mean	27	3	16	21	3	1	0	0	16	37	19	0	16
	St. deviation	87	7	23	48	12	4	0	0	59	97	37	0	49
	Occurrence	34	16	229	307	71	27	2	4	45	168	54	3	960
	%Occur./land.	43	32	58	57	28	11	33	4	27	77	56	30	45
Tongkol	Maximum	892	570	1269	1039	3262	527	10	369	360	4518	539	4094	4518
	Mean	71	0	17	13	28	18	0	6	10	148	35	721	36
	St. deviation	199	0	79	79	243	65	0	41	40	431	88	1392	209
	Occurrence	23	3	69	61	21	63	1	6	29	96	29	7	408
	%Occur./land.	29	6	17	11	8	26	16	7	17	44	30	70	19
Campuran	Maximum	830	1188	2048	1174	788	618	30	1382	818	1287	2970	16	2970
	Mean	50	118	139	99	31	36	0	242	53	84	75	0	88
	St. deviation	122	255	191	165	80	61	0	251	108	150	324	0	172
	Occurrence	39	31	339	441	141	165	2	64	79	180	50	1	1532
	%Occur./land.	49	63	86	81	57	68	33	79	48	82	52	10	72
Lain-lain	Maximum	65	293	269	800	360	210	75	138	306	218	150	0	800
	Mean	6	12	15	24	8	3	0	6	12	10	6	0	13
	St. deviation	14	46	31	64	31	17	0	21	40	29	24	0	41
	Occurrence	16	8	168	287	64	16	2	14	45	61	8	0	689
	%Occur./land.	20	16	42	53	25	6	33	17	27	27	8	0	32
Jumlah	Minimum	31	12	19	22	14	22	83	36	11	30	42	80	11
	Maximum	1931	3795	5410	5018	9388	6083	705	3191	3726	6634	3878	5197	9388
	Mean	498	663	625	688	780	783	409	550	741	729	489	956	685
	St. deviation	403	870	576	794	911	989	225	459	797	788	601	1669	779
	Landing	79	49	393	538	247	240	6	81	162	218	96	10	2119

Pekalongan 1996 (kg /landing)		MONTH						
		1	2	3	4	5	6	Total
Banyar	Maximum	13	125	814	2211	3691	2774	3691
	Mean	0	38	56	90	180	221	140
	St. deviation	0	37	106	239	434	495	366
	Occurrence	1	8	93	330	444	184	1060
	%Occur./land.	33	100	52	67	86	73	73
Bentong	Maximum	160	80	930	1053	1399	330	1399
	Mean	0	0	39	55	24	21	36
	St. deviation	0	0	103	105	86	46	91
	Occurrence	3	8	102	297	218	92	720
	%Occur./land.	100	100	57	60	42	36	49
Cumi-cumi	Maximum	38	21	0	226	96	176	226
	Mean	0	9	0	9	1	5	4
	St. deviation	0	7	0	19	7	15	14
	Occurrence	1	6	0	169	17	74	267
	%Occur./land.	33	75	0	34	3	29	18
Tanjan	Maximum	40	330	2300	4736	4290	3385	4736
	Mean	0	0	153	329	211	324	263
	St. deviation	0	0	298	545	449	587	498
	Occurrence	2	4	137	378	344	167	1032
	%Occur./land.	66	50	77	77	66	66	71
Tenggiri	Maximum	9	15	699	526	283	115	699
	Mean	0	0	27	32	7	2	17
	St. deviation	0	0	63	56	24	10	44
	Occurrence	1	2	113	320	183	23	642
	%Occur./land.	33	25	64	65	35	9	44
Tongkol	Maximum	45	68	1374	5287	2330	1885	5287
	Mean	0	0	42	64	33	55	48
	St. deviation	0	0	164	338	136	187	234
	Occurrence	1	4	33	158	138	75	409
	%Occur./land.	33	50	18	32	26	29	28
Campuran	Maximum	63	6	740	1482	990	1000	1482
	Mean	0	0	125	63	52	26	60
	St. deviation	0	0	137	132	100	85	118
	Occurrence	2	2	160	383	356	88	991
	%Occur./land.	66	25	90	78	69	35	68
Lain-lain	Maximum	0	15	469	1356	2731	1489	2731
	Mean	0	0	58	42	62	31	49
	St. deviation	0	0	82	128	201	142	156
	Occurrence	0	1	137	216	287	38	679
	%Occur./land.	0	12	77	44	55	15	47
Jumlah	Minimum	93	33	22	17	25	19	17
	Maximum	277	420	3034	5689	5380	4127	5689
	Mean	201	139	499	682	580	685	620
	St. deviation	96	128	429	702	657	764	671
	Landing	3	8	176	490	515	251	1443

Sarang 1992 (kg /landing)		MONTH									
		4	5	6	7	8	9	10	11	12	Total
Banyar	Maximum	0	0	0	3694	2000	1252	2654	1774	2223	3694
	Mean	0	0	0	314	105	112	187	236	264	169
	St. deviation	0	0	0	458	187	190	214	252	286	266
	Occurrence	0	0	0	432	496	527	814	488	522	3279
	%Occur./land.	0	0	0	72	53	55	83	87	88	64
Bentong	Maximum	0	0	0	2164	1694	1443	1506	1063	928	2164
	Mean	0	0	0	80	80	116	123	61	79	85
	St. deviation	0	0	0	207	158	183	179	107	117	161
	Occurrence	0	0	0	235	418	574	656	321	390	2594
	%Occur./land.	0	0	0	39	45	60	67	57	65	50
Layang	Maximum	0	0	0	2837	4422	5310	2966	2394	2522	5310
	Mean	0	0	0	313	730	691	316	172	255	406
	St. deviation	0	0	0	408	751	845	449	330	357	617
	Occurrence	0	0	0	388	760	704	623	313	437	3225
	%Occur./land.	0	0	0	65	82	74	63	55	73	63
Tanjan	Maximum	0	0	0	2883	2577	11750	4012	1059	4146	11750
	Mean	0	0	0	42	116	225	79	12	52	90
	St. deviation	0	0	0	228	348	677	308	77	321	386
	Occurrence	0	0	0	73	213	321	212	47	51	917
	%Occur./land.	0	0	0	12	23	34	21	8	8	18
Tenggiri	Maximum	0	0	0	57	78	237	235	51	60	237
	Mean	0	0	0	0	0	1	6	1	0	1
	St. deviation	0	0	0	0	3	9	18	5	3	9
	Occurrence	0	0	0	1	6	38	196	42	9	292
	%Occur./land.	0	0	0	0	0	4	20	7	1	5
Tongkol	Maximum	0	0	0	566	1414	3343	3462	2453	3290	3462
	Mean	0	0	0	11	26	36	134	57	47	50
	St. deviation	0	0	0	48	112	184	361	213	266	221
	Occurrence	0	0	0	76	139	138	367	118	107	945
	%Occur./land.	0	0	0	12	15	14	37	21	18	18
Campuran	Maximum	0	0	0	0	0	0	270	46	28	270
	Mean	0	0	0	0	0	0	3	0	0	1
	St. deviation	0	0	0	0	0	0	16	0	0	7
	Occurrence	0	0	0	0	0	0	55	4	4	63
	%Occur./land.	0	0	0	0	0	0	5	0	0	1
Lain-lain	Maximum	0	0	0	1376	1500	2840	3310	3660	2375	3660
	Mean	0	0	0	37	27	83	243	401	89	126
	St. deviation	0	0	0	134	123	255	447	624	274	349
	Occurrence	0	0	0	132	142	299	624	399	159	1755
	%Occur./land.	0	0	0	22	15	31	64	71	26	34
Jumlah	Minimum	10	14	25	20	23	30	20	23	24	10
	Maximum	3660	2310	4043	3741	4491	11800	4110	3909	4206	11800
	Mean	390	233	869	797	1084	1264	1092	939	786	970
	St. deviation	609	363	830	599	795	964	726	709	628	792
	Landing	341	91	67	595	925	942	974	560	593	5088

Sarang 1993 (kg /landing)		MONTH												
		1	2	3	4	5	6	7	8	9	10	11	12	Total
Banyar	Maximum	1200	880	2111	845	715	1206	1578		1110	1481	1125	1129	2111
	Mean	156	108	116	81	65	132	107		32	86	100	124	98
	St. deviation	201	146	197	133	103	173	217		94	152	159	178	168
	Occurrence	299	146	507	353	137	214	319		160	548	506	334	3523
	%Occur./land.	63	71	65	51	55	71	49		23	53	60	65	55
Bentong	Maximum	1191	1225	2558	732	2168	1620	1873		3246	3992	1437	1679	3992
	Mean	98	178	96	59	154	75	69		263	455	107	153	175
	St. deviation	158	219	202	108	246	132	180		348	528	156	210	314
	Occurrence	302	172	457	336	199	180	210		518	946	650	398	4368
	%Occur./land.	63	83	58	49	81	60	32		75	92	77	78	68
Cumi-cumi	Maximum	0	0	53	65	10	15	147		0	80	128	130	147
	Mean	0	0	0	0	0	0	0		0	0	2	1	1
	St. deviation	0	0	4	4	0	0	0		0	4	10	8	5
	Occurrence	0	0	11	14	1	4	4		0	12	46	17	109
	%Occur./land.	0	0	1	2	0	1	0		0	1	5	3	1
Layang	Maximum	2668	1959	1331	1513	1272	389	3076		6741	6996	6493	6226	6996
	Mean	146	285	30	39	73	12	336		855	431	758	358	355
	St. deviation	319	400	114	133	177	43	469		909	620	945	579	647
	Occurrence	225	142	122	105	79	44	445		602	765	715	395	3639
	%Occur./land.	47	69	15	15	32	14	68		87	75	84	77	56
Tanjan	Maximum	4902	3390	5435	2995	2327	3084	2858		8660	3480	5840	3920	8660
	Mean	200	101	250	295	189	339	148		122	278	317	209	234
	St. deviation	542	381	536	402	311	456	388		439	514	701	501	510
	Occurrence	168	38	493	572	172	249	171		223	614	409	200	3309
	%Occur./land.	35	18	63	83	70	83	26		32	60	48	39	51
Tenggiri	Maximum	30	114	367	136	20	57	120		12	180	117	95	367
	Mean	0	1	6	3	0	1	0		0	2	2	1	2
	St. deviation	2	10	23	12	2	4	0		0	11	10	6	11
	Occurrence	5	5	166	129	5	10	2		3	80	77	14	496
	%Occur./land.	1	2	21	18	2	3	0		0	7	9	2	7
Tongkol	Maximum	4678	1101	1923	3089	453	269	2539		1216	3774	4183	1953	4678
	Mean	41	17	25	11	4	8	66		16	12	38	24	26
	St. deviation	271	91	146	144	33	26	203		71	141	237	128	166
	Occurrence	64	22	74	22	8	55	233		136	71	93	86	864
	%Occur./land.	13	10	9	3	3	18	35		19	6	11	16	13
Campuran	Maximum	0	0	141	199	8	104	332		32	313	842	1219	1219
	Mean	0	0	1	1	0	1	1		0	1	2	3	1
	St. Deviation	0	0	6	9	0	10	14		0	11	30	0	20
	Occurrence	0	0	39	25	1	9	5		2	11	16	2	110
	%Occur./land.	0	0	5	3	0	3	0		0	1	1	0	1
Lain-lain	Maximum	1898	306	4318	1650	781	865	2239		664	1440	1880	506	4318
	Mean	62	9	49	30	19	43	42		7	19	20	16	29
	St. Deviation	177	33	241	85	75	111	158		40	84	101	55	129
	Occurrence	170	40	464	324	67	140	213		73	221	173	117	2002
	%Occur./land.	35	19	59	47	27	46	32		10	21	20	22	31
Jumlah	Minimum	25	15	12	7	15	17	59		25	30	20	30	7
	Maximum	5232	3574	5515	3179	2684	3405	4694		9216	6996	6493	7166	9216
	Mean	703	700	572	519	505	612	769		1294	1286	1348	889	919
	St. Deviation	672	627	656	503	468	514	584		1017	914	1053	784	855
	Landing	474	205	779	681	245	299	648	0	689	1019	841	509	6389

Sarang 1994 (kg /landing)		MONTH												
		1	2	3	4	5	6	7	8	9	10	11	12	Total
Banyar	Maximum	1225	1370	1063	901	970	1380	1134	727					1380
	Mean	58	100	85	67	97	143	91	33					84
	St. deviation	111	157	150	123	141	205	139	78					145
	Occurrence	257	491	273	392	359	381	287	176					2616
	%Occur./land.	48	60	54	48	65	65	59	30					54
Bentong	Maximum	1380	1880	2851	3211	1413	2249	1354	2471					3211
	Mean	257	141	94	69	250	277	182	111					166
	St. deviation	241	225	210	203	268	292	241	226					250
	Occurrence	493	536	252	373	473	529	378	347					3381
	%Occur./land.	93	65	50	46	86	91	78	61					70
Cumi-cumi	Maximum	0	150	206	70	125	62	110	0					206
	Mean	0	3	16	7	6	0	1	0					4
	St. deviation	0	12	25	11	11	3	6	0					12
	Occurrence	0	59	195	280	199	15	11	0					759
	%Occur./land.	0	7	39	34	36	2	2	0					15
Layang	Maximum	1468	1417	738	1269	1048	989	2525	5437					5437
	Mean	165	55	16	8	20	73	194	883					165
	St. deviation	236	142	70	63	76	155	372	825					425
	Occurrence	365	284	60	42	91	202	246	533					1823
	%Occur./land.	68	34	12	5	16	34	51	93					37
Tanjan	Maximum	3566	6400	3400	4600	3960	3557	5148	3061					6400
	Mean	279	564	469	500	331	338	140	68					358
	St. deviation	497	864	619	642	558	482	432	294					617
	Occurrence	295	542	439	719	367	456	192	92					3102
	%Occur./land.	55	66	88	88	66	78	40	16					64
Tenggiri	Maximum	60	107	163	128	238	42	20	7					238
	Mean	0	2	8	5	10	0	0	0					3
	St. deviation	4	9	19	12	24	3	0	0					12
	Occurrence	13	93	152	248	185	17	3	1					712
	%Occur./land.	2	11	30	30	33	2	0	0					14
Tongkol	Maximum	2229	2689	641	3153	2656	1662	3961	1621					3961
	Mean	41	44	6	16	37	63	84	26					39
	St. deviation	161	172	38	148	191	164	251	124					166
	Occurrence	173	253	53	92	69	272	220	100					1232
	%Occur./land.	32	31	10	11	12	46	45	17					25
Campuran	Maximum	90	444	79	805	362	216	276	390					805
	Mean	0	2	0	2	10	2	3	2					3
	St. deviation	0	24	4	29	29	12	19	21					21
	Occurrence	1	18	10	26	142	34	24	12					267
	%Occur./land.	0	2	2	3	25	5	5	2					5
Lain-lain	Maximum	720	1520	730	3150	403	3440	5911	2550					5911
	Mean	18	55	35	50	19	63	183	21					54
	St. deviation	59	141	69	150	42	230	493	142					208
	Occurrence	118	356	264	463	205	217	298	82					2003
	%Occur./land.	22	43	53	57	37	37	62	14					41
Jumlah	Minimum	7	14	17	10	11	9	17	10					7
	Maximum	3852	6796	3937	5224	4268	4912	6493	7389					7389
	Mean	818	966	729	723	781	960	877	1145					875
	St. deviation	596	885	757	722	663	673	776	889					770
	Landing	529	813	498	808	548	581	480	568					4825

Sarang 1995 (kg /landing)		MONTH												
		1	2	3	4	5	6	7	8	9	10	11	12	Total
Banyar	Maximum	0	655	1400	506	476	458	4089	1951	860	1560	992	974	4089
	Mean	0	55	50	41	40	36	71	61	59	78	60	75	57
	St. deviation	0	89	104	72	73	62	196	145	105	125	120	105	120
	Occurrence	0	256	331	190	165	133	350	433	374	540	375	458	3605
	%Occur./land.	0	58	49	45	51	43	52	42	47	61	46	62	48
Bentong	Maximum	0	1417	2661	1300	813	634	640	2240	1974	2060	1492	2073	2661
	Mean	0	142	92	144	99	39	30	77	98	95	37	171	86
	St. deviation	0	204	219	215	143	76	58	148	154	175	96	222	167
	Occurrence	0	303	359	255	228	143	287	567	562	582	295	579	4160
	%Occur./land.	0	69	53	61	70	47	43	56	71	66	36	79	56
Layang	Maximum	0	2188	920	1828	201	333	2880	7200	9151	5754	4879	2882	9151
	Mean	0	143	14	23	5	4	215	680	729	631	633	242	368
	St. deviation	0	321	77	150	24	27	470	888	823	799	809	306	670
	Occurrence	0	183	64	38	22	14	228	683	654	660	625	545	3716
	%Occur./land.	0	41	9	9	6	4	34	67	82	75	76	74	50
Tanjan	Maximum	0	2232	4240	3870	2369	2720	3415	5411	3974	3280	4320	6040	6040
	Mean	0	281	631	703	341	581	406	427	163	57	41	200	295
	St. deviation	0	429	654	652	433	559	551	759	435	237	212	534	554
	Occurrence	0	268	634	372	253	262	452	423	214	143	136	358	3515
	%Occur./land.	0	61	93	89	78	86	67	41	27	16	16	48	47
Tenggiri	Maximum	0	101	2054	202	63	130	40	40	95	483	874	252	2054
	Mean	0	1	15	5	3	2	0	0	0	3	9	5	4
	St. deviation	0	6	83	19	9	9	3	2	0	25	46	18	32
	Occurrence	0	20	228	99	66	21	11	10	4	63	119	130	771
	%Occur./land.	0	4	33	23	20	6	1	0	0	7	14	17	10
Tongkol	Maximum	0	1140	653	1978	929	489	1447	2216	752	3887	2275	934	3887
	Mean	0	17	11	22	11	14	39	19	11	224	30	40	45
	St. deviation	0	85	51	160	82	47	107	97	44	607	142	99	236
	Occurrence	0	76	91	41	18	58	285	193	119	273	120	299	1573
	%Occur./land.	0	17	13	9	5	19	42	19	15	31	14	40	21
Campuran	Maximum	0	0	0	0	0	0	62	560	796	504	296	470	796
	Mean	0	0	0	0	0	0	0	1	19	12	4	11	5
	St. deviation	0	0	0	0	0	0	0	21	80	48	23	35	35
	Occurrence	0	0	0	0	0	0	1	8	101	119	45	180	454
	%Occur./land.	0	0	0	0	0	0	0	0	12	13	5	24	6
Lain-lain	Maximum	0	1278	720	1263	944	640	780	889	1640	2200	4955	1930	4955
	Mean	0	28	34	34	15	17	28	10	15	34	308	70	58
	St. deviation	0	95	67	109	60	55	67	47	109	156	419	183	193
	Occurrence	0	124	349	150	80	80	209	131	84	186	654	321	2368
	%Occur./land.	0	28	51	36	24	26	31	12	10	21	80	43	31
Jumlah	Minimum	10	20	20	20	23	20	17	30	30	25	15	14	10
	Maximum	3030	3011	4240	4341	2552	2966	4114	7320	9241	6030	5382	6136	9241
	Mean	693	666	847	973	513	692	790	1275	1095	1135	1121	814	955
	St. deviation	490	530	705	744	440	548	626	945	826	919	882	673	795
	Landing	382	439	675	415	323	303	666	1010	790	873	812	732	7420

During the month of January, the different surveys were only described with their values.

Sarang 1996 (kg /landing)		MONTH												
		1	2	3	4	5	6	7	8	9	10	11	12	Total
Banyar	Maximum	1010	2042	1230	622	2457	1452	1001	1730	784	802	959	1175	2457
	Mean	92	200	77	46	150	109	64	54	35	49	50	82	75
	St. deviation	148	312	149	76	234	193	132	133	86	99	111	131	153
	Occurrence	342	169	265	337	345	336	303	205	212	359	200	214	3287
	%Occur./land.	59	63	51	50	74	54	43	38	29	40	38	61	48
Bentong	Maximum	2960	3613	5047	1446	3083	2095	1759	2722	1821	2067	796	1877	5047
	Mean	124	162	146	54	224	119	71	119	118	61	24	136	105
	St. deviation	221	342	367	116	381	232	149	223	176	146	61	209	228
	Occurrence	395	149	309	377	363	371	394	342	496	423	190	251	4060
	%Occur./land.	68	56	59	56	78	60	56	64	69	47	36	72	59
Cumi-cumi	Maximum	0	0	200	85	80	140	20	0	157	100	60	95	200
	Mean	0	0	9	7	3	3	0	0	0	1	2	2	2
	St. deviation	0	0	18	11	9	12	2	0	0	7	8	9	9
	Occurrence	0	0	168	246	61	71	13	0	2	62	47	23	693
	%Occur./land.	0	0	32	36	13	11	1	0	0	6	9	6	10
Layang	Maximum	2072	2051	3087	1312	1374	1335	4332	4460	5042	5480	3209	3317	5480
	Mean	171	162	90	16	17	47	335	606	637	756	500	540	348
	St. deviation	290	342	304	88	103	169	482	642	660	820	547	528	570
	Occurrence	368	104	120	57	35	93	503	454	650	760	409	296	3849
	%Occur./land.	64	39	23	8	7	15	72	85	90	85	78	85	56
Tanjan	Maximum	2444	3340	5440	5080	4600	4466	2530	936	2090	4025	3840	1680	5440
	Mean	78	133	395	414	478	213	71	22	44	78	91	51	168
	St. deviation	221	348	664	660	673	518	251	92	182	352	347	176	448
	Occurrence	215	114	413	569	358	244	116	55	94	126	136	75	2515
	%Occur./land.	37	42	79	85	77	39	16	10	13	14	26	21	36
Tenggiri	Maximum	70	70	170	226	150	212	120	17	363	270	89	114	363
	Mean	1	2	5	10	3	1	1	0	1	2	2	1	2
	St. deviation	5	8	16	25	14	11	7	0	14	13	8	8	13
	Occurrence	23	24	105	191	49	31	22	4	14	73	32	11	579
	%Occur./land.	4	9	20	28	10	5	3	0	1	8	6	3	8
Tongkol	Maximum	997	4095	4866	832	4233	730	2214	1856	1209	6314	1629	1804	6314
	Mean	26	53	20	7	78	12	39	28	29	70	15	19	33
	St. deviation	97	364	225	47	312	59	159	130	106	426	108	128	219
	Occurrence	112	22	54	46	140	79	157	93	146	144	42	38	1073
	%Occur./land.	19	8	10	6	30	12	22	17	20	16	8	10	15
Campuran	Maximum	533	594	1102	429	1122	376	432	1292	303	180	86	57	1292
	Mean	74	30	6	5	23	2	5	7	2	2	1	0	12
	St. deviation	103	84	52	22	96	17	31	63	16	15	6	4	54
	Occurrence	369	54	58	114	93	57	46	21	28	44	9	7	900
	%Occur./land.	64	20	11	17	20	9	6	3	3	4	1	2	13
Lain-lain	Maximum	386	1260	3541	1520	585	1952	895	1310	1790	1620	440	1015	3541
	Mean	18	31	56	41	20	124	63	26	44	21	15	42	43
	St. deviation	50	105	230	109	58	225	123	84	143	87	42	104	132
	Occurrence	132	101	254	361	145	404	343	157	223	219	144	148	2631
	%Occur./land.	22	37	48	54	31	65	49	29	31	24	27	42	38
Jumlah	Minimum	11	20	10	7	8	14	20	30	20	10	16	35	7
	Maximum	3926	4508	7477	5120	4982	5065	4332	5340	5255	6314	3880	3668	7477
	Mean	584	773	804	601	996	631	649	862	910	1041	701	874	788
	St. deviation	571	814	928	694	871	660	581	713	740	909	594	586	753
	Landing	575	266	519	667	461	618	692	534	718	892	518	348	6808

Tasik Agung 1995 (kg /landing)		MONTH												
		1	2	3	4	5	6	7	8	9	10	11	12	Total
Banyar	Maximum	1251	1988	1299	1049	2967	957	688	975	1391	2083	1976	1174	2967
	Mean	133	194	90	131	134	66	51	66	111	114	68	74	97
	St. deviation	191	261	157	160	183	91	84	102	154	188	126	126	153
	Occurrence	205	178	442	726	756	506	415	637	780	634	499	340	6118
	%Occur./land.	80	86	67	82	91	74	64	70	80	77	66	70	75
Bentong	Maximum	1521	713	1171	816	645	680	1756	1017	1793	1065	1136	863	1793
	Mean	199	35	57	53	71	65	103	73	97	97	125	80	85
	St. deviation	233	81	110	82	89	103	202	126	158	147	187	118	143
	Occurrence	219	86	345	516	647	424	308	430	551	502	511	344	4883
	%Occur./land.	85	41	52	58	78	62	48	47	56	61	68	70	60
Cumi-cumi	Maximum	0	192	153	750	213	93	15	20	22	100	30	60	750
	Mean	0	7	8	4	1	0	0	0	0	1	1	1	2
	St. deviation	0	20	17	29	11	4	0	1	0	8	3	6	12
	Occurrence	0	40	212	103	35	6	4	10	4	29	36	33	512
	%Occur./land.	0	19	32	11	4	0	0	1	0	3	4	6	6
Layang	Maximum	2674	2992	1404	3223	2597	390	4240	6396	8400	4370	4093	3661	8400
	Mean	167	94	28	33	38	12	180	498	646	593	322	334	277
	St. deviation	301	278	105	158	126	41	409	699	889	762	496	376	567
	Occurrence	164	76	147	180	267	111	377	678	792	633	572	415	4412
	%Occur./land.	64	36	22	20	32	16	58	75	81	77	76	85	54
Tanjan	Maximum	3679	3970	4938	8940	4109	4300	5000	22050	9030	3180	3200	2919	22050
	Mean	91	593	512	645	172	565	379	443	147	67	93	85	313
	St. deviation	327	840	768	908	356	706	612	1016	472	287	308	244	672
	Occurrence	93	142	423	649	425	522	422	540	328	123	213	159	4039
	%Occur./land.	36	68	64	73	51	77	65	59	33	15	28	32	50
Tenggiri	Maximum	0	0	167	342	80	70	0	15	101	130	1541	204	1541
	Mean	0	0	3	4	0	0	0	0	0	1	8	3	2
	St. deviation	0	0	15	24	4	4	0	0	4	8	65	18	22
	Occurrence	0	0	74	74	13	15	0	3	8	25	73	39	324
	%Occur./land.	0	0	11	8	1	2	0	0	0	3	9	8	4
Tongkol	Maximum	918	790	1900	2383	388	1608	844	740	652	4378	839	2736	4378
	Mean	14	47	9	12	3	10	22	15	6	83	21	41	22
	St. deviation	72	97	87	92	22	71	57	61	30	328	72	156	129
	Occurrence	43	85	65	96	35	83	237	187	113	154	137	149	1384
	%Occur./land.	16	41	9	10	4	12	36	20	11	18	18	30	17
Campuran	Maximum	0	1750	559	244	266	963	880	180	415	1550	350	800	1750
	Mean	0	15	13	5	5	3	3	1	2	8	5	37	7
	St. deviation	0	124	40	19	21	39	37	9	17	70	26	93	45
	Occurrence	0	25	157	112	96	48	11	12	37	57	94	169	818
	%Occur./land.	0	12	23	12	11	7	1	1	3	6	12	34	10
Lain-lain	Maximum	1090	468	1679	2420	275	480	1038	800	2785	2306	4050	546	4050
	Mean	53	19	47	41	11	9	34	28	36	50	131	15	41
	St. deviation	122	69	148	138	27	33	93	90	154	198	261	62	143
	Occurrence	158	47	278	306	262	152	223	218	224	253	503	71	2695
	%Occur./land.	61	22	42	34	31	22	34	24	22	30	67	14	33
Jumlah	Minimum	27	25	5	4	10	3	7	12	28	9	1	15	1
	Maximum	5973	4977	5211	9661	4290	4300	5060	22157	10520	4866	4093	3661	22157
	Mean	655	1011	767	928	435	730	772	1124	1045	1015	774	672	844
	St. deviation	586	1026	800	964	413	703	680	1107	957	817	623	479	832
	Landing	256	206	655	879	822	677	641	901	974	820	747	485	8063

Tasik Agung 1996 (kg /landing)		MONTH												
		1	2	3	4	5	6	7	8	9	10	11	12	Total
Banyar	Maximum	1059	1862	2841	1072	2037	3334	1361	1783	1933	1653	1131	2293	3334
	Mean	86	185	160	92	99	164	169	121	138	81	53	107	109
	St. deviation	166	295	288	128	185	272	243	187	228	161	113	224	205
	Occurrence	180	154	352	392	349	449	199	366	393	632	440	384	4290
	%Occur./land.	60	78	81	77	65	79	80	81	68	55	50	59	66
Bentong	Maximum	1625	644	1071	584	1593	793	1735	798	2049	1625	1191	2035	2049
	Mean	80	71	75	61	75	83	124	70	101	77	97	105	85
	St. deviation	149	110	119	85	148	122	237	128	193	156	178	198	159
	Occurrence	220	130	288	370	341	343	164	234	283	506	460	354	3693
	%Occur./land.	74	65	66	72	64	60	66	52	49	44	52	55	57
Cumi-cumi	Maximum	150	51	712	350	172	100	30	22	35	110	350	190	712
	Mean	1	2	8	7	5	2	0	0	1	2	9	11	4
	St. deviation	11	8	38	24	15	8	3	0	4	8	25	26	19
	Occurrence	15	16	80	108	92	54	7	4	17	100	203	148	844
	%Occur./land.	5	8	18	21	17	9	2	1	2	8	23	23	13
Layang	Maximum	1437	1148	4147	1385	1236	1865	2870	2898	3935	7173	3502	4432	7173
	Mean	143	65	40	36	78	92	340	406	359	385	232	344	235
	St. deviation	197	132	233	114	146	204	501	480	499	622	372	472	434
	Occurrence	220	93	87	141	248	259	184	366	412	755	560	505	3830
	%Occur./land.	74	47	20	27	46	46	74	81	72	66	64	78	59
Tanjan	Maximum	2000	1920	4800	4150	5600	4000	2211	1574	1850	4100	3600	1786	5600
	Mean	115	131	400	357	250	185	82	69	46	102	73	64	147
	St. deviation	240	311	654	621	583	433	230	186	184	354	277	162	404
	Occurrence	128	76	271	339	284	252	82	142	102	268	210	193	2347
	%Occur./land.	43	38	62	66	53	44	33	31	17	23	24	30	36
Tenggiri	Maximum	127	87	1789	96	250	49	10	0	30	1057	500	150	1789
	Mean	1	3	8	2	1	0	0	0	0	2	5	2	2
	St. deviation	8	12	98	10	12	3	1	0	2	32	23	11	31
	Occurrence	8	18	36	45	21	7	3	0	10	69	103	38	358
	%Occur./land.	2	9	8	8	3	1	1	0	1	6	11	5	5
Tongkol	Maximum	1022	126	1929	417	2933	3141	488	1909	999	3092	2567	2964	3141
	Mean	11	2	27	3	40	28	8	17	22	68	63	88	41
	St. deviation	69	11	162	27	179	193	45	108	94	284	263	333	212
	Occurrence	29	7	54	21	147	107	18	66	95	168	141	140	993
	%Occur./land.	9	3	12	4	27	19	7	14	16	14	16	21	15
Campuran	Maximum	1204	395	3454	1200	388	818	229	740	731	1823	1375	1173	3454
	Mean	79	44	42	33	27	23	11	27	20	30	31	27	31
	St. deviation	173	72	204	108	55	75	30	85	64	114	86	102	107
	Occurrence	180	100	140	197	218	163	55	113	126	305	305	187	2089
	%Occur./land.	60	50	32	38	41	28	22	25	22	26	35	29	32
Lain-lain	Maximum	40	95	1200	800	195	1679	790	356	1982	1143	970	100	1982
	Mean	0	1	15	7	1	23	15	5	28	15	8	0	11
	St. deviation	3	9	77	53	12	108	72	26	171	88	56	6	80
	Occurrence	5	7	49	47	18	78	27	31	38	72	52	7	431
	%Occur./land.	1	3	11	9	3	13	10	6	6	6	5	1	6
Jumlah	Minimum	4	16	21	6	25	9	14	14	6	4	5	14	4
	Maximum	2397	2960	4864	4330	6000	4120	4161	2977	3988	8757	3678	4432	8757
	Mean	516	504	775	599	576	600	750	716	732	786	570	772	674
	St. deviation	425	480	765	624	621	601	690	568	621	742	521	591	633
	Landing	296	197	432	509	529	563	246	449	571	1130	871	643	6436

Annex 3 :
The sale values per landing (in Rp.)

Banyutowo 1995 (Rp * 1000)		MONTH												
		1	2	3	4	5	6	7	8	9	10	11	12	Total
Banyar	Maximum	629	539	811	1616		728	820	864	1209	969	742	1527	1616
	Mean	75	135	131	177		189	100	173	124	67	52	202	113
	St. deviation	115	136	196	312		225	173	201	216	165	134	314	202
	Occurrence	53	40	35	29		25	25	70	43	33	28	28	409
	%Occur./land.	60	74	68	51		65	47	77	35	19	18	42	43
Bentong	Maximum	429	170	104	54		47	0	0	252	0	236	460	460
	Mean	66	19	8	0		0	0	0	0	0	20	31	14
	St. deviation	83	36	23	0		0	0	0	0	0	47	89	46
	Occurrence	59	18	9	1		3	0	0	4	0	29	12	135
	%Occur./land.	67	33	17	1		7	0	0	3	0	19	18	14
Layang	Maximum	1029	1080	814	1286		852	1012	1238	1607	1521	1761	1073	1761
	Mean	178	234	116	253		154	234	275	421	345	301	334	286
	St. deviation	214	228	144	259		192	200	230	337	335	256	265	279
	Occurrence	63	47	36	42		27	51	79	107	131	127	53	763
	%Occur./land.	72	87	70	75		71	96	87	89	77	84	80	81
Tanjan	Maximum	108	174	426	408		225	219	936	665	1096	981	279	1096
	Mean	3	11	30	48		27	32	161	93	128	54	0	68
	St. deviation	13	34	69	90		57	49	168	122	216	122	0	139
	Occurrence	5	7	26	18		11	27	78	66	71	43	4	356
	%Occur./land.	5	12	50	32		28	50	86	55	42	28	6	38
Tongkol	Maximum	335	0	0	114		0	511	1311	136	398	288	0	1311
	Mean	9	0	0	0		0	40	83	0	0	0	0	13
	St. deviation	45	0	0	0		0	88	229	0	0	0	0	82
	Occurrence	5	0	0	2		0	18	26	2	2	4	0	59
	%Occur./land.	5	0	0	3		0	33	28	1	1	2	0	6
Lain-lain	Maximum	232	201	553	0		103	0	0	0	0	0	650	650
	Mean	25	17	79	0		0	0	0	0	0	0	0	9
	St. deviation	50	42	134	0		0	0	0	0	0	0	0	49
	Occurrence	26	11	22	0		2	0	0	0	0	0	2	63
	%Occur./land.	29	20	43	0		5	0	0	0	0	0	3	6
Jumlah	Minimum	34	67	48	85		82	16	42	23	33	30	39	16
	Maximum	1299	1376	1700	1905		1086	1562	2547	2430	1866	2235	2002	2547
	Mean	356	415	354	483		379	406	692	644	543	433	589	503
	St. deviation	266	279	300	396		256	310	484	483	426	322	450	401
	Landing	87	54	51	56	0	38	53	90	120	169	151	66	935

Banyutowo 1996 (Rp * 1000)		MONTH												
		1	2	3	4	5	6	7	8	9	10	11	12	Total
Banyar	Maximum		38	1475	1911	2565	672	959	775	667	1057	441	4958	4958
	Mean		0	285	180	212	174	171	120	124	113	77	144	150
	St. deviation		0	313	267	401	188	229	171	176	170	119	599	288
	Occurrence		1	55	48	36	37	38	27	53	104	32	28	459
	%Occur./land.		9	78	70	67	78	57	61	51	64	45	38	59
Bentong	Maximum		317	815	354	123	514	310	200	973	941	432	395	973
	Mean		0	34	31	19	87	62	26	165	124	82	87	84
	St. deviation		0	107	74	32	120	75	43	194	162	102	95	133
	Occurrence		2	19	19	20	29	41	18	73	122	45	57	445
	%Occur./land.		18	27	27	37	61	62	40	71	75	64	78	58
Cumi-cumi	Maximum		0	0	0	0	0	64	152	93	0	0	0	152
	Mean		0	0	0	0	0	0	0	0	0	0	0	1
	St. deviation		0	0	0	0	0	0	0	0	0	0	0	7
	Occurrence		0	0	0	0	0	1	2	2	0	0	0	5
	%Occur./land.		0	0	0	0	0	1	4	1	0	0	0	0
Layang	Maximum		946	861	1188	1796	2185	2559	2055	1989	1291	1020	1697	2559
	Mean		295	73	232	291	200	445	480	391	320	329	283	307
	St. deviation		260	159	301	427	366	526	438	388	287	310	313	363
	Occurrence		11	29	53	36	22	61	42	84	141	58	64	601
	%Occur./land.		100	41	77	67	46	92	95	82	87	82	87	78
Tenggiri	Maximum		0	335	184	103	134	356	103	138	163	308	81	356
	Mean		0	29	13	0	7	37	12	8	11	10	13	14
	St. deviation		0	60	34	0	27	78	23	25	29	39	20	39
	Occurrence		0	30	17	2	7	20	18	15	35	13	30	187
	%Occur./land.		0	42	25	3	14	30	40	14	21	18	41	24
Tenggiri	Maximum		0	0	0	0	0	0	0	0	123	149	34	149
	Mean		0	0	0	0	0	0	0	0	0	0	0	1
	St. deviation		0	0	0	0	0	0	0	0	0	0	0	8
	Occurrence		0	0	0	0	0	0	0	0	3	2	2	7
	%Occur./land.		0	0	0	0	0	0	0	0	1	2	2	0
Tongkol	Maximum		0	145	0	544	72	0	0	0	165	549	493	549
	Mean		0	0	0	0	5	0	0	0	0	0	0	4
	St. deviation		0	0	0	0	16	0	0	0	0	0	0	36
	Occurrence		0	1	0	2	5	0	0	0	1	2	4	15
	%Occur./land.		0	1	0	3	10	0	0	0	0	2	5	1
Campuran	Maximum		0	0	0	0	0	0	0	349	586	520	241	586
	Mean		0	0	0	0	0	0	0	0	17	21	0	7
	St. deviation		0	0	0	0	0	0	0	0	74	74	0	45
	Occurrence		0	0	0	0	0	0	0	3	15	9	2	29
	%Occur./land.		0	0	0	0	0	0	0	2	9	12	2	3
Lain-lain	Maximum		0	780	252	609	287	0	0	0	229	498	765	780
	Mean		0	48	26	40	20	0	0	0	9	23	32	18
	St. deviation		0	111	51	97	52	0	0	0	33	70	103	64
	Occurrence		0	26	23	17	10	0	0	0	19	14	18	127
	%Occur./land.		0	37	33	32	21	0	0	0	11	20	24	16
Jumlah	Minimum		107	31	37	63	34	60	73	59	80	38	44	31
	Maximum		946	2706	2456	3002	2242	2869	2055	2646	2418	1246	4958	4958
	Mean		338	471	482	577	493	715	643	694	595	555	575	583
	St. deviation		239	405	447	635	373	596	428	472	408	314	654	479
	Landing		11	70	68	53	47	66	44	102	162	70	73	766

Batang 1995 (Rp * 1000)		MONTH												
		1	2	3	4	5	6	7	8	9	10	11	12	Total
Banyar	Maximum		1643	1267	1862	2168	3036	824	3440	1241	2068	3717	697	3717
	Mean		130	114	120	190	219	296	267	168	267	229	147	167
	St. deviation		261	165	197	217	336	227	371	209	349	489	186	269
	Occurrence	3	53	296	535	457	227	46	129	108	176	107	32	2169
	%Occur./land.		66	50	53	65	59	82	67	60	56	47	55	55
Bentong	Maximum		891	874	1738	1326	1154	475	804	868	2530	2598	156	2598
	Mean		64	89	95	55	57	109	75	81	94	74	12	76
	St. deviation		126	146	132	98	122	119	126	122	259	259	35	151
	Occurrence	7	35	277	617	286	131	34	87	83	70	43	7	1677
	%Occur./land.		43	46	62	40	34	60	45	46	22	18	12	43
Layang	Maximum		1727	3294	2100	1148	975	738	1584	1620	948	825	369	3294
	Mean		208	223	154	86	93	150	100	102	105	85	80	128
	St. deviation		341	318	246	130	122	191	176	204	143	117	102	216
	Occurrence	5	56	375	511	324	181	29	83	54	131	108	26	1883
	%Occur./land.		70	63	51	46	47	51	43	30	42	47	44	48
Tanjan	Maximum		731	697	920	529	760	366	425	400	2085	4802	439	4802
	Mean		60	70	35	27	29	23	26	46	231	213	111	65
	St. deviation		113	111	76	49	71	63	56	63	294	501	109	176
	Occurrence	4	49	292	368	247	109	13	58	93	201	117	38	1589
	%Occur./land.		61	49	37	35	28	23	30	51	64	51	65	40
Tongkol	Maximum		0	390	810	0	1817	0	551	0	0	433	0	1817
	Mean		0	4	1	0	20	0	0	0	0	0	0	3
	St. deviation		0	31	28	0	125	0	0	0	0	0	0	45
	Occurrence	0	0	16	5	0	18	0	3	0	0	1	0	43
	%Occur./land.		0	2	0	0	4	0	1	0	0	0	0	1
Lain-lain	Maximum		150	627	3040	777	3077	518	460	122	1636	0	0	3077
	Mean		10	40	43	14	15	0	4	0	0	0	0	22
	St. deviation		27	90	159	69	162	0	37	0	0	0	0	110
	Occurrence	3	14	165	231	46	19	1	5	3	1	0	0	488
	%Occur./land.		17	27	23	6	4	1	2	1	0	0	0	12
Jumlah	Minimum	26	40	14	23	40	68	90	26	37	42	40	21	14
	Maximum	7217	2519	5490	5839	3679	6693	1809	5336	1989	5171	8713	965	8713
	Mean	550	472	553	446	372	433	588	470	400	700	607	349	481
	St. deviation	811	551	480	486	319	548	390	524	314	693	1115	250	559
	Landing	154	80	592	991	703	382	56	192	179	310	227	58	3924

During the month of January, 154 surveys were realised, but only for the last eight, the description of species were given.

Eretan Wetan 1995 (Rp * 1000)		MONTH												
		1	2	3	4	5	6	7	8	9	10	11	12	Total
Banyar	Maximum	6506	2090	345	1776	2170	2850	1730	2360	2557	2700	2500	530	6506
	Mean	730	528	89	179	242	500	306	369	449	231	171	0	311
	St. deviation	1331	723	109	284	378	628	367	509	527	402	341	0	517
	Occurrence	27	10	10	53	117	57	60	44	93	63	47	3	584
	%Occur./land.	84	71	52	56	71	82	88	81	91	63	66	100	74
Bentong	Maximum	1476	597	1095	1300	1977	3420	1664	1980	510	1551	872	327	3420
	Mean	331	0	171	149	80	303	180	168	84	97	138	0	143
	St. deviation	349	0	271	253	203	547	323	391	110	208	167	0	288
	Occurrence	25	4	13	46	69	36	35	25	65	44	49	2	413
	%Occur./land.	78	28	68	49	42	52	51	46	63	44	69	66	52
Layang	Maximum	4279	1034	304	495	2811	3900	2144	3900	2860	4560	5569	580	5569
	Mean	1251	158	0	22	44	127	97	318	296	242	328	0	207
	St. deviation	1115	301	0	87	263	501	339	722	560	558	809	0	574
	Occurrence	28	6	2	8	18	17	13	19	54	49	40	2	256
	%Occur./land.	87	42	10	8	11	24	19	35	52	49	56	66	32
Tanjan	Maximum	4203	3035	1978	6080	1700	1438	1530	1800	3193	2537	2944	2400	6080
	Mean	411	305	312	317	108	284	275	376	555	167	242	0	283
	St. deviation	954	798	447	846	228	357	414	517	671	360	570	0	567
	Occurrence	15	9	16	68	93	45	38	33	89	58	41	3	508
	%Occur./land.	46	64	84	73	57	65	55	61	87	58	57	100	64
Tongkol	Maximum	209	0	0	0	346	635	667	74	390	1590	1090	0	1590
	Mean	0	0	0	0	6	0	0	0	0	0	0	0	8
	St. deviation	0	0	0	0	39	0	0	0	0	0	0	0	80
	Occurrence	2	0	0	0	7	2	3	1	3	1	2	0	21
	%Occur./land.	6	0	0	0	4	2	4	1	2	1	2	0	3
Lain-lain	Maximum	2673	976	479	3300	4640	3540	2000	1670	1190	2295	2865	252	4640
	Mean	465	90	194	331	244	261	178	278	205	194	239	0	245
	St. deviation	682	262	168	524	502	520	347	428	232	398	469	0	448
	Occurrence	27	5	18	86	136	57	45	45	82	56	55	1	613
	%Occur./land.	84	35	94	92	83	82	66	83	80	56	77	33	78
Jumlah	Minimum	61	47	202	19	5	17	39	14	46	27	109	995	5
	Maximum	9190	4072	3576	7300	5369	7924	4816	5797	5397	4560	5589	2676	9190
	Mean	3198	1178	796	998	724	1487	1047	1511	1594	948	1136	1811	1197
	St. deviation	1928	1144	735	1138	799	1547	1061	1218	1136	920	1139	842	1232
	Landing	32	14	19	93	163	69	68	54	102	100	71	3	788

Eretan Wetan 1996 (Rp * 1000)		MONTH												
		1	2	3	4	5	6	7	8	9	10	11	12	Total
Banyar	Maximum	320	0	2960	1745									2960
	Mean	0	0	487	230									252
	St. deviation	0	0	962	436									527
	Occurrence	3	0	7	24									34
	%Occur./land.	50	0	77	54									56
Bentong	Maximum	360	38	1580	1651									1651
	Mean	0	0	337	148									176
	St. deviation	0	0	550	348									369
	Occurrence	4	1	5	18									28
	%Occur./land.	66	100	55	40									46
Layang	Maximum	400	0	0	33									400
	Mean	0	0	0	0									18
	St. deviation	0	0	0	0									72
	Occurrence	4	0	0	1									5
	%Occur./land.	66	0	0	2									8
Tanjan	Maximum	319	107	2029	2560									2560
	Mean	0	0	0	431									388
	St. deviation	0	0	0	555									547
	Occurrence	4	1	4	35									44
	%Occur./land.	66	100	44	79									73
Tongkol	Maximum	0	0	126	0									126
	Mean	0	0	0	0									2
	St. deviation	0	0	0	0									16
	Occurrence	0	0	1	0									1
	%Occur./land.	0	0	11	0									1
Lain-lain	Maximum	369	360	770	1900									1900
	Mean	0	0	299	290									276
	St. deviation	0	0	318	451									409
	Occurrence	4	1	8	33									46
	%Occur./land.	66	100	88	75									76
Jumlah	Minimum	316	505	17	113									17
	Maximum	1231	505	7339	3166									7339
	Mean	699	505	1516	1100									1112
	St. deviation	324	0	2311	924									1185
	Landing	6	1	9	44									60

Kranji 1995 (Rp * 1000)		MONTH												
		1	2	3	4	5	6	7	8	9	10	11	12	Total
Jumlah	Minimum	190	47	74	229	162	100	26	31	43	42	93	64	26
	Maximum	5693	201	544	1276	1354	581	1071	1235	2706	7486	4400	4729	7486
	Mean	727	117	329	578	506	294	261	372	549	630	906	700	597
	St. deviation	989	78	191	295	327	184	195	241	480	653	980	823	679
	Landing	34	3	8	14	35	6	77	92	129	216	135	89	838

Pekalongan 1995 (Rp * 1000)		MONTH												
		1	2	3	4	5	6	7	8	9	10	11	12	Total
Banyar	Maximum	2744	2606	3377	1661	963	1451	255	509	1862	2604	2520	592	3377
	Mean	146	310	136	80	94	124	0	24	94	125	36	172	107
	St. deviation	368	613	314	183	127	173	0	82	244	339	258	225	259
	Occurrence	48	34	282	322	191	214	4	18	75	144	19	9	1360
	%Occur./land.	60	69	71	59	77	89	66	22	46	66	19	90	64
Bentong	Maximum	1192	1642	1078	1605	1043	1077	207	194	356	1044	628	120	1642
	Mean	169	89	44	50	87	77	0	14	41	22	58	0	57
	St. deviation	189	240	98	150	154	160	0	32	68	82	102	0	135
	Occurrence	68	27	189	220	161	138	3	27	100	110	67	4	1114
	%Occur./land.	86	55	48	40	65	57	50	33	61	50	69	40	53
Cumi-cumi	Maximum	0	0	544	0	0	0	0	0	0	125	81	47	544
	Mean	0	0	9	0	0	0	0	0	0	4	4	0	2
	St. deviation	0	0	38	0	0	0	0	0	0	17	14	0	18
	Occurrence	0	0	41	0	0	0	0	0	0	14	8	1	64
	%Occur./land.	0	0	10	0	0	0	0	0	0	6	8	10	3
Layang	Maximum	252	1575	440	0	6	48	0	0	0	517	0	100	1575
	Mean	19	59	0	0	0	0	0	0	0	0	0	0	3
	St. deviation	46	250	0	0	0	0	0	0	0	0	0	0	43
	Occurrence	24	5	4	0	2	4	0	0	0	3	0	2	44
	%Occur./land.	30	10	1	0	0	1	0	0	0	1	0	20	2
Tanjan	Maximum	134	140	1820	877	773	1186	260	2355	788	786	1144	270	2355
	Mean	9	10	67	79	85	141	137	101	112	48	43	0	79
	St. deviation	19	29	130	132	104	203	97	289	167	82	125	0	146
	Occurrence	37	16	313	429	213	166	6	54	147	196	85	4	1666
	%Occur./land.	46	32	79	79	86	69	100	66	90	89	88	40	79
Tenggiri	Maximum	2732	142	589	2687	479	185	14	114	2378	4515	922	177	4515
	Mean	124	16	57	76	12	4	0	0	74	138	75	0	60
	St. deviation	441	32	84	183	37	18	0	0	285	387	145	0	203
	Occurrence	34	16	229	307	71	27	2	4	45	168	54	3	960
	%Occur./land.	43	32	58	57	28	11	33	4	27	77	56	30	45
Tongkol	Maximum	1031	1329	2883	2350	2487	1615	13	438	488	9067	1142	9345	9345
	Mean	89	0	38	28	34	50	0	8	18	261	69	1554	67
	St. deviation	246	0	180	172	223	187	0	50	69	787	175	3149	387
	Occurrence	23	3	69	60	21	63	1	6	29	96	29	7	407
	%Occur./land.	29	6	17	11	8	26	16	7	17	44	30	70	19
Campuran	Maximum	592	1389	1144	3096	1305	1107	21	595	531	4626	1691	3	4626
	Mean	44	109	154	156	36	85	0	179	45	148	54	0	114
	St. deviation	108	289	195	308	102	133	0	165	85	422	203	0	247
	Occurrence	39	31	339	441	141	165	2	64	79	180	50	1	1532
	%Occur./land.	49	63	86	81	57	68	33	79	48	82	52	10	72
Lain-lain	Maximum	153	1422	375	1188	300	225	74	272	461	89	58	0	1422
	Mean	13	42	29	34	12	3	0	15	14	6	2	0	20
	St. deviation	33	205	51	77	34	17	0	47	48	14	10	0	60
	Occurrence	16	8	168	287	64	16	2	14	45	61	8	0	689
	%Occur./land.	20	16	42	53	25	6	33	17	27	27	8	0	32
Jumlah	Minimum	13	27	22	10	19	12	86	57	15	4	17	164	4
	Maximum	2936	4768	3377	3809	2624	2666	549	2871	2599	9168	2542	5436	9168
	Mean	612	687	537	502	359	485	264	344	399	755	361	914	505
	St. deviation	624	939	472	530	392	428	177	334	389	969	465	1611	576
	Landing	79	49	393	538	247	240	6	81	162	218	96	10	2119

Pekalongan 1996 (Rp * 1000)		MONTH												
		1	2	3	4	5	6	7	8	9	10	11	12	Total
Banyar	Maximum	35	101	2109	6382	5306	4626							6382
	Mean	0	57	131	209	329	382							271
	St. deviation	0	31	250	570	722	832							657
	Occurrence	1	8	93	330	444	184							1060
	%Occur./land.	33	100	52	67	86	73							73
Bentong	Maximum	371	140	2605	2222	2324	387							2605
	Mean	0	38	80	109	38	28							66
	St. deviation	0	43	246	211	138	58							177
	Occurrence	3	8	102	297	218	92							720
	%Occur./land.	100	100	57	60	42	36							49
Cumi-cumi	Maximum	190	49	0	442	281	230							442
	Mean	0	28	0	31	3	14							14
	St. deviation	0	21	0	60	22	32							42
	Occurrence	1	6	0	169	17	74							267
	%Occur./land.	33	75	0	34	3	29							18
Tanjan	Maximum	8	130	1292	1939	1054	1959							1959
	Mean	0	0	75	134	69	144							105
	St. deviation	0	0	149	232	142	270							205
	Occurrence	2	4	137	378	344	167							1032
	%Occur./land.	66	50	77	77	66	66							71
Tenggiri	Maximum	40	75	3312	1999	1337	441							3312
	Mean	0	0	131	135	34	8							75
	St. deviation	0	0	307	232	118	45							195
	Occurrence	1	2	113	320	183	23							642
	%Occur./land.	33	25	64	65	35	9							44
Tongkol	Maximum	83	162	3764	16768	5013	3293							16768
	Mean	0	0	123	169	78	133							123
	St. deviation	0	0	486	982	312	446							653
	Occurrence	1	4	33	158	138	75							409
	%Occur./land.	33	50	18	32	26	29							28
Campuran	Maximum	141	24	1466	1250	1382	315							1466
	Mean	0	0	207	76	88	19							86
	St. deviation	0	0	235	136	171	45							163
	Occurrence	2	2	160	383	356	88							991
	%Occur./land.	66	25	90	78	69	35							68
Lain-lain	Maximum	0	53	508	1016	1976	1733							1976
	Mean	0	0	103	47	58	29							54
	St. deviation	0	0	100	113	140	144							129
	Occurrence	0	1	137	216	287	38							679
	%Occur./land.	0	12	77	44	55	15							47
Jumlah	Minimum	280	69	73	29	39	38							29
	Maximum	635	361	4895	10000	5306	4782							10000
	Mean	422	203	849	893	703	758							792
	St. deviation	188	102	750	1018	815	912							900
	Landing	3	8	176	490	515	251							1443

Sarang 1992 (Rp * 1000)		MONTH												
		1	2	3	4	5	6	7	8	9	10	11	12	Total
Banyar	Maximum				1233	611	1021	0	0	0	0	0	0	1233
	Mean				36	47	190	0	0	0	0	0	0	6
	St. deviation				96	94	235	0	0	0	0	0	0	48
	Occurrence				196	43	52	0	0	0	0	0	0	297
	%Occur./land.				57	47	77	0	0	0	0	0	0	5
Bentong	Maximum				760	226	862	0	0	0	0	0	0	862
	Mean				35	27	82	0	0	0	0	0	0	4
	St. deviation				89	47	186	0	0	0	0	0	0	34
	Occurrence				120	35	25	0	0	0	0	0	0	181
	%Occur./land.				35	38	37	0	0	0	0	0	0	3
Layang	Maximum				958	8	221	0	0	0	0	0	0	1466
	Mean				20	0	10	0	0	0	0	0	0	4
	St. deviation				108	0	38	0	0	0	0	0	0	54
	Occurrence				23	1	7	0	0	0	0	0	0	53
	%Occur./land.				6	1	10	0	0	0	0	0	0	1
Tanjan	Maximum				956	1020	1355	0	0	0	0	0	0	1355
	Mean				44	61	146	0	0	0	0	0	0	6
	St. deviation				126	151	291	0	0	0	0	0	0	55
	Occurrence				252	58	32	0	0	0	0	0	0	344
	%Occur./land.				73	63	47	0	0	0	0	0	0	6
Tenggiri	Maximum				673	45	12	0	0	0	0	0	0	673
	Mean				20	2	0	0	0	0	0	0	0	1
	St. deviation				51	7	0	0	0	0	0	0	0	14
	Occurrence				150	16	1	0	0	0	0	0	0	167
	%Occur./land.				43	17	1	0	0	0	0	0	0	3
Tongkol	Maximum				935	23	949	0	0	0	0	0	0	949
	Mean				16	0	76	0	0	0	0	0	0	2
	St. deviation				73	0	185	0	0	0	0	0	0	30
	Occurrence				64	4	20	0	0	0	0	0	0	88
	%Occur./land.				18	4	29	0	0	0	0	0	0	1
Lain-lain	Maximum				622	147	351	0	0	0	0	0	0	622
	Mean				18	12	27	0	0	0	0	0	0	2
	St. deviation				59	20	65	0	0	0	0	0	0	18
	Occurrence				224	58	30	0	0	0	0	0	0	314
	%Occur./land.				65	63	44	0	0	0	0	0	0	6
Jumlah	Minimum				8	7	18	13	11	2	0	8	19	0
	Maximum				1249	1147	1704	2785	3055	8178	3907	3202	4749	8178
	Mean				189	150	531	505	570	610	622	518	603	544
	St. deviation				250	217	456	378	432	507	472	429	541	466
	Landing				341	91	67	595	925	942	973	560	593	5087

Sarang 1993 (Rp * 1000)		MONTH												
		1	2	3	4	5	6	7	8	9	10	11	12	Total
Jumlah	Minimum	7	5	4	4	8	12	27		20	11	7	14	4
	Maximum	3518	3579	3613	2311	2442	1862	9193		7985	5061	2670	4351	9193
	Mean	501	677	345	310	475	416	554		855	736	673	705	582
	St. deviation	455	568	390	315	458	308	560		737	595	495	606	554
	Landing	474	205	779	681	245	299	648		689	1019	841	509	6389

Sarang 1994 (Rp per kg)		MONTH												
		1	2	3	4	5	6	7	8	9	10	11	12	Total
Jumlah	Minimum	2	4	5	7	18	7	11	7					4
	Maximum	3948	3842	3124	7600	4135	3772	6408	5015					7600
	Mean	632	488	363	410	765	742	899	888					627
	St. deviation	480	435	349	487	577	541	797	702					584
	Landing	528	813	498	808	547	578	478	563					4813

Sarang 1995 (Rp * 1000)		MONTH												
		1	2	3	4	5	6	7	8	9	10	11	12	Total
Banyar	Maximum	1419												
	Mean	100												
	St. deviation	173												
	Occurrence	242												
	%Occur./land.	63												
Bentong	Maximum	3780												
	Mean	208												
	St. deviation	385												
	Occurrence	274												
	%Occur./land.	71												
Layang	Maximum	2725												
	Mean	209												
	St. deviation	339												
	Occurrence	246												
	%Occur./land.	64												
Tanjan	Maximum	660												
	Mean	35												
	St. deviation	98												
	Occurrence	112												
	%Occur./land.	29												
Tenggiri	Maximum	100												
	Mean	1												
	St. deviation	8												
	Occurrence	11												
	%Occur./land.	2												
Tongkol	Maximum	3165												
	Mean	79												
	St. deviation	306												
	Occurrence	95												
	%Occur./land.	24												
Campuran	Maximum	0												
	Mean	0												
	St. deviation	0												
	Occurrence	0												
	%Occur./land.	0												
Lain-lain	Maximum	387												
	Mean	22												
	St. deviation	51												
	Occurrence	150												
	%Occur./land.	39												
Jumlah	Minimum	3	12	10	10	13	9	10	22	29	17	9	8	3
	Maximum	3907	2982	4444	4589	2631	1581	2652	4795	9022	7415	3814	9545	9545
	Mean	661	481	402	428	351	336	509	672	699	846	691	800	618
	St. deviation	558	433	414	490	353	268	391	463	606	787	518	670	564
	Landing	382	439	675	415	323	303	666	1010	790	873	812	732	7420

Sarang 1996 (Rp * 1000)		MONTH												
		1	2	3	4	5	6	7	8	9	10	11	12	Total
Jumlah	Minimum	15	12	7	13	20	13	19	14	18	5	10	14	5
	Maximum	2999	3033	5598	4422	3993	6113	3960	3750	5431	6471	4040	4176	6471
	Mean	704	557	805	640	849	564	563	791	757	797	712	1019	724
	St. deviation	521	540	810	654	714	605	533	657	653	728	596	756	664
	Landing	575	266	519	667	461	618	692	534	718	892	518	348	6808

Tasik Agung 1995 (Rp * 1000)		MONTH												
		1	2	3	4	5	6	7	8	9	10	11	12	Total
Banyar	Maximum	1902	1855	1692	1293	3453	910	832	2243	1720	5400	2371	1878	5400
	Mean	168	235	100	172	207	92	67	108	136	153	92	130	133
	St. deviation	258	283	163	206	230	116	107	182	191	291	161	221	206
	Occurrence	205	178	442	726	756	506	415	637	780	634	499	340	6118
	%Occur./land.	80	86	67	82	91	74	64	70	80	77	66	70	76
Bentong	Maximum	1298	570	1522	571	1184	853	1756	729	995	816	1527	1291	1756
	Mean	146	29	52	50	87	66	82	46	64	56	101	90	69
	St. deviation	182	70	104	73	123	103	163	90	110	92	188	142	124
	Occurrence	219	86	345	516	647	424	308	430	551	502	511	343	4882
	%Occur./land.	85	41	52	58	78	62	48	47	56	61	68	70	61
Cumi-cumi	Maximum	0	326	286	1950	720	233	41	82	57	329	110	210	1950
	Mean	0	12	20	10	3	1	0	0	0	5	2	4	4
	St. deviation	0	33	42	73	31	10	0	4	0	29	8	20	32
	Occurrence	0	40	212	103	35	6	4	10	4	29	36	33	512
	%Occur./land.	0	19	32	11	4	0	0	1	0	3	4	6	6
Layang	Maximum	1801	4189	1544	2901	3636	659	3816	4478	9576	7398	4292	4759	9576
	Mean	158	129	33	48	60	19	175	395	525	495	306	439	251
	St. deviation	273	380	116	185	182	66	346	566	817	727	445	485	514
	Occurrence	164	76	147	180	267	111	377	678	792	633	572	415	4412
	%Occur./land.	64	36	22	20	32	16	58	75	81	77	76	85	55
Tanjan	Maximum	1074	2198	1257	6271	1075	1720	2000	8820	3612	954	1167	1751	8820
	Mean	32	327	141	235	56	241	180	176	59	22	32	46	121
	St. deviation	103	443	199	419	108	276	267	408	189	87	103	133	272
	Occurrence	93	142	423	649	425	522	422	540	328	123	213	159	4039
	%Occur./land.	36	68	64	73	51	77	65	59	33	15	28	32	50
Tenggiri	Maximum	0	0	412	616	128	112	0	30	182	390	5546	449	5546
	Mean	0	0	9	6	1	1	0	0	1	3	26	8	5
	St. deviation	0	0	37	38	7	6	0	0	8	24	226	38	72
	Occurrence	0	0	74	74	13	15	0	3	8	25	73	39	324
	%Occur./land.	0	0	11	8	1	2	0	0	0	3	9	8	4
Tongkol	Maximum	999	1106	1042	3098	1101	2412	844	1620	913	3772	1259	2738	3772
	Mean	17	69	9	18	6	19	39	30	11	95	33	70	32
	St. deviation	83	137	53	129	53	117	89	119	51	357	112	211	155
	Occurrence	43	85	65	96	35	83	237	187	113	154	137	149	1384
	%Occur./land.	16	41	9	10	4	12	36	20	11	18	18	30	17
Campuran	Maximum	0	875	684	360	346	674	528	135	275	489	801	1904	1904
	Mean	0	14	28	7	7	4	2	1	3	8	11	96	12
	St. deviation	0	71	80	28	29	33	23	7	23	43	58	247	75
	Occurrence	0	25	157	112	96	48	11	12	37	57	94	169	818
	%Occur./land.	0	12	23	12	11	7	1	1	3	6	12	34	10
Lain-lain	Maximum	658	371	649	2420	237	558	931	1189	1409	1000	3227	905	3227
	Mean	63	13	32	34	13	9	23	18	24	33	91	13	30
	St. deviation	105	48	78	116	27	34	70	65	94	96	199	60	99
	Occurrence	158	47	278	306	262	152	223	218	224	253	503	71	2695
	%Occur./land.	61	22	42	34	31	22	34	24	22	30	67	14	33
Jumlah	Minimum	35	18	6	2	18	6	7	17	14	22	7	26	2
	Maximum	3292	4254	2176	6290	4003	2633	3816	8981	9715	8497	5603	4759	9715
	Mean	584	828	424	580	441	451	568	774	823	863	693	896	657
	St. deviation	477	749	330	553	341	331	434	670	830	792	562	594	612
	Landing	256	206	655	879	822	677	641	901	974	820	747	485	8063

Tasik Agung 1996 (Rp * 1000)		MONTH												
		1	2	3	4	5	6	7	8	9	10	11	12	Total
Banyar	Maximum	3165	3724	4972	1715	2489	4426	2855	1882	1883	2101	2404	4199	4972
	Mean	233	381	321	201	174	266	253	169	151	131	103	220	191
	St. deviation	478	590	520	254	293	401	407	251	241	235	211	477	353
	Occurrence	180	154	352	392	349	449	199	366	393	632	440	384	4290
	%Occur./land.	60	78	81	77	65	79	80	81	68	55	50	59	66
Bentong	Maximum	2345	909	1154	1071	1115	898	2591	1297	1639	1887	1661	3400	3400
	Mean	105	82	100	93	83	103	118	77	92	80	114	131	98
	St. deviation	196	126	148	132	145	156	247	155	180	166	217	278	187
	Occurrence	220	130	288	370	341	343	164	234	283	506	460	354	3693
	%Occur./land.	74	65	66	72	64	60	66	52	49	44	52	55	57
Cumi-cumi	Maximum	630	255	906	714	413	261	102	115	155	286	437	483	906
	Mean	6	9	21	19	14	6	2	0	2	6	23	29	12
	St. deviation	44	35	67	59	38	21	10	0	11	24	53	68	44
	Occurrence	15	16	80	108	92	54	7	4	17	100	203	148	844
	%Occur./land.	5	8	18	21	17	9	2	0	2	8	23	23	13
Layang	Maximum	1877	1083	4940	2102	2101	4092	4305	4824	2882	6456	4153	3989	6456
	Mean	273	119	67	71	139	157	395	531	364	401	309	510	299
	St. deviation	367	206	319	222	276	379	614	646	496	643	515	679	529
	Occurrence	220	93	87	141	248	259	184	366	412	755	560	505	3830
	%Occur./land.	74	47	20	27	46	46	74	81	72	66	64	78	59
Tanjan	Maximum	1000	826	2051	2668	3878	2393	884	944	810	2050	2160	776	3878
	Mean	70	60	211	183	132	116	46	40	21	45	37	31	77
	St. deviation	144	141	349	326	341	274	116	112	83	166	149	79	219
	Occurrence	128	76	270	339	284	252	82	142	101	268	210	193	2345
	%Occur./land.	43	38	62	66	53	44	33	31	17	23	24	30	36
Tenggiri	Maximum	368	196	3821	384	243	80	20	0	138	1903	2508	657	3821
	Mean	3	9	19	7	2	0	0	0	1	7	20	6	7
	St. deviation	27	35	205	33	15	5	0	0	11	63	107	37	74
	Occurrence	8	18	36	45	21	7	3	0	10	69	103	38	358
	%Occur./land.	2	9	8	8	3	1	1	0	1	6	11	5	5
Tongkol	Maximum	1635	239	3925	1031	4106	7853	601	3523	2420	4844	4877	5840	7853
	Mean	26	3	62	8	67	57	14	31	39	114	119	169	76
	St. deviation	137	21	368	71	288	421	71	200	177	464	491	648	391
	Occurrence	29	7	54	21	147	107	18	66	95	168	141	140	993
	%Occur./land.	9	3	12	4	27	19	7	14	16	14	16	21	15
Campuran	Maximum	2769	768	2370	1118	1302	2564	321	3622	3509	2513	3350	1215	3622
	Mean	204	109	68	41	64	54	11	70	39	46	91	25	62
	St. deviation	407	177	230	116	176	197	33	314	185	199	303	101	226
	Occurrence	180	100	140	197	218	163	55	113	126	305	309	187	2093
	%Occur./land.	60	50	32	38	41	28	22	25	22	26	35	29	32
Lain-lain	Maximum	107	383	853	420	117	1800	600	407	2085	2060	1379	172	2085
	Mean	1	5	17	7	1	20	12	3	30	21	10	1	12
	St. deviation	8	33	75	37	10	102	64	23	180	139	79	8	94
	Occurrence	5	7	49	47	18	78	27	31	38	72	52	8	432
	%Occur./land.	1	3	11	9	3	13	10	6	6	6	5	1	6
Jumlah	Minimum	12	23	21	28	39	13	21	11	14	9	10	16	9
	Maximum	5131	3860	5190	3820	4161	7853	6290	4824	4379	7825	5081	6374	7853
	Mean	920	776	885	630	677	779	850	923	755	881	825	1158	845
	St. deviation	774	637	799	493	590	800	840	786	643	836	752	984	779
	Landing	296	197	432	509	529	563	246	449	571	1130	871	643	6436

Annex 4
Ex-vessel prices (in Rp per kg)

Banyutowo 1995 (Rp per kg)		MONTH												
		1	2	3	4	5	6	7	8	9	10	11	12	Total
Banyar	Minimum	935	1000	1089	1391		1677	1407	732	638	771	688	819	638
	Maximum	2231	2654	3545	2533		2900	3375	4050	2143	1959	1810	7413	7413
	Mean	1554	1793	1913	1784		2322	2001	1439	1368	1356	1305	1725	1638
	St. deviation	376	334	503	245		307	452	432	372	209	204	1151	537
	Occurrence	53	40	35	29		25	25	70	43	33	28	28	409
Bentong	Minimum	377	488	520	806		789	0	0	354	0	508	610	354
	Maximum	1438	2000	1280	806		1146	0	0	1406	0	690	6053	6053
	Mean	829	1107	823	0		928	0	0	751	0	625	1121	847
	St. deviation	265	383	287	0		191	0	0	460	0	46	1556	534
	Occurrence	59	18	9	1		3	0	0	4	0	29	12	135
Layang	Minimum	433	556	612	547		621	414	464	421	601	86	634	86
	Maximum	2043	1712	1857	1622		3309	2286	1393	1467	1483	1190	1811	3309
	Mean	1181	1236	1182	1042		1611	862	772	853	824	791	973	942
	St. deviation	325	236	299	211		662	293	150	203	134	129	234	311
	Occurrence	63	47	36	42		27	51	79	107	131	127	53	763
Tanjan	Minimum	352	173	69	141		150	286	95	311	213	189	288	69
	Maximum	611	817	1170	797		377	578	634	553	845	507	507	1170
	Mean	469	519	305	503		234	403	388	424	414	380	405	399
	St. deviation	95	249	216	145		89	82	100	45	92	75	90	117
	Occurrence	5	7	26	18		11	27	78	66	71	43	4	356
Tongkol	Minimum	1120	0	0	1887		0	1048	1080	1700	1301	1196	0	1048
	Maximum	1800	0	0	1900		0	2154	2382	2227	1400	1319	0	2382
	Mean	1414	0	0	1894		0	1385	1777	1964	1351	1259	0	1587
	St. deviation	340	0	0	9		0	235	389	373	70	64	0	376
	Occurrence	5	0	0	2		0	18	26	2	2	4	0	59
Lain-lain	Minimum	296	367	2651	0		4933	0	0	0	0	0	2098	296
	Maximum	5100	4786	9375	0		9364	0	0	0	0	0	2399	9375
	Mean	2580	2454	4042	0		7149	0	0	0	0	0	2249	3203
	St. deviation	1193	1737	1530	0		3133	0	0	0	0	0	213	1748
	Occurrence	26	11	22	0		2	0	0	0	0	0	2	63
Jumlah	Minimum	377	318	148	141		191	400	252	354	213	86	615	86
	Maximum	2974	2698	4433	2533		3309	2069	1275	2071	1959	1810	7413	7413
	Mean	1190	1371	1389	1181		1679	915	720	813	744	748	1156	967
	St. deviation	439	443	845	442		826	345	253	306	275	244	853	529
	Landing	87	54	51	56	0	38	53	90	120	169	151	66	935

Banyutowo 1996 (Rp per kg)		MONTH												
		1	2	3	4	5	6	7	8	9	10	11	12	Total
Banyar	Minimum		1810	1307	1757	1870	575	1404	1500	1068	440	1462	739	440
	Maximum		1810	3891	3529	3814	3063	2455	2857	3550	3902	2778	2615	3902
	Mean		0	2328	2463	2552	2027	1879	2188	1842	1795	2085	1799	2063
	St. deviation		0	571	427	406	577	248	278	409	431	275	424	506
	Occurrence		1	55	48	36	37	38	27	53	104	32	28	459
Bentong	Minimum		482	580	420	286	314	550	578	522	345	541	379	286
	Maximum		4342	1770	2692	2591	1519	3082	1727	1200	1346	2000	1452	4342
	Mean		2412	977	1088	949	886	906	888	804	817	906	738	861
	St. deviation		2729	331	618	618	298	392	252	126	163	231	196	335
	Occurrence		2	19	19	20	29	41	18	73	122	45	57	445
Cumi-cumi	Minimum		0	0	0	0	0	4000	5067	3190	0	0	0	3190
	Maximum		0	0	0	0	0	4000	5833	4650	0	0	0	5833
	Mean		0	0	0	0	0	0	5450	3920	0	0	0	4548
	St. deviation		0	0	0	0	0	0	542	1032	0	0	0	1009
	Occurrence		0	0	0	0	0	1	2	2	0	0	0	5
Layang	Minimum		575	1000	746	733	882	1018	1009	866	623	1061	719	575
	Maximum		2690	5281	2747	3025	2217	2367	2784	1777	2009	2195	2071	5281
	Mean		1725	2085	1583	1788	1568	1468	1519	1264	1179	1458	1361	1430
	St. deviation		744	1254	494	536	381	306	300	187	243	236	269	475
	Occurrence		11	29	53	36	22	61	42	84	141	58	64	601
Tanjan	Minimum		0	100	202	348	286	143	226	150	131	164	132	100
	Maximum		0	1509	586	514	765	643	730	580	909	600	439	1509
	Mean		0	449	387	431	551	477	488	393	361	314	281	396
	St. deviation		0	233	110	117	167	126	153	140	166	125	79	169
	Occurrence		0	30	17	2	7	20	18	15	35	13	30	187
Tenggiri	Minimum		0	0	0	0	0	0	0	0	1400	1800	2333	1400
	Maximum		0	0	0	0	0	0	0	0	5125	3921	4250	5125
	Mean		0	0	0	0	0	0	0	0	3461	2861	3292	3241
	St. deviation		0	0	0	0	0	0	0	0	1894	1500	1356	1396
	Occurrence		0	0	0	0	0	0	0	0	3	2	2	7
Tongkol	Minimum		0	8056	0	1761	1412	0	0	0	1755	1611	1800	1412
	Maximum		0	8056	0	2022	2100	0	0	0	1755	1654	2037	8056
	Mean		0	0	0	1892	1796	0	0	0	0	1633	1914	2233
	St. deviation		0	0	0	185	273	0	0	0	0	30	101	1622
	Occurrence		0	1	0	2	5	0	0	0	1	2	4	15
Campuran	Minimum		0	0	0	0	0	0	0	1136	3389	2452	808	808
	Maximum		0	0	0	0	0	0	0	2827	5813	5147	3825	5813
	Mean		0	0	0	0	0	0	0	2196	4493	3833	2317	3901
	St. deviation		0	0	0	0	0	0	0	923	545	761	2133	1104
	Occurrence		0	0	0	0	0	0	0	3	15	9	2	29
Lain-lain	Minimum		0	812	292	954	1031	0	0	0	143	1912	145	143
	Maximum		0	7500	5125	4500	4875	0	0	0	5000	5714	5625	7500
	Mean		0	3486	2195	3162	3311	0	0	0	2000	3587	2768	2882
	St. deviation		0	1496	1589	1084	1610	0	0	0	1639	862	1624	1548
	Occurrence		0	26	23	17	10	0	0	0	19	14	18	127
Jumlah	Minimum		575	366	202	733	792	555	931	619	462	425	267	202
	Maximum		3038	4630	2887	4097	3500	2107	2607	2346	4504	4370	2087	4630
	Mean		1853	1814	1596	2072	1509	1269	1496	1182	1138	1465	1155	1407
	St. deviation		867	772	609	664	489	318	357	304	443	578	398	581
	Landing		11	70	68	53	47	66	44	102	162	70	73	766

Batang 1995 (Rp per kg)		MONTH												
		1	2	3	4	5	6	7	8	9	10	11	12	Total
Banyar	Minimum	699	597	470	500	225	700	996	900	1471	1297	1296	1500	225
	Maximum	1500	1097	1345	1284	951	1201	1600	1305	2000	1732	1714	1708	2000
	Mean	966	754	820	814	808	1036	1231	1180	1644	1506	1491	1610	1009
	St. deviation	462	131	82	70	53	151	154	67	142	189	176	95	310
	Occurrence	3	53	296	535	457	227	46	129	108	176	107	32	2169
Bentong	Minimum	442	491	230	389	418	295	334	372	450	768	1079	1193	230
	Maximum	8854	851	804	1248	744	902	774	5364	920	1204	1201	1200	8854
	Mean	1794	590	638	615	588	623	585	693	699	1191	1197	1198	668
	St. deviation	3116	87	86	75	52	83	110	530	178	55	18	3	289
	Occurrence	7	35	277	617	286	131	34	87	83	70	43	7	1677
Layang	Minimum	818	660	591	350	697	699	898	897	1198	599	117	900	117
	Maximum	1500	1099	852	830	759	908	1200	908	1511	964	9066	1017	9066
	Mean	1013	760	702	701	702	820	935	902	1245	901	970	907	775
	St. deviation	281	72	19	19	4	94	89	2	109	28	790	23	228
	Occurrence	5	56	375	511	324	181	29	83	54	131	108	26	1883
Tanjan	Minimum	450	422	118	99	100	113	115	108	113	202	243	281	99
	Maximum	511	700	703	721	605	584	480	500	505	842	979	822	979
	Mean	468	515	488	411	391	374	315	375	320	585	603	531	455
	St. deviation	29	43	84	75	82	98	121	91	100	133	143	134	129
	Occurrence	4	49	292	368	247	109	13	58	93	201	117	38	1589
Tongkol	Minimum	0	0	898	900	0	1500	0	1602	0	0	2123	0	898
	Maximum	0	0	2700	3056	0	1505	0	1655	0	0	2123	0	3056
	Mean	0	0	1220	1801	0	1501	0	1636	0	0	2123	0	1455
	St. deviation	0	0	436	1090	0	2	0	29	0	0	0	0	480
	Occurrence	0	0	16	5	0	18	0	3	0	0	1	0	43
Lain-lain	Minimum	522	706	115	700	932	1022	2590	899	903	3444	0	0	115
	Maximum	1462	2391	7857	5287	3280	3634	2590	2238	904	3444	0	0	7857
	Mean	995	1175	1209	1456	1468	1358	0	1321	904	0	0	0	1360
	St. deviation	470	412	858	708	579	599	0	572	1	0	0	0	752
	Occurrence	3	14	165	231	46	19	1	5	3	1	0	0	488
Jumlah	Minimum	500	491	115	203	293	500	241	500	398	500	343	429	115
	Maximum	1185	816	2700	1381	1302	914	1600	1007	1480	1598	9066	1017	9066
	Mean	695	696	694	693	701	828	886	886	869	897	931	861	760
	St. deviation	57	43	114	55	47	101	150	81	125	63	551	129	178
	Landing	154	80	592	991	703	382	56	192	179	310	227	58	3924

Eretan Wetan 1995 (Rp per kg)		MONTH												
		1	2	3	4	5	6	7	8	9	10	11	12	Total
Banyar	Minimum	567	1000	950	800	100	425	885	815	590	275	548	2400	100
	Maximum	3550	3742	3450	9200	5000	4008	5850	4250	6644	6450	4300	3400	9200
	Mean	1816	2308	2566	3156	2589	2354	2802	2789	2248	1862	2104	2817	2443
	St. deviation	834	811	721	1301	913	750	929	852	982	970	846	520	1008
	Occurrence	27	10	10	53	117	57	60	44	93	63	47	3	584
Bentong	Minimum	774	650	1550	475	700	900	540	519	389	248	272	1168	248
	Maximum	4750	2488	3220	4900	6200	3567	4000	3600	2925	3400	2888	2067	6200
	Mean	1568	1438	2274	2493	2209	2092	2318	1989	1533	1273	1540	1618	1894
	St. deviation	803	859	431	731	822	621	712	924	624	630	710	636	819
	Occurrence	25	4	13	46	69	36	35	25	65	44	49	2	413
Layang	Minimum	736	194	1520	1650	1000	1011	580	491	137	290	249	1450	137
	Maximum	2252	3231	2092	2711	3083	7233	3188	3455	8200	2541	3315	2057	8200
	Mean	1159	1608	1806	2283	2221	2540	1528	1457	1086	817	1134	1754	1337
	St. deviation	316	987	404	349	624	1366	816	821	1070	406	582	429	917
	Occurrence	28	6	2	8	18	17	13	19	54	49	40	2	256
Tanjan	Minimum	283	370	243	17	106	295	160	467	34	123	220	1091	17
	Maximum	2040	6900	688	2875	2800	3185	3887	1733	2300	5286	1850	1575	6900
	Mean	925	1691	376	502	541	690	1014	1039	588	647	559	1285	669
	St. deviation	437	2088	123	448	448	445	590	270	309	780	360	256	576
	Occurrence	15	9	16	68	93	45	38	33	89	57	41	3	507
Tongkol	Minimum	2090	0	0	0	1000	3175	1750	3700	2294	2650	1410	0	1000
	Maximum	3733	0	0	0	3425	4000	3511	3700	5800	2650	1817	0	5800
	Mean	2912	0	0	0	2219	3588	2554	0	3681	0	1614	0	2705
	St. deviation	1162	0	0	0	796	583	891	0	1864	0	288	0	1089
	Occurrence	2	0	0	0	7	2	3	1	3	1	2	0	21
Lain-lain	Minimum	177	733	419	112	35	243	317	395	83	125	111	2800	35
	Maximum	3067	6971	6387	7000	8000	6800	11200	9836	8542	13000	7800	2800	13000
	Mean	1045	2717	2139	1974	2400	2269	2083	2312	1666	2307	1659	0	2061
	St. deviation	591	2656	1570	1322	1716	1607	1999	2025	1853	2097	1572	0	1742
	Occurrence	27	5	18	86	136	57	45	45	82	56	55	1	613
Jumlah	Minimum	580	427	284	32	125	362	372	467	74	125	285	1163	32
	Maximum	2083	4143	2343	4231	5188	5300	5850	9836	3103	7263	6228	1631	9836
	Mean	1258	1801	916	1353	1859	1644	1878	2005	980	1301	1277	1425	1505
	St. deviation	334	1009	531	876	1132	953	918	1712	500	1153	909	239	1058
	Landing	32	14	19	93	163	69	68	54	102	100	71	3	788

Eretan Wetan 1996 (Rp per kg)		MONTH												
		1	2	3	4	5	6	7	8	9	10	11	12	Total
Banyar	Minimum	3500	0	2400	1525									1525
	Maximum	5900	0	5290	27000									27000
	Mean	4467	0	4096	4439									4371
	St. deviation	1266	0	981	4936									4156
	Occurrence	3	0	7	24									34
Bentong	Minimum	1636	3800	2417	750									750
	Maximum	2825	3800	4400	3967									4400
	Mean	2151	0	3472	2630									2754
	St. deviation	496	0	705	931									920
	Occurrence	4	1	5	18									28
Layang	Minimum	2139	0	0	3300									2139
	Maximum	3513	0	0	3300									3513
	Mean	2981	0	0	0									3044
	St. deviation	631	0	0	0									565
	Occurrence	4	0	0	1									5
Tanjan	Minimum	829	764	633	300									300
	Maximum	1050	764	1719	2700									2700
	Mean	969	0	1111	624									703
	St. deviation	99	0	548	413									429
	Occurrence	4	1	4	35									44
Tongkol	Minimum	0	0	3150	0									3150
	Maximum	0	0	3150	0									3150
	Mean	0	0	0	0									3150
	St. deviation	0	0	0	0									0
	Occurrence	0	0	1	0									1
Lain-lain	Minimum	1419	3000	400	369									369
	Maximum	8571	3000	8900	13571									13571
	Mean	3902	0	4783	2848									3280
	St. deviation	3226	0	2553	2500									2594
	Occurrence	4	1	8	33									46
Jumlah	Minimum	1067	1870	1827	324									324
	Maximum	3160	1870	5022	6400									6400
	Mean	2176	0	3388	1652									1969
	St. deviation	707	0	1087	1492									1487
	Occurrence	6	1	9	44									60

Kranji 1995 (Rp per kg)		MONTH												
		1	2	3	4	5	6	7	8	9	10	11	12	Total
Jumlah	Minimum	180	200	300	353	200	150	150	100	150	84	79	150	79
	Maximum	2000	760	1150	2000	2000	1000	1000	1000	3750	3600	2000	2000	3750
	Mean	814	487	724	1289	1216	444	231	228	412	517	771	885	578
	St. deviation	385	280	334	452	541	418	154	131	544	413	436	257	477
	Landing	34	3	8	14	35	6	77	92	129	216	134	89	837

Pekalongan 1995 (Rp per kg)		MONTH												
		1	2	3	4	5	6	7	8	9	10	11	12	Total
Banyar	Minimum	545	493	393	625	915	300	1200	1054	900	133	500	969	133
	Maximum	2132	2333	3600	3643	3773	3633	2375	2625	3469	2500	2833	2409	3773
	Mean	1513	1134	1440	1916	1831	1896	1866	2023	2375	1743	1699	1634	1772
	St. deviation	423	467	361	417	336	338	510	533	716	473	666	437	490
	Occurrence	48	34	282	322	191	214	4	18	75	144	19	9	1360
Bentong	Minimum	233	833	375	52	357	308	300	1048	500	300	311	1333	52
	Maximum	2800	2680	3943	5143	2600	2938	2250	2200	2450	2391	1720	1500	5143
	Mean	1115	1371	1395	1620	1553	1560	1050	1578	1565	1098	1222	1431	1444
	St. deviation	364	449	444	543	347	366	1050	356	510	418	366	72	474
	Occurrence	68	27	189	220	161	138	3	27	100	110	67	4	1114
Cumi-cumi	Minimum	0	0	873	0	0	0	0	0	0	3643	533	4273	533
	Maximum	0	0	4300	0	0	0	0	0	0	5000	5222	4273	5222
	Mean	0	0	3325	0	0	0	0	0	0	4252	2977	0	3499
	St. deviation	0	0	585	0	0	0	0	0	0	361	1808	0	893
	Occurrence	0	0	41	0	0	0	0	0	0	14	8	1	64
Layang	Minimum	200	767	250	0	308	600	0	0	0	693	0	1267	200
	Maximum	1456	1667	759	0	600	1600	0	0	0	1735	0	1282	1735
	Mean	877	1018	624	0	454	1150	0	0	0	1076	0	1275	907
	St. deviation	397	373	249	0	206	443	0	0	0	573	0	11	405
	Occurrence	24	5	4	0	2	4	0	0	0	3	0	2	44
Tanjan	Minimum	67	67	56	57	73	68	200	69	48	42	42	444	42
	Maximum	500	800	4353	1250	699	894	505	818	538	533	1816	2127	4353
	Mean	154	234	253	200	148	291	383	250	204	166	139	956	209
	St. deviation	89	199	258	113	58	146	109	126	114	111	192	795	169
	Occurrence	37	16	313	429	213	166	6	54	147	196	85	4	1666
Tenggiri	Minimum	2000	1300	1000	1000	1400	1000	1833	577	800	667	2667	3529	577
	Maximum	5750	10000	7000	10000	6500	7250	4667	5700	7333	6333	6500	6429	10000
	Mean	4028	4504	3688	3470	3753	4039	3250	2967	4452	3648	4041	5426	3709
	St. deviation	1089	2042	946	897	961	1236	2004	2394	1579	929	818	1644	1046
	Occurrence	34	16	229	307	71	27	2	4	45	168	54	3	960
Tongkol	Minimum	673	2290	568	625	365	1238	1300	1187	438	600	882	1044	365
	Maximum	2857	9000	3500	4452	3750	3866	1300	2400	3000	3064	3625	2283	9000
	Mean	1318	4541	2137	2227	2200	2623	0	1929	1891	1730	2084	1867	2073
	St. deviation	447	3862	492	812	678	563	0	528	708	482	673	418	761
	Occurrence	23	3	69	60	21	63	1	6	29	96	29	7	407
Campuran	Minimum	105	48	67	33	58	78	700	244	56	89	17	188	17
	Maximum	4583	4228	8000	5364	5800	6455	850	1818	4258	5333	5444	188	8000
	Mean	968	812	1290	1765	1666	2510	775	833	906	1508	1024	0	1551
	St. deviation	1033	817	1128	1256	1235	1326	106	243	565	1099	1181	0	1228
	Occurrence	39	31	339	441	141	165	2	64	79	180	50	1	1532
Lain-lain	Minimum	480	1040	250	117	250	167	700	1063	144	202	220	0	117
	Maximum	3810	7688	8615	8261	5625	2000	987	5500	5417	5800	1933	0	8615
	Mean	2560	3853	2393	2080	1980	928	844	3478	1995	861	531	0	2045
	St. deviation	1274	2163	1427	1523	1528	403	203	1715	1719	1015	579	0	1548
	Occurrence	16	8	168	287	64	16	2	14	45	61	8	0	689
Jumlah	Minimum	154	215	122	111	83	103	376	220	103	133	113	200	83
	Maximum	3886	4063	3722	3974	2713	4473	1135	2800	3236	3581	3353	2263	4473
	Mean	1234	1260	1038	1068	726	1249	702	727	841	1133	851	1609	1022
	St. deviation	671	640	607	800	644	903	332	383	727	656	689	659	735
	Landing	79	49	393	538	247	240	6	81	162	218	96	10	2119

Pekalongan 1996 (Rp per kg)		MONTH 1	2	3	4	5	6	7	8	9	10	11	12	Total
Banyar	Minimum	2692	808	1222	457	711	769							457
	Maximum	2692	2950	4273	5463	3933	4000							5463
	Mean	0	1806	2286	2359	1970	1752							2081
	St. deviation	0	706	444	605	456	526							567
	Occurrence	1	8	93	330	444	184							1060
Bentong	Minimum	1500	1346	430	341	500	317							317
	Maximum	2319	2500	4455	3500	2849	3556							4455
	Mean	2006	1948	1883	1980	1588	1476							1783
	St. deviation	443	425	607	481	431	561							536
	Occurrence	3	8	102	297	218	92							720
Cumi-cumi	Minimum	5000	2333	0	367	1667	1000							367
	Maximum	5000	4000	0	7206	4429	8125							8125
	Mean	0	3313	0	3349	3316	3371							3358
	St. deviation	0	672	0	767	801	1081							866
	Occurrence	1	6	0	169	17	74							267
Tanjan	Minimum	200	300	100	152	129	147							100
	Maximum	500	778	1700	1143	1000	975							1700
	Mean	350	464	483	404	331	431							395
	St. deviation	212	213	184	132	107	140							144
	Occurrence	2	4	137	378	344	167							1032
Tenggiri	Minimum	4444	5000	1111	800	1000	1300							800
	Maximum	4444	7250	8889	7667	7000	5781							8889
	Mean	0	6125	4834	4177	4542	3697							4386
	St. deviation	0	1591	949	885	1085	1129							1010
	Occurrence	1	2	113	320	183	23							642
Tongkol	Minimum	1844	1364	1250	467	654	400							400
	Maximum	1844	2857	4336	4429	3545	4375							4429
	Mean	1844	2129	2707	2534	2440	2451							2496
	St. deviation	0	639	716	601	461	627							577
	Occurrence	1	4	33	158	138	75							409
Campuran	Minimum	810	667	106	128	119	190							106
	Maximum	2238	4800	5583	6500	7500	6000							7500
	Mean	1524	2734	2052	1637	2081	1078							1816
	St. deviation	1010	2922	1487	1297	1935	823							1585
	Occurrence	2	2	160	383	356	88							991
Lain-lain	Minimum	0	3533	167	300	265	143							143
	Maximum	0	3533	4714	8000	5250	2833							8000
	Mean	0	0	2492	1924	1732	923							1904
	St. deviation	0	0	1239	1288	1239	494							1279
	Occurrence	0	1	137	216	287	38							679
Jumlah	Minimum	1511	860	506	193	223	161							161
	Maximum	3011	2633	4788	5900	5814	3374							5900
	Mean	2271	1842	1885	1546	1464	1248							1510
	St. deviation	750	520	856	805	905	624							838
	Landing	3	8	176	490	515	251							1443

Sarang 1992 (Rp per kg)		MONTH												
		1	2	3	4	5	6	7	8	9	10	11	12	Total
Jumlah	Minimum				42	330	333	119	59	30	54	78	67	54
	Maximum				3599	1595	1739	1857	3694	6414	2976	5345	3796	6414
	Mean				615	681	720	658	545	511	596	627	786	608
	St. deviation				360	227	262	192	204	271	240	356	272	276
	Landing				341	91	67	595	925	942	973	560	593	5087

Sarang 1993 (Rp per kg)		MONTH												
		1	2	3	4	5	6	7	8	9	10	11	12	Total
Jumlah	Minimum	164	305	31	139	249	226	100		29	73	41	113	29
	Maximum	7240	1771	9622	2458	2194	9874	5179		6086	5885	4994	3569	9874
	Mean	782	986	660	638	921	790	733		705	630	567	824	702
	St. deviation	486	314	479	317	365	641	291		371	390	314	320	403
	Landing	474	205	779	681	245	299	648	0	689	1019	841	509	6389

Sarang 1994 (Rp per kg)		MONTH												
		1	2	3	4	5	6	7	8	9	10	11	12	Total
Jumlah	Minimum	61	58	89	155	66	99	40	133					40
	Maximum	9571	3000	3613	12875	5906	8953	18050	3327					18050
	Mean	833	622	636	675	1166	832	1101	810					812
	St. deviation	548	412	414	678	512	549	939	336					599
	Landing	528	813	498	808	547	578	478	563					4813

Sarang 1995 (Rp per kg)		MONTH												
		1	2	3	4	5	6	7	8	9	10	11	12	Total
Jumlah	Minimum	99	56	69	30	79	144	74	75	128	43	57	102	30
	Maximum	4404	1931	3389	2350	2719	2821	3130	7489	10308	7815	3821	12778	12778
	Mean	938	779	581	492	836	641	734	601	696	818	701	1070	738
	St. deviation	428	370	433	412	560	493	414	376	510	610	418	629	505
	Landing	382	439	675	415	323	303	666	1010	790	873	812	732	7420

Sarang 1996 (Rp per kg)		MONTH												
		1	2	3	4	5	6	7	8	9	10	11	12	Total
Jumlah	Minimum	218	242	227	128	122	126	376	330	294	108	250	278	108
	Maximum	5273	3440	9203	6111	4955	2547	7325	1141	3338	6604	8541	3762	1141
	Mean	1524	846	1178	1249	968	940	888	941	826	834	1067	1176	1027
	St. deviation	896	457	719	581	502	307	403	539	267	451	479	398	561
	Landing	575	266	519	667	461	618	692	534	718	892	518	348	6808

Tasik Agung 1995 (Rp per kg)		MONTH												
		1	2	3	4	5	6	7	8	9	10	11	12	Total
Banyar	Minimum	350	459	500	143	200	500	505	125	217	42	7	503	7
	Maximum	2600	2000	2533	3346	4306	3743	2571	6000	4000	90000	4000	5020	90000
	Mean	1280	1340	1214	1425	1737	1531	1431	1661	1283	1507	1547	1843	1498
	St. deviation	296	267	301	494	603	504	355	543	472	3566	654	577	1255
	Occurrence	205	178	442	726	756	506	415	637	780	634	499	340	6118
Bentong	Minimum	211	364	90	170	397	500	500	146	82	179	140	154	82
	Maximum	2648	1200	3000	3273	5481	5331	2000	2167	2714	7769	12000	3529	12000
	Mean	782	831	986	1059	1231	1095	840	688	691	640	847	1188	919
	St. deviation	343	131	337	410	520	447	263	329	326	472	864	528	524
	Occurrence	219	86	345	516	647	424	308	430	551	502	511	343	4882
Cumi-cumi	Minimum	0	500	1000	300	615	2505	2733	2600	2100	1600	300	1429	300
	Maximum	0	2667	6000	4391	3380	2692	4000	4100	2591	7000	6000	6500	7000
	Mean	0	2009	2579	2391	2420	2593	3183	3112	2348	3516	2977	3275	2625
	St. deviation	0	578	802	433	372	65	559	453	235	1216	1065	1176	850
	Occurrence	0	40	212	103	35	6	4	10	4	29	36	33	512
Layang	Minimum	263	800	300	636	399	794	500	130	122	100	170	600	100
	Maximum	2125	2000	3000	4857	5000	3000	2000	2545	3000	2000	3400	2253	5000
	Mean	1009	1418	1332	1713	1741	1661	1248	918	846	852	1048	1343	1108
	St. deviation	311	220	523	590	538	416	420	446	345	395	388	276	500
	Occurrence	164	76	147	180	267	111	377	678	792	633	572	415	4412
Tanjan	Minimum	31	398	100	20	46	40	199	86	51	198	60	275	20
	Maximum	1000	1455	3000	2667	2000	975	714	1900	1700	1000	1380	3273	3273
	Mean	397	614	324	400	384	486	514	402	421	382	406	620	431
	St. deviation	143	140	190	236	195	113	87	142	162	151	194	309	192
	Occurrence	93	142	423	649	425	522	422	540	328	123	213	159	4039
Tenggiri	Minimum	0	0	789	500	1375	1500	0	2000	1802	1000	1000	1500	500
	Maximum	0	0	7000	4000	2000	4000	0	3800	5625	7000	7000	6692	7000
	Mean	0	0	2997	1665	1647	1884	0	3017	3479	3305	3313	2927	2686
	St. deviation	0	0	1209	528	204	608	0	922	1371	1257	882	1367	1202
	Occurrence	0	0	74	74	13	15	0	3	8	25	73	39	324
Tongkol	Minimum	529	167	200	148	1000	692	1000	398	1000	400	600	700	148
	Maximum	6000	2094	5000	7000	6000	5000	3000	4000	5000	4885	3750	3667	7000
	Mean	1635	1549	1772	1792	2533	2262	1862	2039	2178	1397	1668	1908	1851
	St. deviation	903	313	793	797	856	703	459	641	730	536	458	463	656
	Occurrence	43	85	65	96	35	83	237	187	113	154	137	149	1384
Campuran	Minimum	0	500	200	387	500	391	400	336	238	200	261	400	200
	Maximum	0	2000	6000	15333	8000	4000	3000	4000	5909	5000	9600	5900	15333
	Mean	0	1424	2467	1591	1730	1337	1156	1412	2532	2050	2051	2636	2090
	St. deviation	0	450	1125	1490	1050	784	812	1010	1381	1364	1574	1374	1353
	Occurrence	0	25	157	112	96	48	11	12	37	57	94	169	818
Lain-lain	Minimum	141	400	26	120	104	60	300	120	133	120	73	277	26
	Maximum	6444	2295	5000	4733	10000	10000	7000	4897	6000	8429	32538	7000	32538
	Mean	1687	771	1062	1095	1666	1190	801	964	1092	1641	1449	1209	1267
	St. deviation	1224	298	842	833	1269	960	648	865	1050	1558	1970	1216	1307
	Occurrence	158	47	278	306	262	152	223	218	224	253	503	71	2695
Jumlah	Minimum	342	403	142	123	80	40	242	222	247	200	136	400	40
	Maximum	2467	2600	5000	3220	4000	3767	7000	2702	2771	5000	7000	4563	7000
	Mean	950	979	900	871	1217	828	846	784	827	939	1063	1451	953
	St. deviation	319	338	664	525	516	414	404	385	317	492	654	570	520
	Landing	256	206	655	879	822	677	641	901	974	820	747	485	8063

Tasik Agung 1996 (Rp per kg)		MONTH												
		1	2	3	4	5	6	7	8	9	10	11	12	Total
Banyar	Minimum	898	200	324	410	477	393	275	450	212	148	260	200	148
	Maximum	4600	4700	7000	4000	4375	5217	4267	3168	4083	4952	6000	7647	7647
	Mean	2626	2271	2259	2358	1936	1814	1496	1520	1242	1813	2091	2069	1919
	St. deviation	739	678	707	663	704	630	528	486	492	619	777	814	748
	Occurrence	180	154	352	392	349	449	199	366	393	632	440	384	4290
Bentong	Minimum	500	429	311	320	261	221	90	343	265	102	180	10	10
	Maximum	6750	4417	5000	4000	3625	8125	4440	4900	2500	4280	6881	3900	8125
	Mean	1420	1300	1432	1609	1225	1383	1040	1124	922	1122	1243	1256	1262
	St. deviation	595	680	568	555	522	763	589	494	333	509	588	521	590
	Occurrence	220	130	288	370	341	343	164	234	283	506	460	354	3693
Cumi-cumi	Minimum	1750	2529	530	300	1200	800	2400	3133	1000	850	400	1000	300
	Maximum	5000	6026	9625	6300	6400	8700	5286	5750	5400	8000	7500	7250	9625
	Mean	3325	4097	3425	3075	2874	3108	3290	4616	3105	3178	3064	3034	3124
	St. deviation	978	1064	1225	986	686	1678	1106	1133	1444	1211	1143	916	1123
	Occurrence	15	16	80	108	92	54	7	4	17	100	203	148	844
Layang	Minimum	500	667	400	596	205	367	183	404	154	160	160	357	154
	Maximum	4702	3700	4267	3400	4958	8500	2985	2600	4250	4782	6123	4108	8500
	Mean	1956	2084	1887	1959	1768	1803	1260	1341	1135	1174	1332	1529	1453
	St. deviation	481	601	789	581	634	805	500	358	420	435	501	470	591
	Occurrence	220	93	87	141	248	259	184	366	412	755	560	505	3830
Tanjan	Minimum	160	224	40	40	69	78	200	150	50	20	119	140	20
	Maximum	1100	1533	1619	2821	1713	3328	2510	3550	2375	5692	5750	5000	5750
	Mean	621	523	552	563	530	706	636	695	577	604	627	571	597
	St. deviation	163	230	194	310	174	397	414	528	373	635	677	470	423
	Occurrence	128	76	270	339	284	252	82	142	101	268	210	193	2345
Tenggiri	Minimum	1600	1701	1000	500	700	1000	1600	0	3000	1000	578	731	500
	Maximum	8500	6385	8000	7000	5800	6375	2000	0	5882	7500	12000	6133	12000
	Mean	4337	3851	3706	3165	2707	2800	1867	0	4287	3959	4118	3052	3682
	St. deviation	2280	1648	1237	1470	1589	1869	231	0	990	1627	1747	1414	1650
	Occurrence	8	18	36	45	21	7	3	0	10	69	103	38	358
Tongkol	Minimum	1591	1897	912	1707	900	258	489	531	751	387	618	237	237
	Maximum	5000	3133	3685	3900	6000	4800	3611	4118	5577	6429	5833	4429	6429
	Mean	2867	2315	2317	2576	2081	2514	1839	2215	1864	2095	2003	2036	2144
	St. deviation	943	450	607	694	914	979	717	738	693	934	682	571	825
	Occurrence	29	7	54	21	147	107	18	66	95	168	141	140	993
Campuran	Minimum	200	400	200	255	205	139	125	80	47	80	35	33	33
	Maximum	6700	6296	8000	6333	7600	9286	4600	6222	7750	9000	12467	9200	1246
	Mean	2909	2617	2198	1694	2161	2600	1294	1758	2207	1773	2796	1217	2150
	St. deviation	1402	1336	1573	1200	1554	1886	950	1783	2058	1741	2292	1186	1773
	Occurrence	180	100	140	197	218	163	55	113	126	305	305	187	2089
Lain-lain	Minimum	1000	1067	333	400	300	469	170	67	300	80	363	270	67
	Maximum	3690	6154	4917	4583	5000	7471	17000	3300	4076	3517	6509	5056	17000
	Mean	2698	3325	1643	1499	1562	1117	1435	818	1284	1339	1351	1379	1374
	St. deviation	1091	1891	1238	978	1201	1091	3168	613	715	743	979	1660	1286
	Occurrence	5	7	49	47	18	78	27	31	38	72	52	7	431
Jumlah	Minimum	551	248	357	157	198	272	320	386	125	66	266	371	66
	Maximum	5000	6072	4658	6333	5367	5840	3004	6000	6000	7425	6541	3667	7425
	Mean	1949	1874	1467	1350	1406	1452	1186	1335	1176	1273	1657	1497	1435
	St. deviation	765	933	777	649	636	644	422	568	643	651	886	492	712
	Landing	296	197	432	509	529	563	246	449	571	1130	871	643	6436

The dynamic of the Javanese coastal seiners fleet according to the 1995 censuses

Jung A.[1] and Ecoutin J.M.[2]

Abstract: In 1995, three censuses were carried out to assess the importance of the coastal seiners fleet of the North coast of the Java Island. According to these three censuses (March, June and November), the number of coastal seiners varies from 1,580 to 1,660. The spatial distribution of the fishing units is characterised by an increasing gradient from the West to the East of the Java Island.
During each census, some technical characteristics were recorded. Inside this fleet, two main opposites are described: the first depends on the level of the technical characterisation (type of the fishing aggregating device, differentiated holds); the second is linked to the ability to migrate along the North coast of the Java Island (shape of boat, motorization). So, a first image of the dynamic of this fleet is outlined thanks to the different results.

Keywords: census, purse seine, fleet dynamic, Java Sea, Indonesia.

The living aquatic resources of the Java Sea whether they are demersal or pelagic fishes, are exploited by many inshore or deep sea fishing fleets. The Pelfish Project[3] (Durand and Widodo, 1997) dealt with the study of the pelagic stocks of the Java Sea. These last ones are exploited by various fishing fleets from numerous ports located mainly on the Java Island (fig. 1).

More particularly, this stock of pelagic fishes is widely exploited by fishing fleets using the encircling purse seine[4]. An assessment of the exploitation of pelagic species of the Java Sea was made by Potier and Nurhakim (1995), Pelfish (1996), Roch *et al.* (1998), Potier (1998), and Sadhotomo (1998). The different synthesis lay out the results of the study carried out between 1990 and 1995.

[1] Address: IRD-HEA, PO 5045, 34032 Montpellier Cedex 1, France.
[2] Address: IRD-HEA, PO 5045, 34032 Montpellier Cedex 1, France.
[3] Java Sea Pelagic Fishery Assessment Project.
[4] Although, according to Potier and Sadhotomo (1995), it would be better to use the term ring net, the expression purse seine is used here to agree with the Indonesian terminology.

Part of the fleets is formed by small coastal seiners. This fleet is described by Potier and Boely (1990) as composed of 10 to 15-meter-long boats that are mainly equipped with out-board motors and which use a 300-meter-long (maximum) seine.

Along the year, mini seiners present intense fishing activity. In 1995, fishing operations last between 330 and 340 days (Ecoutin and Dharmadi, 1999). According to the ports of registration, dynamics of the activity can be different. Such differences can be explained either by the physical configuration specific to each port or by the social behaviour of the units related to the owners (Ecoutin and Dharmadi, 1999).

This global approach gives a lot of information on the dynamic of the fleet that is being studied. However it does not allow the estimation of the necessary parameters for the evaluation of the whole contribution of this fleet to the fishing production of the Java Sea. An estimation of the fishing effort that may be expressed in a number of tides per time unit is necessary to get an indication of the global contribution.

To estimate the fishing effort, the first step is to assess the importance of the fleet, which is concerned. Therefore different censuses of fishing units were regularly carried out during the two-year study. The first one, carried out in October 1994 (Ecoutin *et al.,* 1997) allowed a better characterisation of the fleet. The next three were carried out in 1995 on the whole North coast of the Java Island from the city of Labuhan (West Java province) in the Sunda Strait, to Madura Island (East Java province) on the one hand, and the city of Situbondo (East Java) in the Strait of Bali on the other hand (fig. 1). They provided the basic indications to estimate the importance of the fleet.

The global analysis of this publication is to link the evolution of the fleet (through its technical description) with, on the one hand the observation location of the fishing units and on the other hand the location of origin of the same fishing units. This will give the ability to establish some spatial heterogeneousness within the fleet, that Wijopriono *et al.* (1996) have already noted down.

Most of the results are taken out the chapter 4 of the Master of Science work (D.E.S.S.) presented by Jung (1998).

Material and methods

To characterise the mini seiner fleet of the North coast of the Java Island, the questionnaire, used exhaustively in all the villages involved, takes up the one that was used for the first census conducted in November 1994 (Ecoutin *et al.,* 1997).

This questionnaire describes all the units of mini seiners that were observed on the investigation place the day of the investigation. The boats, observed visually at the investigation spot, are numbered and, if possible, each unit is described. Seven informations are recorded: the name of the boat or its registration number, its shape, the province and the port of origin, the type of lights used to attract the fish, the number and type of engines visible onboard, the methods used to preserve the fish onboard. Most of the information is registered visually and directly by the investigator. The information regarding the province and the port of origin of the unit is collected by interview of the people met on the spot.

During the first census, in November 1994, the presence of a capstan was noted as well as its position on the boat (Ecoutin *et al.,* 1997). The analysis of this census shows that a capstan placed on the deck "first third at starboard" is a recognition criterion of a mini seiner

unit. Therefore the description of this parameter was not mentioned any more in the 1995 censuses.

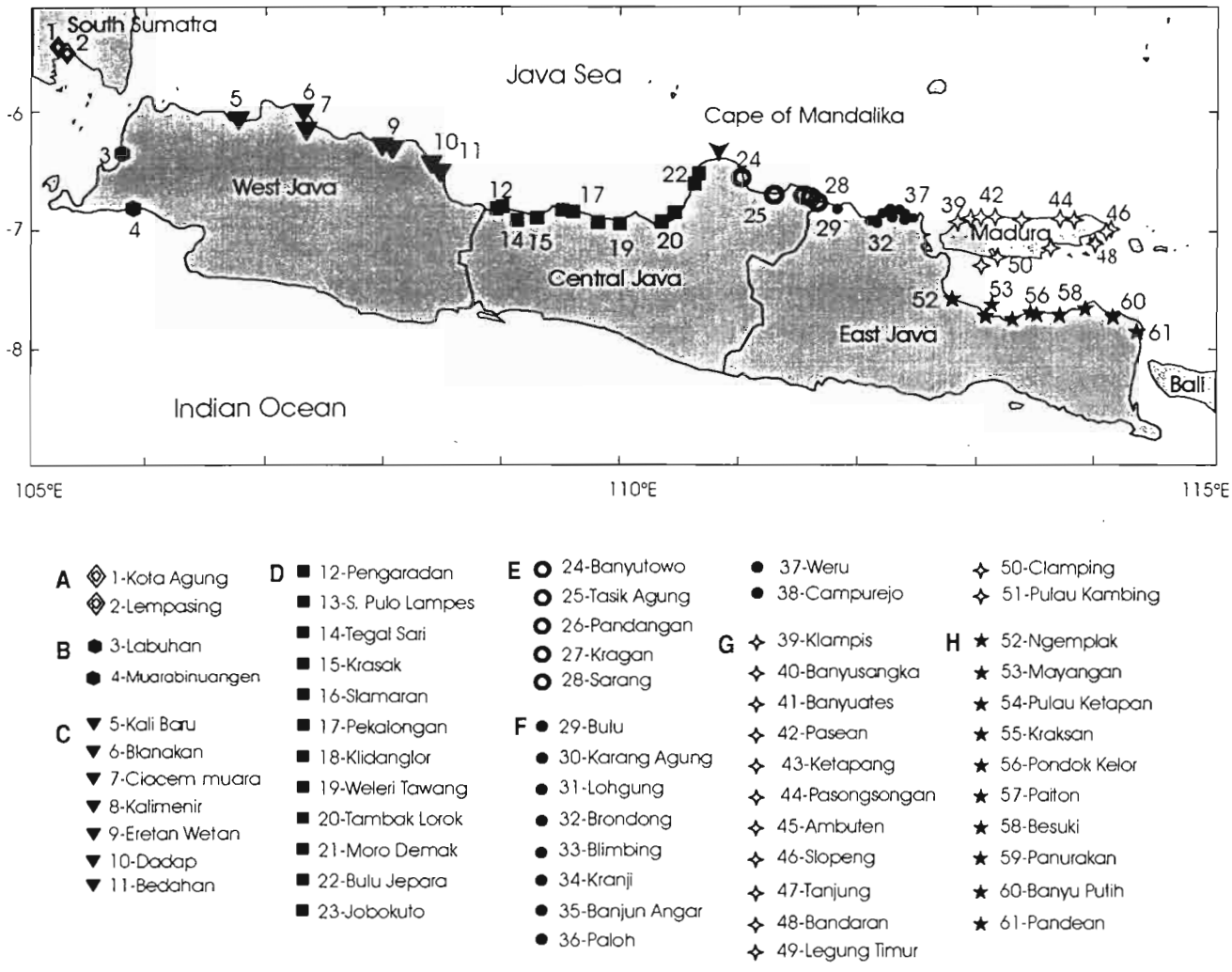

Figure 1: Mini seiners census: location of the inquiries along the Northern and south-western coast of the Java Island (from Jung, 1998)

All locations where some mini seiners could potentially be observed have been visited. They may correspond to a port, a village, a landing place or a beach (fig. 1). Because of their easy access places where wharfs, mooring quays and auctions are observed, are chosen preferentially by the mini seiners. Drawing alongside is definitely an important point, consequently places located along river banks near the mouth, offer sheltered sites which are of great interest for mini seiners (Pandangan, Batang, Eretan Wetan, Karang Agung, fig. 1).

The inquiry area was divided into eight zones, noted from A to H. It allows a better repartition of the working field (fig. 1). Zone A corresponds to Lampung province in the South of Sumatra Island. West Java province was divided into two sectors: B covers the Sunda Strait, C starts from Jakarta to the west and reaches the border of the Central Java province. The Western part of this province is called D and extends to Cape of Mandalika (fig. 1). Zone E stretches from Mandalika to the border of the East Java province. This last one was divided into three zones: F and H cover the northern part of the province, respectively from Bulu to Campurejo and from Ngemplak to Pandean. Madura Island is a specific unit, G.

The censuses dates were chosen to find the highest number of fishing units ashore or at least with a minimum of units working. The first census was conducted between March 9 and March 11, 1995. These dates correspond to the period of *Idul Fitri*. This religious festival, the most important in Indonesia, is a Public Holiday and the fishing activity is stopped for the few days before and after the festival (Ecoutin and Dharmadi, 1999). The second census took place between June 14 and June 18, 1995. This period corresponds to the full moon and most of the fishing units present no activity. Finally, the third census period from November 5 to November 12 corresponds to a full moon period and to the yearly weather changes with the beginning of the northwest monsoon and of the rainy season. At this time, the fishing activity of the mini seiners fleet tends to decrease due to difficult weather conditions.

Results

During an investigation conducted in 1995, the description of some fishing units could not be achieved with precision, the units being too far at sea. The number of units recorded in a site is the sum of the vessels described, of the vessels observed but not described because too far from the shore and of the vessels which just leave the spot to go at sea (by interviews). The sums registered in every site give an estimation of the mini seiners fleet operating along the northern coast of Java (tab. 1).

The result of the three censuses varies from 1,580 to 1,660 mini seiners landing along the northern coast of the Java Island (tab. 1). In November, the number of vessels recorded is slightly less due to difficulties in the sampling. The investigators did not always have the possibility to reach the spots (especially in the East of Java, the rainy season making it impossible to reach some beaches). This is a good agreement with the estimates presented by Potier and Sadhotomo (1995) with a fleet ranging from 1,500 to 1,600 boats or Hariati *et al.* (1995) with a number of 1,555 units in 1991. The lesser estimate given by Ecoutin *et al.* (1997), slightly over 1,000 units in November 1994, may be explained by the fact that the spatial investigation was not exhaustive.

Table 1: Estimate of the mini seiners fleet according to three 1995 censuses

	March	June	November
Described fishing units	1,199	1,300	1,369
Observed fishing units	195	108	26
Just left fishing units	236	193	188
Estimated total	1,660	1,601	1,583

It is nevertheless possible to count a unit twice when it is spotted at sea off a village and registered in another village as having been observed in the latter.

About 90% fishing units observed are described. The dataset is based on the described units of which the number is very close to the estimated fleet. Then the results can be extended to the entire fleet.

1. Investigation place

For the three investigations in 1995, 110 locations were visited by the investigators and mini seiners were observed in 61 places (tab. 2). More than 2/3 of these spots were visited

during every census and these locations represent more than 90% of the fleet has been observed there.

Table 2: Number of ports investigated in 1995

	March	June	November	Total
Ports investigated	56	69	86	110
Ports with seiners	45	52	52	61

Along the northern coast of Java, the spatial distribution of the fishing units is characterised by an increasing gradient from the West to the East (fig. 2).

Whatever the month the census was conducted, less than 5% of the fleet is observed in the sectors A and B (tab. 3). Lempasing, zone A and Labuhan, zone B gather 90% of the units observed in each sector.

By contrast, 18 to 24% of the entire fleet observed in sector H and the towns of Besuki and Banyu Putih gather together only half of the fleet in this sector.

Table 3: Geographical distribution (in numbers and %) of the mini seiner units

Census zone	March		June		November	
	Nb	%	Nb	%	Nb	%
A	42	3	47	4	45	3
B	46	4	55	4	38	3
C	38	3	72	6	78	6
D	102	9	122	9	154	11
E	183	15	197	15	195	14
F	266	22	147	11	171	13
G	308	26	403	31	356	26
H	214	18	257	20	332	24

Three areas can be recognised in the region studied. The first one includes the provinces of Lempasing and West Java as well as zone D in Central Java. They are characterised by a low percentage of the fleet observed and by a concentration of the mini seiners in few places. East of Cape Mandalika, more mini seiners are observed and two areas are recognised. In zones E and F many small villages with a large number of mini seiners are noted. 10 to 20% of the fleet are found in each zone (tab. 3). Certain small spots, which have been checked regularly, count more than 40 units. Zones G and H show the biggest concentrations of mini seiners with 20% (or more) of the fleet observed in each census. In three to five villages a number of units close to 80 can be observed.

A first criterion of the heterogeneity of the fleet may be observed from the spatial distribution of its units.

2. Characteristics of the fishing units

Describing the fishing units observed on investigation spots, five main characteristics were noted down: the name of the boat or its registration number, its shape, the type of light device used to attract the fish, the type of engines visible on the boat, and the method used to preserve the fish onboard. The analysis of this information conducted on the whole fleet and taking account the description of each unit allows the description of the heterogeneity of this fishing fleet and the definition of groups within it.

2.1 Shape of the boats

The term mini seiner includes boats with different shapes. Each shape presents characteristics, which identify it easily. Then some models of mini seiners can be recognised (Ecoutin *et al.*, 1997):

- boat with decks : this category consists of three models *kranji, bulu* and *dadap*,
- boat with double stems: two models are found, *payang* and *sopeck*.

But inside the fleet, some vessels are difficult to classify as their shape presents characteristics belonging to different models (mainly *kranji* and *bulu*).

Thus, depending on what the observer sees (and his accuracy) a unit will be classified in either category. That is why only four categories have been chosen in this analysis to define the shape of the boats. The category "annexed shapes"[5] was connected to *payang* model, and the *kranji* to the category *bulu*. The other two categories are composed of the *sopeck* and the *dadap*.

The fleet described in 1995 is mainly composed of shapes *kranji-bulu* (tab. 4). They represent 55 to 65% of the units observed. Shape *payang* ranks second (25 to 38% of the models). Then come the *sopeck* (3 to 6%), finally the *dadap*. This last one never represents more than 4% of the fishing units. These results are slightly different from the ones observed in November 1994 (Ecoutin *et al.*, 1997): *bulu-kranji* 42%; *payang* 44%; *dadap* 6%; *sopeck* 8%; but the differences may be related to the fact that the investigation conducted in 1994 was not exhaustive.

In zones A and B the mini seiners are mainly of type *kranji-bulu* (fig. 3). It is almost the same situation which prevails in zones E and F, even though a few *payang* units are registered in zone F. Zones C and D are more diversified, three out of the four categories are found: *dadap, sopeck* and *kranji-bulu*. Each one varies in proportion depending on the census. In zones G and F, the fourth category "*payang* and annexes" represents the majority of the boats described. In November 1995, the informations collected in zone H lack of accuracy due to the difficulties encountered at the beginning of the rainy season. According to the informations collected in March and June 1995, put together with the various reports of missions conducted in this sector, we may conclude that most of the boats found in zone H are of *payang* type. On Madura Island (zone G), the *payang* shape represents up to 76% of all the mini seiners described.

[5] It includes the *ketiping, ketapang* and *mandagin* shapes. They differ in their closed rear deck and/or an axial or lateral, in-board, double or triple motorisation.

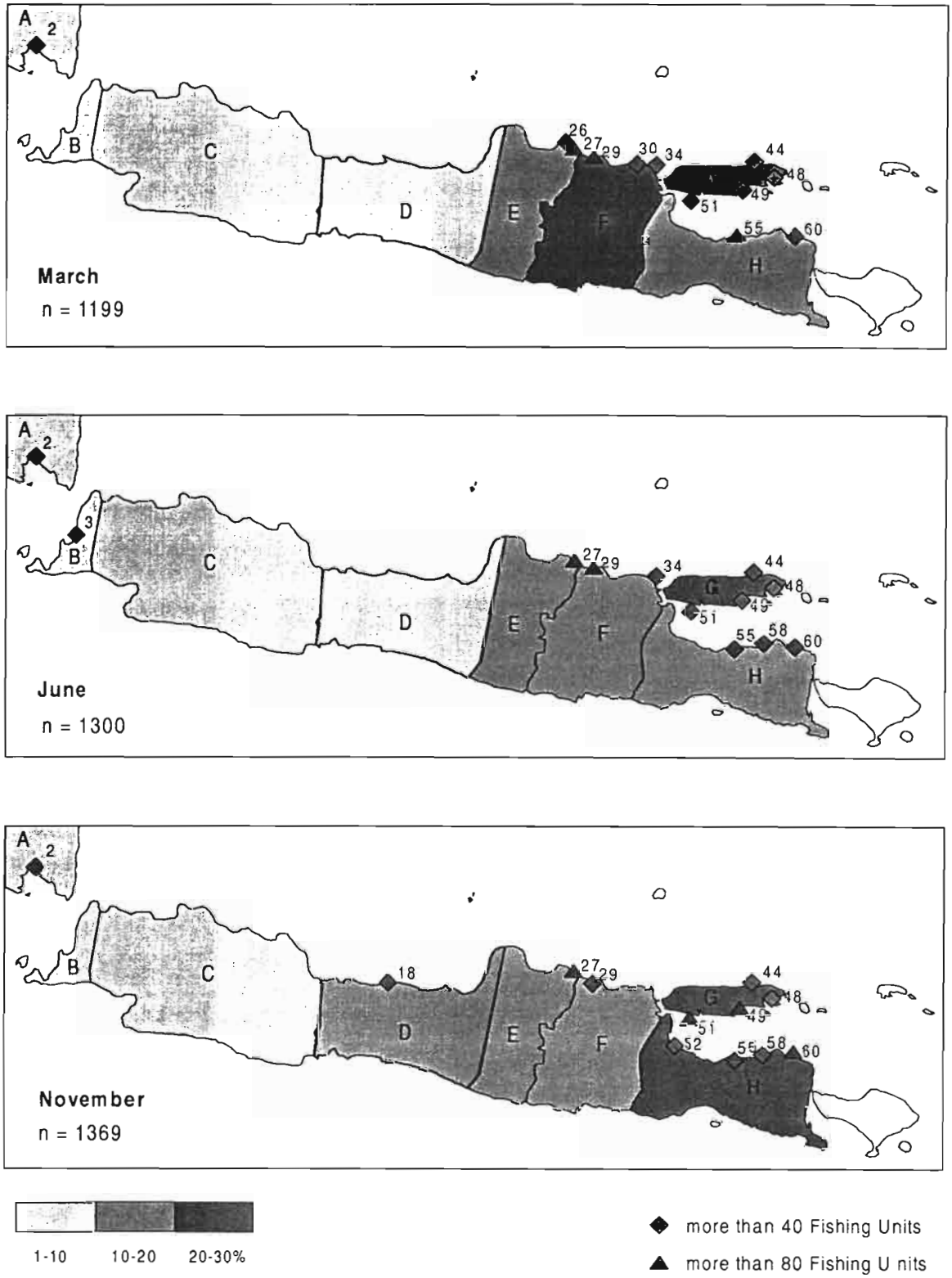

Figure 2: Geographical distribution of the mini seiners described in the three 1995 censuses

Table 4: Repartition (%) of the fleet by shape described in the various censuses of 1995

Shape of boat	*March*	*June*	*November*
kranji-bulu	63	55	65
dadap	3	4	4
sopeck	5	3	6
payang and annexes	29	38	25

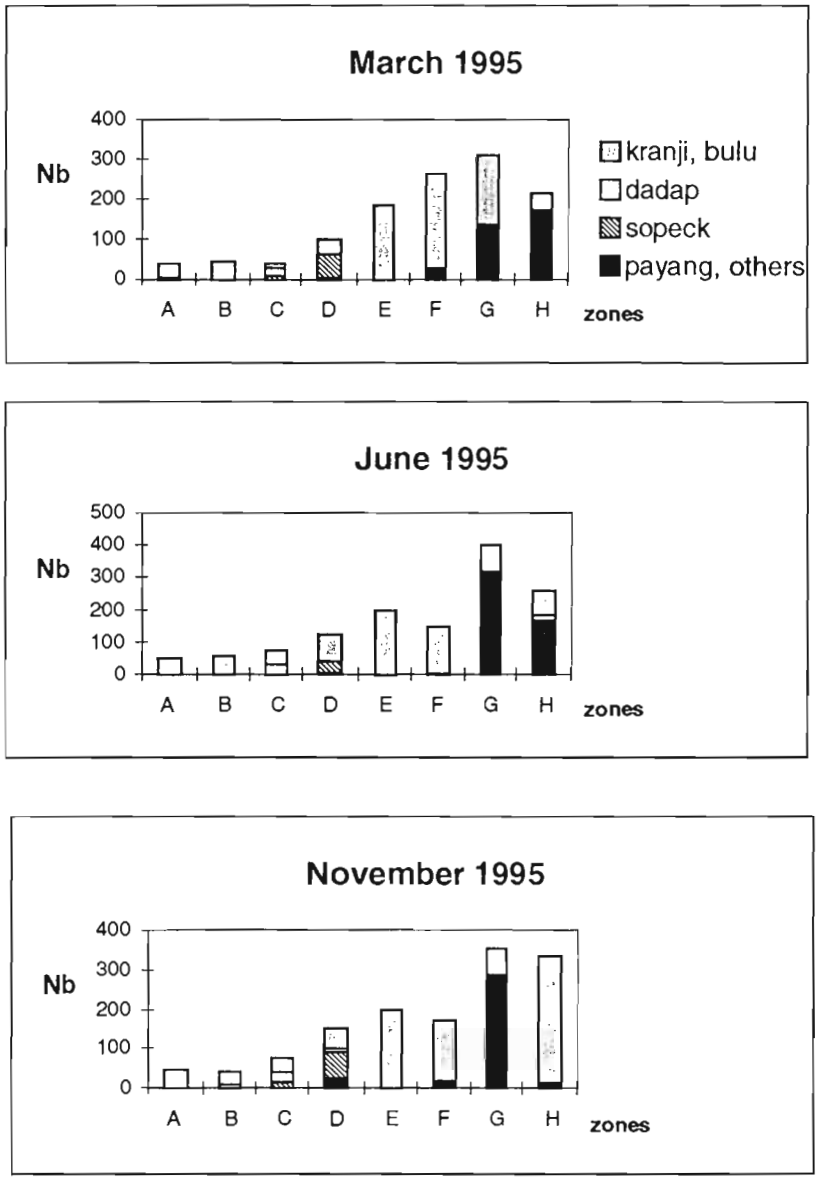

Figure 3: Geographical repartition of the boat shapes found in the 1995 census

The various shapes observed during the censuses are not randomly distributed. The *kranji-bulu,* the most numerous type, are found everywhere, they are noted in all zones of the study whatever the month of observation. Models *dadap* and *sopeck* are much more localised: they are observed almost solely in the province of Central Java where they may represent up to 2/3 of the local population. *Payang* are observed in the three Eastern zones, mostly in Madura Island where 62% of the whole *payang* fleet may be found.

Shapes increase the heterogeneity observed with the distribution of the mini seiners along the northern coast of Java. Two stages can be identified. The first one covers the numeric distribution of the shapes, the second the geographic distribution, some shapes being found everywhere, other being very localised.

2.2 Name of the fishing unit

Each boat has a registration number allowing its identification. The name is used to identify the boat when fish is sold under auction. It is painted on the hull of the boat and is subjected to a tax[6] when the boat is registered at the auction office. In order to get the information by personal means the census was conducted regardless of the administrative lists[7].

During the censuses, for the units that were too far off shore, the name was eventually collected via crewmembers or fishermen present on the investigation spot. The goal was to get as many individual identification of fishing units as possible.

This report has not been systematic due to difficulties encountered on the field (boats too far off shore, casting off....), or proper to the teams. This was the case for Madura Island, that was not properly investigated (no names collected in March and November). However the rest of the coast was thoroughly investigated and trustworthy.

The raw lists of names collected in 1995 have two drawbacks: redundancy and lack of precision. The name noted down by the investigators is sometimes a random choice between several words visible on the fishing unit. Double, even triple names for a boat are common and may cause a boat to be registered under different names according to whether the investigator takes one name or the other into consideration. The name given to the TPI employee during registration for a sale is the name painted on the stern of the boat. Writing is sometimes visible on the upper part of the poop deck it may be similar to the name written on the bow, or recall the last renovation. The bow and the rear wings of the *kranji-bulu* may be adorned as well, it is freewriting expressed by the sailors[8].

Some fishing units have names with very close spelling. Boats with different characteristics may even have the same name. These differences may as well be due to the language used Indonesian, Javanese or Madurese.

In order to get accuracy, these cases were thoroughly examined until the results were trustworthy. The information collected with the fishermen confirmed the existence of several units described under the same name, often individualised thanks to a number. They allowed the correction of mistakes, increasing our list of boats described and named with accuracy.

We may note a wide heterogeneity in the collection of this information (tab. 5). The zones in the Western and Central provinces were fairly well investigated and the percentage of units named reaches more than 85% of the population described. In the Eastern provinces

[6] This tax must be paid together with the fishing licence, it is valid in the administrative province where it was applied for and for a period of three years.

[7] These lists remain non exhaustive and difficult to obtain.

[8] Film titles, cigarette brands or girls' first names may have been chosen.

(Zones E, F and H), getting the data depends on the census campaign. The mini seiners of the Madura Island were not well identified, which is partly the reason why we will concentrate our analysis on the Java Island, which was better investigated, at least for this parameter.

Table 5: Percentage of fishing units identified by a name per zone investigated in 1995

Census zone	March	June	November
A	100	87	95
B	100	100	100
C	97	90	93
D	89	88	81
E	95	72	96
F	81	56	61
G	0	97	0
H	14	16	98

This part of the investigation consisted in the identification of the highest number of fishing units in order to cross the data with catch data in order to be able to estimate the activity rate of the mini seiners. The results will not be treated in this report but will be published later on.

2.3 Motorisation

All the fishing units that use a purse seine are powered by engines. Ten models of different engines were identified during the investigations. Most of them are out-board engines with long shafts and power ranging from 14 to 27CV. The different models are grouped into two categories depending where the shaft is positioned: rear or side.

The engines of the mini seiners are found mainly in a rear position, engines fixed on the sides represent between 30 to 40% of the boats observed (fig. 4).

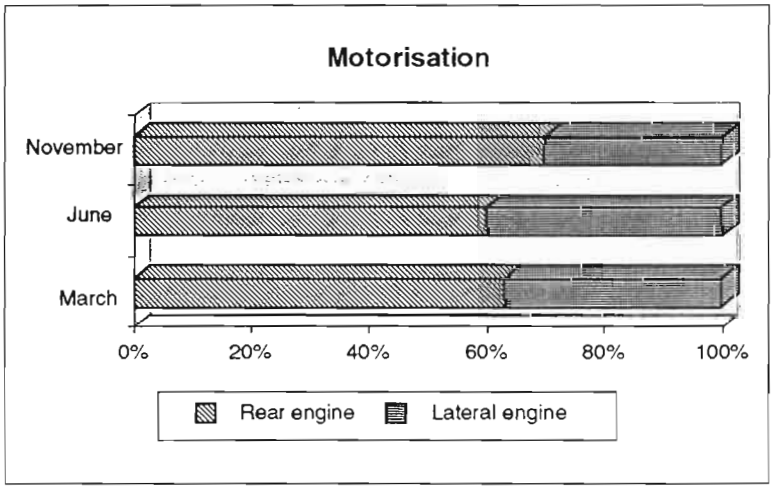

Figure 4: Type of engines described during the 1995 censuses

Table 6: Distribution (%) of categories of engines according to the shape of the boats

Month	Motorisation	Shape of the boat			
		kranji-bulu	*dadap*	*sopeck*	*payang*
March	*Lateral*	1	23	96	99
	Rear	99	77	4	1
June	*Lateral*	4	51	99	77
	Rear	96	49	1	23
November	*Lateral*	1	1	88	82
	Rear	99	100	12	18

The rear engines are mainly associated with mini seiners of the *kranji-bulu* and *dadap* shapes (tab. 6). These models are well adapted to the installation of an engine at the stern. Navigation is easier. Double-stemmed models, *payang* and *sopeck,* are powered with lateral out-board engines (over 77%).

The choice of the motorisation (lateral or rear) is directly linked to the shape of the boat. The exceptions to this simple and sensible rule are due to errors of observation (units that were too far off and probably not well observed).

The high number of rear engines may be explained by the fact that the shapes *kranji-bulu* are the most common model of mini seiners.

2.4 Light equipment

In Indonesia, fishing with purse seine is traditionally done with FAD (Fish Aggregating Device) which consist of bamboo and palm leaves (*rumpon*) or equipped with light.

Oil pressure lamps locally called *Petromax* installed on wooden or polystyrene floating rafts (*bangrak)* are commonly used in Indonesia by fishing fleets, particularly by mini seiners. Some mini seiners use now electric lamps to attract the fish. This method requires the use of generators. Two models of lamps, fixed directly on the boat structure, are used: incandescent bulbs (*Galaxy*) or halogen lamps (*Mercury*).

The fishing units observed without light equipment were recorded in the category called *Petromax* (oil pressure lamps), as these lamps are unshipped when there is no activity.

Petromax is used by almost the entire fleet described in 1995. The data are homogenous for the three surveys. 4% boats are equipped with an electrical system (combined or not with rafts with *Petromax* lamps). This equipment is quite new and is usually used by medium or large seiners fleets (Potier and Petit, 1995). It is uncommon on mini seiners fleets in 1995.

Only a very small part of the mini seiners fleet has an electric equipment. The use of this equipment seems related to the shape of the boat (tab. 7). Most of *payang* and *kranji-bulu* types are equipped with *Petromax*, only 7 of them were described with electric equipment in November 1995. On the contrary, 20 to 30% of *sopeck* and *dadap* types have an electric equipment (tab. 7). Although these two types of boats are fewer in number, there is definitely a difference in light equipment within the fleet. These results confirm the first conclusions drawn from the 1994 census (Ecoutin *et al.*, 1997).

Table 7: Light equipment (%) depending on the shape of the fishing units

Month	Type of lamp	Shape of the boat			
		kranji-bulu	*dadap*	*sopeck*	*payang*
March	*Oil*	99	63	79	99
	Electric	1	37	20	1
June	*Oil*	99	64	100	100
	Electric	1	36	0	0
November	*Oil*	99	96	66	95
	Electric	1	4	34	5

2.5 Structures used to preserve the fish

Several methods are used to preserve the fish onboard the mini seiners. The boats are traditionally equipped with baskets made of weaned bamboo stems: the fish is stocked in the baskets until the boat reaches the landing place. Then baskets are taken to the place where fish is to be sold. Plastic or wooden crates are used as well for the same purpose. Moreover some boats are equipped with fixed storage structures, under-deck holds with central opening.

Data on storage method has not always been reported by the investigators. Nevertheless, the information remains useable by defining the hold in its simplest form: the hold is then defined as an under-deck structure that allows the storage of the fish or other items[9]. The units that were described without any equipment (6% of the units) were counted with the units equipped with baskets only.

Therefore, the analysis takes into account the presence or absence of a storage structure either iceboxes or holds.

Both storage methods may be observed in the mini seiners fleet. Some differences appear in the observations made during the three investigations, which is mainly due to the definition of the word "hold". Considering the precision of the information collected, about half of the units recorded are equipped with holds.

All the units are equipped with baskets (the few cases noted without are due to the fact that the baskets had been removed while the boat was not being used) and 50% have an under-deck structure for the storage of the fish. The use of iceboxes was put in another category but represents only a small proportion of the seiners (1 to 7 units recorded depending on the month).

The storage methods (iceboxes or holds) are more particularly associated to the *sopeck, dadap* and *payang* (over 67%, except for March, tab. 8). The *kranji-bulu* are seldom equipped with those (less than 30%, except for March, not homogenous).

The differentiated storage structure, linked to the way the holds are built, represents a technological progress for the fishing unit. A clue to this technical evolution would be to know whether the holds were installed as the boat was being built or added later on.

[9] The compartments may contain cans, fuel, oil, salt, fishing rods, pots and pans as well as food and drinkable water.

Table 8: Method used for the fish storage (%) depending on the shape of the mini seiners

Month	Storage	Shape of the boat			
		kranji-bulu	*dadap*	*sopeck*	*payang*
March	*baskets only*	50	44	2	53
	ice-boxes	1	6	0	1
	holds	49	50	98	45
June	*baskets only*	67	2	33	6
	ice-boxes	5	0	0	0
	holds	28	98	67	94
November	*baskets only*	78	33	1	9
	ice-boxes	1	0	0	0
	holds	21	67	99	91

3. Origin of the fishing unit

In Indonesia, a boat starts taking shape in a fishermen's mind by associating a name (registration name) and a place of origin[10]. It is a means of recognition between fishermen for whom belonging to a social group is essential.

The origin of the fishing unit is often closely linked to the place where its owner lives. The fishermen are recruited in the port of this unit. They are mostly from the port or living close by. The boat and its crew form a fishing unit defined by two names: the boat's and its place of origin. The latter is not always known with accuracy depending on the distance between the place of investigation and the place of origin. The information collected may relate to the main city close to the place of origin[11] or even more simply to the province of origin.

This data was always collected through oral information provided by crewmembers or fishermen present on the investigation spot. The origin of the informer as well as the quality of its relationship with the investigator is important elements to the relevance of the information gathered. One should be cautious when dealing with information collected by that way.

One of the main problems, difficult to tell on the field, is when an information given in good faith proves false. A boat may be landing for several consecutive years on a spot far away from her place of origin. The unit may then be considered native and announced to be so during the interview. This error tends to lessen the number of mini seiners that migrate during their fishing period. Repetitive campaigns allow the evaluation of the problem.

Whenever the information could not be collected on the field, the missing data was looked for in the other two censuses. Two units with the same identifying characteristics (name of the boat, equipment) are then considered as the same and one boat.

[10] Often heard during our conversations, "*kapal itu nama Widodo, ini dari Blimbing*". This boat is called Widodo, it is from Blimbing. The origin is nearly always given to describe the unit in question.

[11] During an investigation at Eretan Wetan, it is easy to hear that Samudra is originating from Blanakan (distant from 30 km) whereas Widodo is said to be originating from Tuban (*kabupaten* which the village of Blimbing is part of, located 800 km from Eretan Wetan).

Just as it was done for the investigation spot variable, the origin of the unit is regrouped according to the zone codes (A to H) corresponding to the villages or province of origin. From the three censuses, a spatial gradient describing the origin of the units expressed by geographical zones comes out clearly between the East and the West (tab. 9). According to the unit origin percentages three groups may be defined: zones A, B, C and D never register more than 10% of the whole fleet, the western zones have zero rates for two of the investigation months; zones E and F take part for 15 to 25% of the total of the units described; then, the third group, zones F and G, corresponds to zones where 25% of the fleet is said to be originated from.

These three campaigns show a variability that does not exceed 6%. It concerns zones F and H between March and November and zone G between June and the other two censuses (tab. 9).

The comparison of the spatial distribution with that of the investigation spots shows some differences. Indeed, for several zones, the number of units described in a zone is different from the number of units announced as coming from this zone. This is mainly the case for zone A, where about forty units are counted during the investigation although only eleven units are said to be native. The same comments can be made for zones B, C and D although at a smaller scale. The opposite fact is noted for zone F where more units are said to be native whereas fewer units are counted in the censuses for this zone. Zones G and H do not present the same variations and the populations described are native.

These differences may be explained by migration: boats from East Java migrate to the landing places of the West provinces of the island. The three 1995 censuses acknowledge this fact and give a first estimate of its importance.

Knowing these migrations is of the highest importance regarding the fishing activity and the fleet dynamic as they reflect the spatial occupation strategy of the fishing units. It shows a dynamic behaviour in a variable environment, the resource.

Table 9: Geographical distribution (in numbers and %) of the origin of the fishing units

Zone of origin	March		June		November	
	N	%	N	%	N	%
A	0	0	0	0	11	1
B	13	1	0	0	22	2
C	28	2	34	3	40	3
D	92	8	69	5	108	8
E	184	15	198	15	176	13
F	361	30	353	27	324	24
G	309	26	403	31	356	26
H	212	18	243	19	332	24

3.1 Spatial analysis of the migration: a migration outline

A fishing unit is said to be a migrating unit when it is recorded in a zone that is not its zone of origin; the zone where it is observed is called the reception zone.

In 1995 a maximum of 17% of the described fleet migrate (tab. 10). The variations within the months during the inquiry show the temporal aspect of the phenomenon with a maximum of units away from their original zones in June. The number of migrating fishing units observed in each zone gives a fair idea of the spatial distribution of the phenomenon (tab. 10).

The welcoming zones are mainly zones A, B, C and D. A few migrations are also noted close to zone H in June. Most of the migration movement comes from zone F (East Java province) and heads to the West of Java, whatever the month (fig. 5 and tab. 10).

The South sector of Sumatra (zone A) may be considered as being mostly occupied by units from zone F as they represent slightly less than 100% of the whole number registered in March and June. The smallest value is noted for the month of November (66% of the mini seiners originated from zone F, 8% from zone E and 11 units from zone A, tab. 9), but when considering this value, one must keep in mind, as stated previously, the origin of a fishing unit landing regularly in the same port. The number of units noted down is constant during the year (tab. 3); moreover during the first two censuses, no fishing unit is described as originated from zone A. The informers may have been misled by the continuous presence of fishing units in a port for a long period of time; they then acknowledged them as native units. The presence of seiners from zone F in Sumatra Island is noted from March to November. The detailed analysis of the fishing units will permit to confirm this conclusion.

In zone B, the phenomenon observed previously seems to be similar with a higher rate of migration in March and June from sectors F and D, and a smaller rate in November. During this last census, only 39% of the observed units come from a different zone (E and F). This diminution is superior to the variation of the numbers between the three censuses (tab. 3 and tab. 9). Consequently the problem of information mentioned for zone A can not fully explain this variation. It may probably describe a temporal variation of the migration process: the migrating units present in zone B in March and June moved away in November; they have gone fishing in another zone or more probably returned to their zone of origin.

Migrations in zone C evolve differently during the censuses: 27% in March, whereas 54% and 50% of the whole fleet is present in this zone in June and November. Migration towards zone C is at its highest between March and June and it is shorter in time than zones A and B.

The same thing happens in zone D. The peak of migrating units (originating from zone F) is in June with 58% of the whole local fleet. The percentages obtained in March and November (13 and 15%) seem to prove that the boats leave and come back within this period. The migrating period might be even shorter; the units as a whole stay a maximum of 7 months in zone D. Zone D is ambivalent: it is a welcoming place for the units coming from the East, it is a departure place for its own local boats or for units in transit from the East towards zones located further West.

A small punctual move towards the East may be noted in June between zone F and zone H. It stands out as it heads in the opposite direction and is in such small numbers: 14 fishing units.

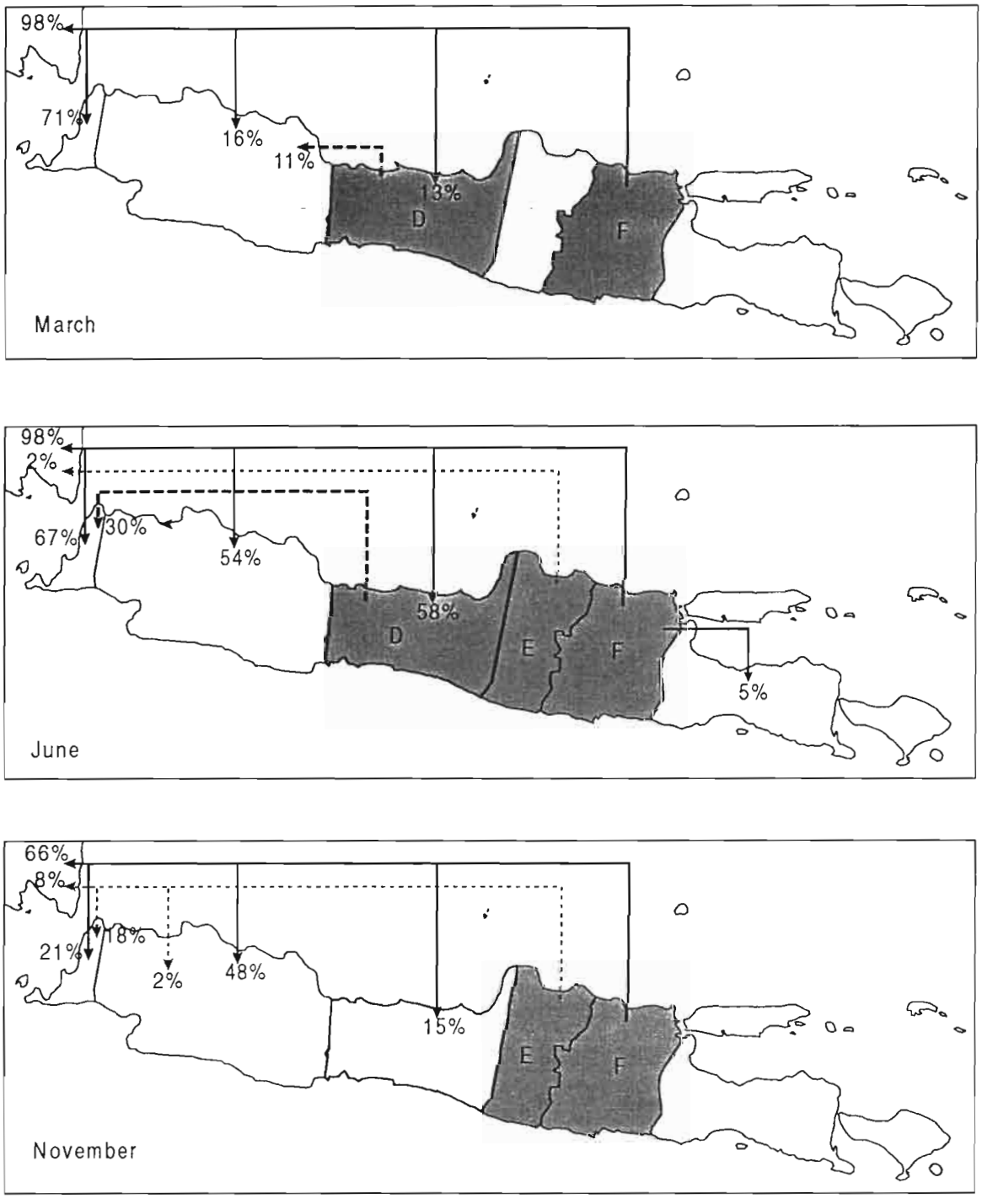

Figure 5: The main migrations observed in the 1995 censuses

Table 10: Zones of origin of the migrating fishing units observed in each reception zone

	March				June				November			
Zone of origin / Census zone	D	E	F	G	C	D	E	F	C	D	E	F
A		1	41			1		46			4	30
B			33		1	17		37	1		7	8
C	4		6					39			1	38
D			14					71				47
E										1		31
F											1	
H			1	1			1	13				0
Migrating units			101				226				169	
Non migrating units			1098				1074				1200	
% migrants			8				17				12	

At the level of Java Island, the number of fishing units involved in migration is limited as a maximum of 17% of mini seiners are described out of their zone of origin. Two of the main zones, zones G and H, are not concerned. Out of these two zones the variations observed between the three censuses allow a first global process of migration, the proportion of migrations doubles between March and June, then decreases in November. Migration might start in March, the date of the first census, be at its maximum in June, and then decrease at the beginning of the rainy season, which usually corresponds to a lesser activity of purse seine fishing.

Migration is mainly originated from zone F towards all the zones located further in the West. The number of boats and the time spent are variable. Following through individual courses could confirm this migration process.

3.2 Technical characterisation of migrating fleets

The topological composition of the migrating units is constant during the three months of investigation. The model *kranji-bulu* prevails and represents 4/5th of the migrating boats. A few units of the other shapes are registered as well but are scarce in number.

According to Indonesian fishermen, the shape of the boat has a great influence on sailing, therefore on migration. The building of *kranji-bulu* favour a wide keel and long rear wings[12], they therefore get stability at sea which is an obvious advantage to sail long distances[13]. This explains the large dominance of *kranji-bulu* among the migrating units.

The seiners registered as migrating and equipped with a double rear motorisation are the highest in number in the fleet: 83% of the migrating units have two engines and only 58% for the rest of the fleet. Double motorisation is taken as a security advantage for long distance sailing.

[12] The fishermen themselves justified the presence of rear wings spread for the stability of the boat.

[13] For example the distance Weru-Lempasing (1,000 km) takes 7 days and 6 nights with a unit type *kranji-bulu* equipped with two engines. The voyage is rarely straight completed, it is coastal navigation and several stops are necessary.

The migrating seiners, which are mostly kranji-bulu, do not have light equipment. In 1995 this equipment is exclusively composed of *Petromax* lamps set on *bangrak* rafts. Similarly, these migrating units seem to be equipped very simply for the storage of the fish onboard; the percentage of holds is inferior. This observation is not easily explained. Yet, the seiners that choose the migration strategy may favour investments linked to sailing (motorisation) rather than storage facilities.

Discussion: A differentiated migration outline

A first image of the fleet may now be outlined thanks to this different results (tab. 11).

From the 1995 censuses we can see two large fishing strategies of the mini seiners in the Java Sea. The units defined as not migrating represent a majority. The migrating mini seiners represent 1/6 of the whole fleet, they come from one of the zones which counts the highest number of mini seiners (zone F); they head to the zones in Sumatra (zone A) and West Java (zone B and C) where they constitute the entire or biggest part of the observed fleet (tab. 3 and 10). This fleet is mostly *kranji-bulu,* it is fitted with relatively basic equipment composed of *Petromax* lamps and bamboo baskets. They are motorised by double rear engines.

The units that never migrate can mainly be found on Madura (zone G) and in East Java (zone E and F). Depending on the shapes of the fishing units, their equipment may or may not be differentiated. Yet, the new types of equipment are found only on the seiners that do not migrate.

Table 11: Main distinctive characters of the mini seiners depending on the strategy chosen

Criterion	Migrating strategy	Non migrating strategy
Shape of boats	*kranji-bulu* near exclusive	All types
Light equipment	Oil pressure lamp	Oil pressure lamp but electric energy as well
Storage of fish	Baskets	Baskets but differentiated structures as well
Motorization	Two rear motors	Adapted to the shape of boat
Zone of origin	Mostly F, E	G, H, F, in lesser proportion D, C
Census zone	Mostly A and B, C and D in lesser proportion	In their zone of origin

Based on a synthetic analysis of the equipment, the fleet is composed of three main groups: the boats that migrate, those that are sedentary with low or high technical characterisation (fig. 6). This classification realised from the units described during the census is relevant to the entire 1,600 mini seiner fleet.

The units that do not migrate are a majority. They may be divided into two groups:

- *kranji-bulu* and *payang* equipped with oil pressure lamps and baskets for the storage of the fish. This combination represents 56% of the number. This group is referred to as sedentary with low technical development;

- the second group is mainly composed of *sopeck* and *dadap* units. They mostly operate in the same zones and have the highest proportion of technical equipment that might be considered as more sophisticated, that is to say differentiated holds and electric lamps. This type of boats represents 5% of the mini seiners described in the Java Sea. This group, which is

sedentary and has a more elaborated technical development, differs by a characteristic considered of the upmost importance in this study, that is to say, its fishing strategy that is, never to migrate.

The migrating units are fairly close to the sedentary *kranji-bulu* as far as equipment is concerned even though some of the equipment of the former are higher in number.

So, whether by tactical choice or not, the migrating boats were observed with equipment that on the whole was less performing than the other groups of mini seiners. There seems to be an opposition between a lesser technological choice and a migrating capacity versus an evolution of the technical equipment copied on fleets, which are said to be more successful.

This partly agrees with the conclusion drawn by Wijopriono *et al.* (1996) from the different data on the Java Sea mini seiners.

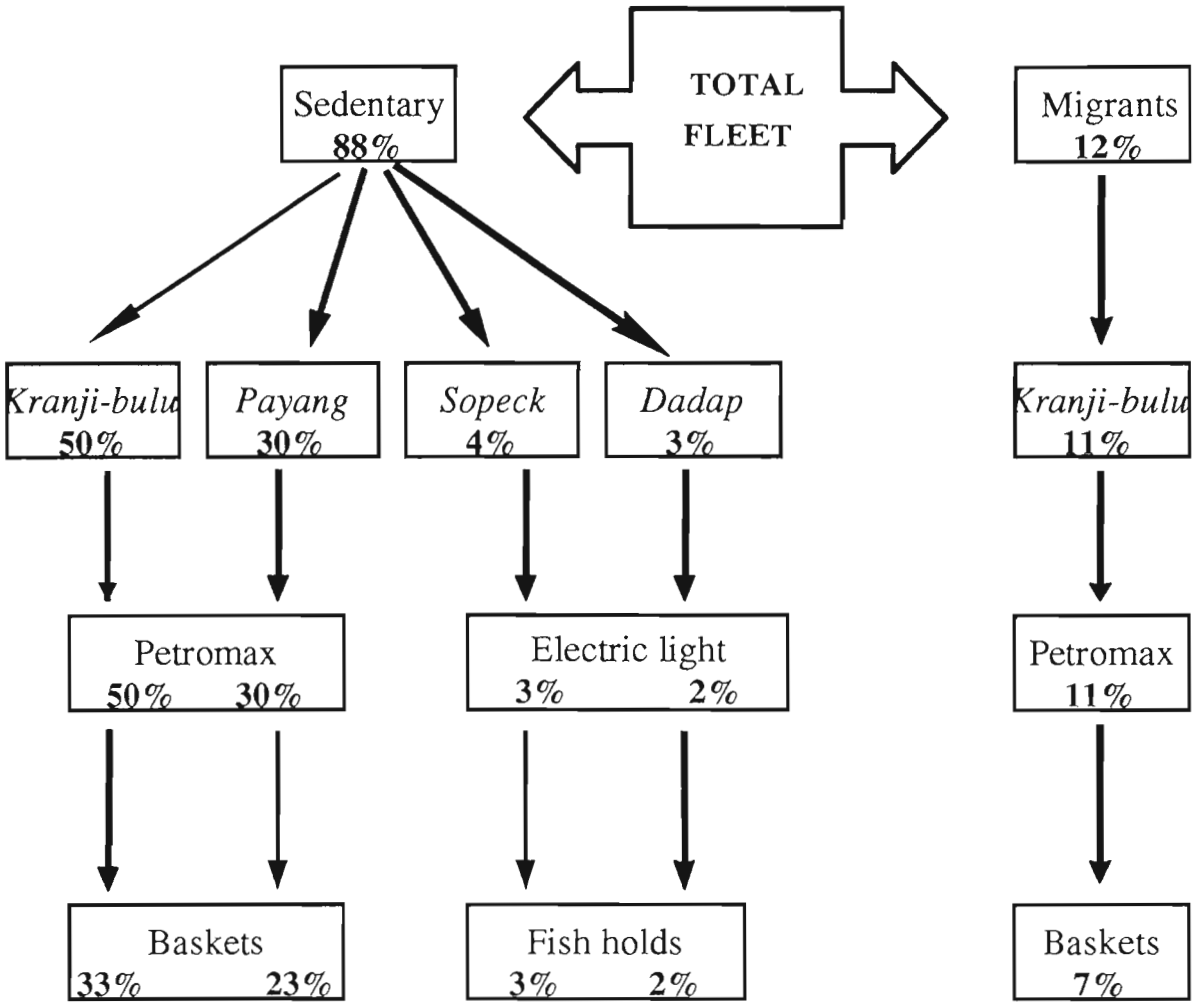

Figure 6: Synthetic outline of the equipment criteria of the mini seiners in the Java Sea

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The mini seiner fleet of the Java Sea
A first global approach to their fishing activity[1]

Ecoutin J.M.[2] and Dharmadi[3]

Abstract: Fishing effort is often a difficult parameter to identify in fisheries studies and even more so if the study involves coastal fisheries spread along a coast more than 1,000 km long. This is the case of the study of the mini seiner fleet operating in the Java Sea. In order to estimate this descriptive parameter of the fishing effort, it has been suggested to use the method of calculating the average activity rate and at the expense of given on certain hypotheses, to translate these rates into estimates of the number of fishing trips.
This article offers a first global approach of the mini seiner fleet operating in the Java Sea from ports located on the north coast of the island of Java. It is thus demonstrated that this fleet's operating activities although more or less significant, were uninterrupted all through the year 1995, the landmark year for this study.
This study also describes the first reason for the heterogeneity of the fleet from the dynamics of utilization of the landing ports by mini seiner fishing units.

Keywords: fishing activity, purse seine, fleet dynamic, small-scale fishery, Java Sea, Indonesia.

From the definition by Poinsard and Le Guen (1975) adapted by Laurec and Le Guen (1981), the fishing effort applied to a stock of aquatic animals is a measure of all the different methods used to catch this stock by the fisherman during a specific time interval. This definition implies that one must take into consideration the number of vessels and their characteristics, the fishing gears used, the level of activity and the human capacities in play, etc (Laurec and Le Guen, 1981).

According to these authors, the fishing effort therefore corresponds to a quantification of the fishing activity in a time interval that relates to the exploitation of one stock or unit of management (Laurec and Le Guen, 1981) taking into consideration isolation and homogeneity hypotheses.

For coastal or small-scale fisheries, the study of the fishing effort is complicated by the heterogeneous nature of this fishing effort, by the difficulty of setting standards in order to integrate the different fleets of small scale fishery, by the relationship of this activity between

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different target species and a sharing of the stocks between small-scale and industrial fisheries (Charles-Dominique, 1991).

The study of the fishing activity conducted on the whole of the small scale fishery, or on a stratum thereof, aims at understanding the importance of the activity deployed either by a global approach of all the fishing units, or on an individual basis by fishing unit or group of fishing units.

By using this approach, the entire small-scale fishery can be characterized by the potential fishing units in activity, by an average number of trips by unit, by the number of days in activity, by the average or individual length of fishing units; it is also possible to establish a diagram that describes the activity by worked days and idle days and possibly explaining the reasons of inactivity of both short and long duration.

The estimated parameters are indicators of the dynamics of each of the different areas of small-scale fishery. They allow the geographic and temporal variations of these areas to be identified and to estimate their evolutionary capacities.

In the Java Sea, the mini seiner fleet can be compared to a fleet of small-scale fishery: the numerical potential is greater than 1,500 units (Potier and Sadhotomo, 1995); the number of landing points is significant, more than 80 (Ecoutin *et al.*, 1997); the possibility of rapidly changing the landing site introduces a major difficulty in following individual fishing units (Hariati *et al.*, 1995); the presence among this fleet of vessels in a variety of shapes describes a notion of heterogeneity and the possibility of partitioning this fleet into more homogeneous subgroups (Wijopriono *et al.*, 1996; Ecoutin *et al.*, 1997).

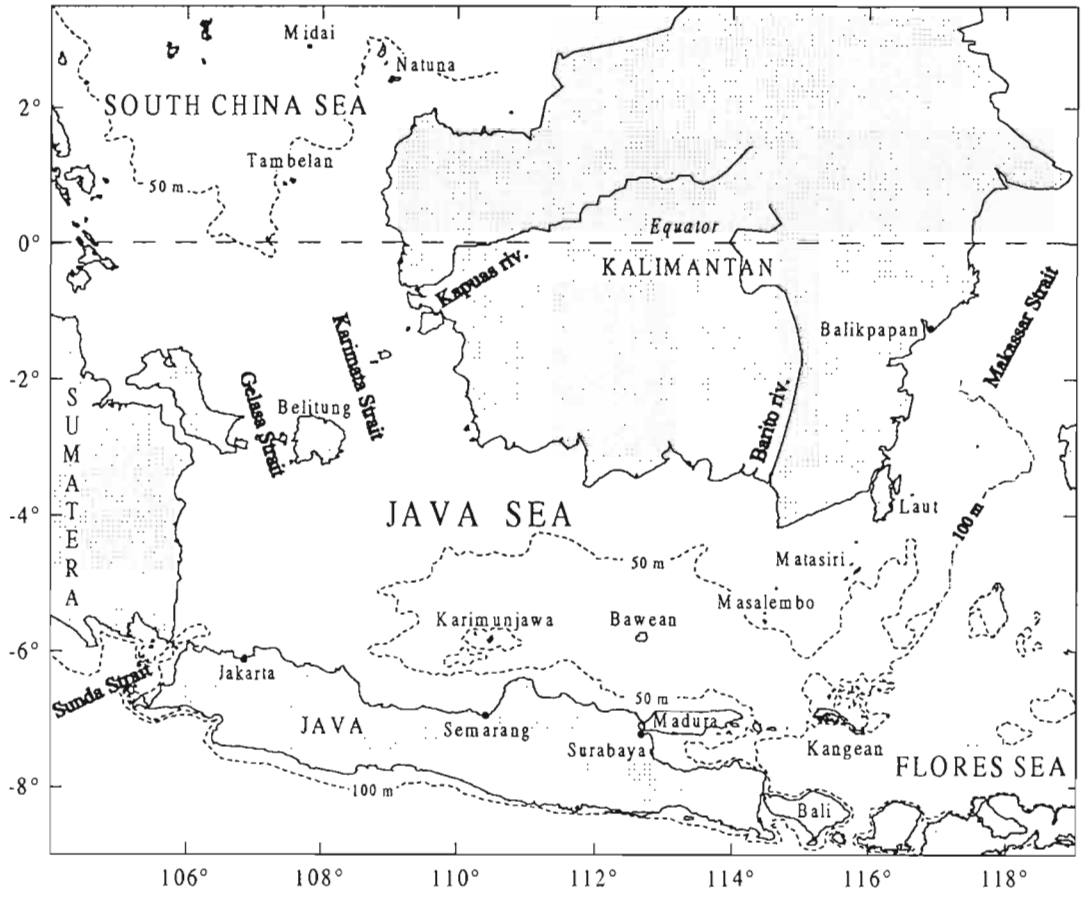

Figure 1: The Java Sea and its surroundings

In order to estimate the fishing effort by mini seiners operating in the different areas of the north shore of the Island of Java (fig. 1) by studying their activities, a regular survey of a sample of fishing units would have been necessary. Because of the significant number of units of the fleet and a lack of time to complete the study, only a global approach could be accomplished. Nevertheless, by this global approach, it is possible to define certain descriptive parameters useful for a first approach of the fishing activity such as the number of active days during a year; explanations for the main fishing idleness, information on the spatiotemporal variability of the distribution of this activity, ... This is not sufficient to translate the results obtained by the units of this fleet into an estimate of the total catch, but it does allow the completion of certain hypotheses to estimate a conversion factor of the results into total catches.

Material and methods

1. Presentation of the ports

Daily listings of landings by mini seiners were used to complete the study. During 1995, these listings were recorded in eight important ports on the north shore of Java (fig. 2). Different censuses of the mini seiner fleet operating in the Java Sea (Ecoutin *et al.*, 1997; Jung, 1998) were used to make this choice. The sampling plan included a ninth location, the port of Brondong located in the province of East Java (fig. 2, n°8); this port was the subject of a specific monograph (Luong, 1997) and its results could not be taken into account for this work.

From West to East, these entries were recorded in:

* Eretan Wetan (Fig. 2, n°1), the only port of the study located in the province of West Java, is a landing and commercial destination for fish from fleets using different fishing techniques: gillnets, Danish seines, mini seines, ... In 1994, the units of medium seiners unloaded more than 2,000 tons of pelagic species at this location, or 5% of the total landings by this fleet (Potier *et al.*, 1995). This location is both an auction place (TPI or *Tempat Pelelangan Ikan*) and a village cooperative (KUD or *Koperasi Unit Desa*). It is representative of the neighboring villages for the study of mini seiners of the Java Sea.

* Pekalongan (n°2) is the largest fishing port in the province of Central Java. It is part of an administrative structure grouping the principal ports of the Indonesian archipelago (PPN or *Pelabuhan Perikanan Nusantara*). Several auction places operate in this port with one that only deals with landings of mini seiners. Pekalongan is the principal landing port for the fleet of large and medium seiners with approximately 50% of the landings of large seiners and 70% by the medium seiners (year 1994, Potier *et al.*, 1995).

* Batang (n°3), not far from the previous port, is a TPI where large, medium and small seiners exploiting the pelagic fish of the Java Sea are unloaded.

* Banyutowo, also called Tayu (n°4), is a small TPI situated north west of the Bay of Rembang. The fishing units from the villages located between Rembang and Sarang regularly visit this port. Mini seiners dock at the end of a long pier built on a beach where the water level is very low.

* Tasik Agung (n°5) is one of the auction places of the village of Rembang. This TPI is different in that it trades pelagic fish caught mainly by mini seiners and secondly by large and

medium seiners (57 landings for 2,300 tons in 1994 or 1.5% of the total catches by this fishing fleet, Potier *et al.*, 1995).

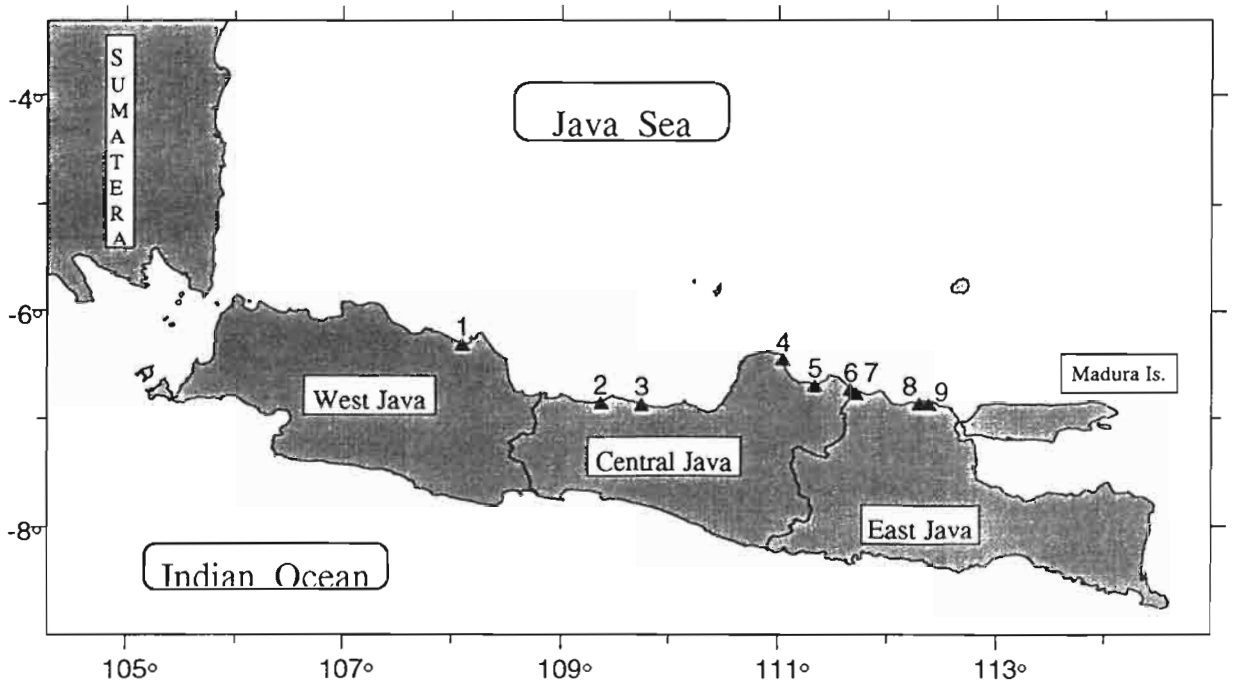

Figure 2: Location of the main ports of inquiries in 1995

* Sarang (n°6) is the more eastern TPI of this study for the province of Central Java. Many fishing techniques were observed there. For this reason, Sarang can be compared to Eretan Wetan (n°1).

* Bulu (n°7) is a landing place located in the province of East Java. It is different in that the mini seiner units that unload their catch here almost exclusively originate from this village and few fishing units registered in Bulu moved to other locations on the north shore of the island of Java during the year.

* Kranji (n°9) is a small TPI located east of the port of Brondong (Luong, 1997) where fishing units using many fishing techniques land.

2. Presentation of the surveys

Each sale of fish landed made by the mini seiners is recorded by the administration of the TPI in a book called in Indonesia *buku bakul*. The different listings are then grouped by fishing unit and recorded on specific sheets for this study. The type of data collected on these pages was information needed to identify the fishing unit (name of the boat, name of the owner, the captain, origin of the fishing unit), information on the fishing trip (fishing location, duration, possible use of fishing aggregating devices) in addition to contents of the catch by category of species; usually, 6 and 8 categories of species were written up. This content is done by weight and often by economic value.

By comparing the lists of fishing units on these study sheets to the data of the *buku bakul* (description by unit sale, daily sales for each unit that landed), there are no differences in the number of mini seiners that arrived each day. The information recorded by each TPI is therefore correctly carried forward in the data acquisition chain of this study.

3. Unit of observation

The landing of one fishing unit as a result of a fishing trip represents the unit of observation. Because of the unit of observation chosen - the landing of catches recorded by the TPI as an indicator of a fishing trip - there exist some bias for the fishing trips whose landings were not recorded by the TPI: catches of small quantity, direct sales to a preferred buyer,...

In addition, the choice of this unit of observation, which is based on a fishing trip, does not allow the extrapolation of the fishing activity of mini seiners into number of days at sea. This latter parameter is often considered a more precise indicator of the level of fishing activity. Depending on the landing location and the fishing seasons, the duration of a trip can vary from a few hours to 3 or 4 days. In a few cases, the length of a trip can be even greater; this is the case of mini seiners that sell their catch directly at sea to specific ships, the *gendong* boats (Luong, 1998). These *gendong* boats sell later the catches at Brondong harbor (Luong, 1997).

In 1995, more than 25,500 entries were recorded in the eight villages described above. Two of them were not taken into consideration in this study of fishing activity. One is the TPI of Batang (n°3, fig. 2) where the data are not validated and the other is the village of Bulu (n°7, fig. 2) where the data for 1995 are too incomplete to be able to conduct this analysis.

Results and discussion

1. Global analysis of the activity

Of the remaining six villages in our sample (one in West Java, four in Central Java and one in East Java) and after validating the inquiries (approximately 0.5% of the inquiries were invalidated), the sample contains more than 20,100 entries spread unevenly over the 12 months of the year (tab. 1).

1.1. Activity calendar

The number of inquiries recorded each day varies from 0 (value observed 11 times during the year or 3%) to 160 inquiries (observation of March 29th, 1995). The average number of daily entries recorded is 55 with a standard deviation of 35. The histogram of the distribution of the number of daily entries does not show any specific shape to the distribution of the values between 15 and 90 entries per observation day (fig. 3).

A little more than 10% of the observations correspond to days with no or few entries (less than 10 landings recorded). They are defined as days or periods with low activity. In the same manner, approximately 10% of the observations correspond to days or periods with high activity with a maximum of entries recorded (more than 100 daily inquiries, fig. 3).

Table 1: General activity calendar of mini seiner fishing units

Low daily activity High activity

Day	Month												Total
	1	2	3	4	5	6	7	8	9	10	11	12	
1	47	13	4	121	116	76	15	66	55	62	104	73	752
2	68	16	0	114	88	75	16	89	70	59	69	36	700
3	53	54	0	123	71	67	19	82	32	71	62	31	665
4	58	11	0	111	59	34	88	98	78	66	43	53	699
5	68	23	0	86	70	52	89	74	68	65	41	44	680
6	65	19	0	43	61	33	75	63	76	55	46	3	539
7	52	8	0	6	36	21	51	76	76	43	48	3	420
8	34	1	8	1	48	15	36	65	55	27	74	0	364
9	27	7	43	37	44	15	40	64	48	33	36	0	394
10	28	0	28	138	7	16	33	59	42	38	38	0	427
11	41	2	31	119	7	29	47	53	51	78	38	2	498
12	8	1	96	36	32	33	53	66	58	59	49	18	509
13	1	2	88	65	70	21	23	41	47	32	72	9	471
14	4	19	68	55	35	18	35	59	32	70	104	12	511
15	2	20	47	43	39	10	28	56	36	64	106	43	494
16	0	13	26	25	24	17	8	86	38	91	125	43	496
17	4	36	6	37	19	20	33	60	85	108	89	36	533
18	6	24	11	36	4	31	43	26	113	88	80	41	503
19	26	48	18	39	15	54	37	14	108	106	77	55	597
20	21	40	8	35	25	40	97	88	128	116	83	83	764
21	17	92	55	53	55	29	66	91	140	73	52	67	790
22	14	59	66	63	56	58	76	114	99	107	127	68	907
23	6	36	104	57	38	87	60	90	108	112	94	84	876
24	8	52	137	97	61	110	45	78	98	101	60	72	919
25	2	69	157	93	49	110	36	92	100	150	38	73	969
26	17	67	119	73	95	93	62	95	86	148	19	98	972
27	57	22	113	87	79	67	60	92	105	82	24	85	873
28	38	15	139	64	56	41	73	84	109	44	22	76	761
29	19		160	43	90	34	71	81	74	28	111	68	779
30	20		141	73	66	21	75	71	73	78	84	70	772
31	55		116		66		39	60		140		40	516
Total	866	769	1789	1973	1581	1327	1529	2233	2288	2394	2015	1386	20150
Average	27.9	27.5	57.7	65.6	51.0	44.2	49.3	72.0	76.3	77.2	67.2	44.7	55.2

*** Study of the periods with low activity**

During 1995, four main periods of low activity were observed (tab. 1, days circled by a thick line). These sequences are formed with a minimum of six consecutive days of reduced activity following the definition stated above. They are the periods:

- from January 12 to 18 with an average of 3.5 landings per day,
- from February 7 to 13, 3 landings per day,
- from March 1 to 8, 1.5 daily landings and 6 consecutive days without a single inquiry,

- and finally from December 6 to 11, to which period we can add the 13, with a little less than 2.5 daily landings and three days with no entries.

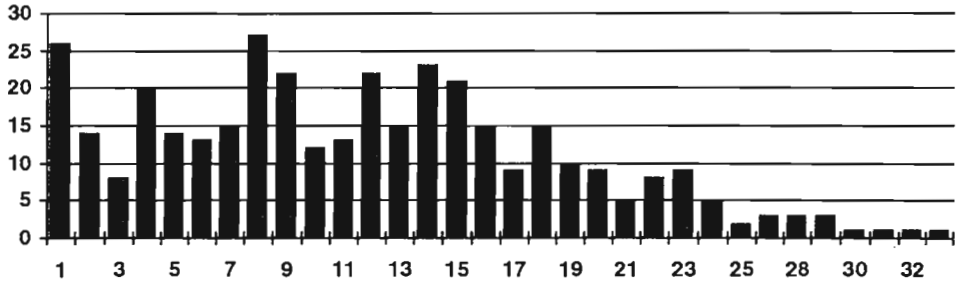

Figure 3: Distribution of the number of daily inquiries (by class of 5 inquiries)

The second and third periods correspond to important religious holidays (tab. 2): the beginning of *Ramadan* for the second period and the end of this fasting month and the *Idul Fitri* holiday at the beginning of March. The two other periods can not be explained by religious or civil events. One of the explanations given by the fishermen related these periods of low activity to the full moon phases during the rainy season, these conditions would therefore not be favorable for catching fish. One other is that, in Indonesia each year, fishermen organize some traditional celebrations named *pesta laut* (celebration of the sea). They last a week but the date of these celebrations is different between each village.

Of the remaining days of the year where the fishing activity seems reduced, May 10 and 11 correspond to the *Idul Adha* holiday (tab. 2). Finally, it must also be mentioned that except for July 16, there are no other days of low activity between the months of June and November.

*** Study of the periods with strong activity**

During 1995, three main periods of high fishing activity were observed (slashed boxes in table 1):

- from March 23 to the beginning of April, with 13 consecutive days,
- the second half of September with 8 non consecutive days,
- the second half of October also with 8 non-consecutive days.

There were no days of strong activity observed in January (maximum observed, 68 entries), February (92), July (97) and December (98). A few days meeting the criteria for strong fishing activity are found on an isolated basis during the months of April, May and June and between August and November in addition to the periods mentioned above.

*** A first picture of the fishing activity**

In 1995, the mini seiners operated all year long (only 3% of days with no landings) on a more or less regular basis. This annual calendar of the fishing activity can be broken down into different main periods.

The period between the beginning of December and March 20 corresponds to a period of low activity for mini seiners. This season includes the four main periods of low activity described above; in addition, the general activity observed, by the landings, is low: besides these four periods, the average number of landings is around forty. This low activity is

explained by two main phenomena: the first explanation relates to *Ramadan,* the Muslim fasting month during which the general activity of the country is often reduced, this period, in 1995, was in February and March. This explanation is not a seasonal constant as the dates of this holiday change from year to year. The second explanation is of a seasonal nature and could correspond to lower catches during the rainy season, especially during the full moon phase but also to unfavorable environmental conditions for fishing activity (wind, waves, swells, currents, desalinization of the coastal border, ...).

Table 2: Relationship between the periods of low activity for the mini seiner fishing units (X less than 11 entries; XX less than 6 entries; XXX no entries) and explanatory hypotheses

Official civil and religious holidays Full moon

Day	Month											
	1	2	3	4	5	6	7	8	9	10	11	12
1			XX									
2			XXX									
3			XXX									
4			XXX									
5			XXX									
6			XXX									XX
7		X	XXX	X								XX
8		XX	X	XX								XXX
9		X			X							XXX
10		XXX			X							XXX
11		XX										XX
12	X	XX										
13	XX	XX										X
14	XX											
15	XX											
16	XXX						X					
17	XX		X									
18	X				XX							
19												
20			X									
21												
22												
23	X											
24	X											
25	XX											
26												
27												
28												
29												
30												
31												

In 1995, the period between mid-March and mid-April is a period of strong and constant activity.

From mid-April to the beginning of August, the activity varies greatly from days of big activity to days of low activity. The average number of landings is slightly greater than the number calculated during the rainy season. The fishermen justify this strong variability of their activity to local climatic conditions that can disturb the fishing activity (Allain, 1996).

The last period, from the beginning of August to the end of November, corresponds to a period of very high activity. No days of reduced activity were observed and the average number of daily entries recorded is greater than 70.

1.2. Variability of the activity due to the lunar cycle

At first glance of table 2, there does not seem to be an obvious relationship between the days of weak activity and the full moon periods. However, compared to an average lunar cycle, these days are spread over most of the lunar days, but 60% of days without much activity are grouped between the five days before and 4 days after the full moon. The remaining days correspond to the *Idul Fitri* period, a holiday which always falls on a new moon phase.

The days or periods with strong activity usually occur, on a lunar month cycle, between the 8th and 16th day therefore surrounding the new moon phase (79% of observations). No days of this kind were observed during the week surrounding a full moon.

These two observations are found on the evolution curve of the average rate of trips by lunar day, which has been corrected for the seasonal effect (fig. 4). This relationship which divides the number of trips recorded on a given day in one port by the average number of trips recorded for the same port for the lunar month describes two main temporal phases: from the eight to the twenty fifth day of the lunar month with activity slightly greater than the average activity for the month; around the full moon, with less activity than the average.

These observations seem to contradict the appearance of an absence of lunar effect on the variation of the activity of mini seiners. However, temporal series greater than one year must be used to test this phenomenon and determine whether there exist a real lunar effect affecting the behavior of fishermen, whether it is a climatic event related to the lunar effect or whether the rainy season is considered a resting season.

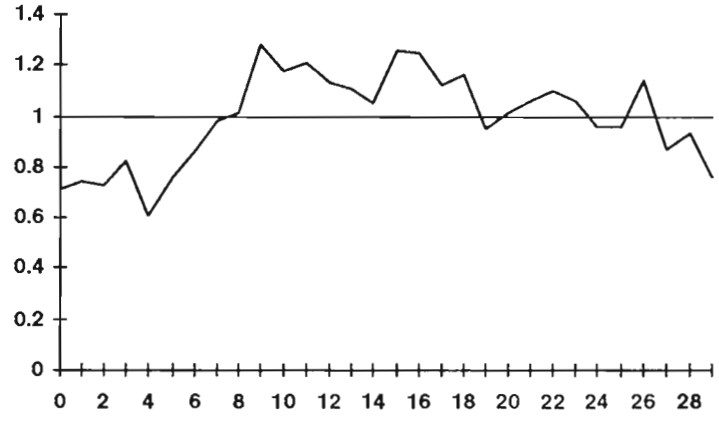

Figure 4: The deseasonalized average rate of trips by lunar day (year 1995, all ports)

2. Analysis by landing site

The analysis of the fishing activity of mini seiners by landing site is presented from West to East.

2.1. Eretan Wetan

Eretan Wetan is a constant and regular landing site throughout the year since activity at this TPI was observed 93% of days during the year 1995 (tab. 3). Approximately 70% of days with no landings are within the four periods of weak activity for mini seiners (2.1) and the remaining days are either before or after these same periods. More precisely, the general activity at the auction place in Eretan Wetan, whatever the fishing techniques used, is reduced during two periods (January 15-24 and December 5-18) corresponding to two of the periods of inactivity observed for the mini seiner fleet; this seems to confirm that these two periods are not favorable for coastal fishing activities.

The fishing units recorded at the auction place in Eretan Wetan use diverse fishing techniques: gillnets, Danish seines, mini seines, ... Although the maximum entries recorded for one day is close to 50, it seems that this auction place saturates at 22-25 daily landings, all fleets included.

In 1995, mini seiner units landed at this port only two thirds of the working days of the auction place with an average number of daily landings of 3.35 calculated for this period of 216 days (tab. 3). In Eretan Wetan, there are no days where a large number of mini seiners was seen landing; in general, there were less than 7 daily landings (95% of observations).

The study of the seasonal variation of the number of entries highlights two main periods; on one hand, from May to October (75% of annual entries of mini seiners, tab. 3) the units landed almost every day (84% of working days) with an average number of landings generally greater than the annual average (3.83 observations by day studied); on the other hand, from December until March where the average number of landings is weak (1.83) with a small number of days present along the dock (tab. 3).

2.2. Pekalongan

During the year 1995 in Pekalongan, entries for mini seiner fishing units were recorded less than one out of every 2 days (45%) for an annual average of a little more than 12 daily entries (tab. 3). Contrarily to the preceding port, there is a very large variability in the number of daily entries with a maximum observed of 56. One fifth of the days observed registered more than 20 observations.

The annual activity calendar describes two periods with strong landing activity of mini seiner units separated by periods with very minimal activity:

- from March 20 to the end of June with activity two out of every three days, and an average of 21 entries per working day;
- between September 15 and the end of October having the same activity rate as the previous period but with an average number of landings per working day much lower, around 11 or 12 entries.

Between these two periods, the number of landings observed in Pekalongan is very weak (20 to 50% of days are worked for an average of approximately 5 entries per day).

More than 90% of units that land in Pekalongan originate from towns located in the province of East Java.

One particularity of Pekalongan is the almost complete absence of landings during the week that includes the full moon and this for periods of both high and low activity. Pekalongan is the only one of the six ports studied where the activity of fishing units measured by their landings is directly or indirectly related to the lunar cycle.

As a landing site for mini seiners, Pekalongan therefore shows a strong variability in terms of presence-absence of these units and in terms of numerical significance of their presence. This strong variability is explained, directly or not, by an activity cycle related to the lunar cycle.

2.3. Banyutowo

The port of Banyutowo, also called Tayu, is a small landing site for fishing units using various techniques and making fishing trips very close to the coast. It is used by the fleet of mini seiners when these units are fishing in areas near this village. A large majority of these units are not from Tayu; in 1995, 60% of the entries recorded were units coming from Pandangan, a village located close to Tasik Agung (fig. 2) and almost 40% from the village of Sarang (fig. 2).

In 1995, mini seiner units landed their catches a little more than 2 days out of 3 (except for the month of May that was not studied) and for each day recorded, approximately 4 units were observed arriving. Here, as in Eretan Wetan, although the activity seems sustained all year long, the daily variation of the number of landings is weak: for 80% of days recorded less than 5 fishing units landing.

For the period from August to November, the activity of these units at the port of Tayu seems to be a little stronger both in terms of days present and the number of units landing.

No lunar effect seems visible since the landings were observed both on full moon days and days surrounding this lunar phase.

2.4. Tasik Agung

In 1995, at Tasik Agung more than 8,100 entries of mini seiner landings were recorded during 329 working days (tab. 3). The percentage of days with entries is greater than 90%. This auction place therefore has regular activity all year long.

With the exception of a few landings by large and medium size seiners (Potier *et al.*, 1995), this TPI only records mini seiner landings. The fishing units that unload their catch here are not native. In 1995, 41% of landings recorded were units from Pandangan (another TPI of Rembang), 48% from Kragan and 11% from Sarang.

The average number of entries per working day is around 25 entries recorded (tab. 3). The variation of this parameter is strong since the daily maximum observed in 1995 was 88 entries.

During 1995, it is possible to pinpoint two main operating periods for this TPI:

- from December to the end of February (before the *Ramadan* period): the rate of days worked is close to 80% and daily activity is clearly inferior to the annual average with approximately 15 entries per day;
- from mid-March (after *Idul Fitri*) to the end of November: activity is constant, almost 100%, and the monthly average number of sales recorded is close to or greater than the annual average. During the months of June and July, there is a slight decrease in the average number of daily entries.

In terms of activity, Tasik Agung, an auction place in the village of Rembang is similar to Eretan Wetan with regular and sustained annual activity however this activity is limited to mini seiner units whereas Eretan Wetan also records catches by pluri-technical units. Another difference between these two ports is the variability of specific landings by mini-seiners; the port located in the province of West Java has a low daily variability, which was not observed in Tasik Agung.

Table 3: Main information on the activity observed at the ports under study (Ne; number of mini seiner entries; Nje, number of days with mini seiner landings recorded; Ne/Je, average number of entries by days with entries; Nje tot, total number of days with entries recorded during the month for the pluri-technical TPI of Eretan Wetan and Kranji)

	Month												Total
	1	2	3	4	5	6	7	8	9	10	11	12	
Eretan Wetan													
Ne	28	18	6	68	152	63	86	58	112	95	72	4	762
NJe	14	7	5	14	24	23	24	25	29	27	20	4	216
Ne/Je	2.00	2.57	1.20	4.86	6.33	2.74	3.58	2.32	3.86	3.52	3.60	1.00	3.35
Nje tot	23	27	26	30	30	30	30	30	30	31	30	24	341
Pekalongan													
Ne	79	49	393	538	247	240	6	81	162	218	96	10	2119
NJe	13	8	15	20	18	19	3	15	18	18	15	6	166
Ne/Je	6.08	6.13	26.2	26.9	13.7	12.6	2.00	5.40	9.06	12.1	6.60	1.67	12.81
Banyutowo													
Ne	87	54	51	56		38	53	90	120	170	151	66	936
NJe	18	17	15	20		16	20	27	26	30	28	21	238
Ne/Je	4.83	3.18	3.40	2.80		2.38	2.65	3.33	4.62	5.67	5.39	3.14	3.93
Tasik Agung (Rembang)													
Ne	256	206	656	882	824	677	641	902	974	822	749	485	8143
NJe	20	20	22	29	31	30	31	31	30	31	30	24	329
Ne/Je	12.8	10.6	29.9	30.6	26.8	22.7	20.8	29.4	32.7	26.6	25.2	20.3	24.75
Sarang													
Ne	382	439	675	415	323	303	666	1010	791	873	812	732	7451
NJe	28	25	25	24	29	29	31	31	30	31	30	27	340
Ne/Je	13.6	17.6	27.0	17.2	11.1	10.5	21.5	32.7	26.3	28.6	27.1	27.1	21.91
Kranji													
Ne	34	3	8	14	35	6	77	92	129	216	135	89	838
NJe	12	3	8	9	13	5	25	23	29	28	25	19	199
Ne/Je	2.83	1.00	1.00	1.55	2.69	1.20	3.35	4.00	4.45	7.71	5.40	4.68	4.21
Nje tot	15	16	14	14	15	12	29	25	29	29	25	24	247

2.5. Sarang

Sarang, a TPI located on the eastern fringe of the province of Central Java (fig. 2, n°6), shows an activity slightly greater than in Tasik Agung as 93% of days in the year 1995 were worked. On average during the year, a little less than 22 mini seiner landings were recorded on active days of this auction place. Here, as in Tasik Agung, the daily variability is high between observations of only one landing (7 times during the year) and 70 landings on the same day.

As with the previous location, there are two main activity periods:

- the first semester with sustained activity but always below 100% (from 80 to 96%). The average number of daily entries is always clearly inferior to the annual average. Only the period in March, after the end of the *Lebaran* holidays, shows a daily activity greater than the annual average;
- the second semester when 100% of days are worked, with a daily rate of entries greater than the annual average.

In Sarang, more than half of the landings are for fishing units registered in Sarang, 44% in Kragan and only 2% in Rembang.

2.6. Kranji

Kranji is a location where fishing units using various techniques land, with a predominance of mini seiners. They represent two thirds of the 1,428 entries recorded in 1995 (amount calculated for the period May-December). During that year, entries were made on 247 days (67%, tab. 3) and mini seiners landed during three quarters of these working days.

On days with activity, an average of more than 5 mini seiners land their catch at this auction place. These units are mainly from Kranji or bordering villages.

Conclusion

The units from the mini seiner fleet operate all year long with a few short periods of inactivity generally corresponding to the beginning and the end of the Indonesian *Lebaran* period.

This general activity can be divided into an annual cycle with strong activity from July to November and reduced activity during the rainy season from December to March.

The landing ports for the fleet of mini seiner units can be broken down into four different operating methods:

- Eretan Wetan, Banyutowo and to a lesser degree, Kranji: they are ports where pluri-technical fishing units land; never representing large numbers of mini seiners and the fishing units are generally migrant.

- Sarang, Kranji: the landings are dominated by native fishing units. Mini seiner units from neighboring villages are unloaded at these ports. The activity is busy, sometimes very busy.

- Tasik Agung is a special case in that it is an auction place that specializes in large, medium and above all mini seiner fishing units; this specialization concentrates mainly in the commercialization of small pelagic species. These units are all from other neighboring ports and the activity is constant and very busy.

- The port of Pekalongan which does not fit into any of the above descriptions. This port welcomes mostly migrating fishing units and the variability of the landing activity of mini seiners is very strong during the month.

For 1995, the mini seiners landed their catches from the Java Sea during approximately 325 to 330 days: this indicates a relatively high global activity rate for the fleet since more than 90% of days during the year were worked. Now this maximum duration of activity for the fleet, its potential activity, must be translated into an average annual activity

rate calculated by fishing unit. This future analysis will have to use the known information on the activity of the units by establishing activity calendars by fishing units and taking into consideration the peculiarities of each port where the catches were landed. In effect, these peculiarities can determine the different exploitation dynamics by large groups of fishing units (Wijopriono *et al.*, 1996).

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The fishing activity of the coastal seiners of the Java Sea an approach by individual schedule of activity

Ecoutin J.M.[1], Jung A.[2] and Dharmadi[3]

Abstract: This article offers a new approach of study about the fishing activity of the coastal seiners operating in the Java Sea. In 1995, about 20,100 investigations were carried out from some villages located along the north coast of the Isle of Java. From these investigations, the fishing activity of some individual fishing units is analyzed daily; it allows to describe the different biases issued from this survey.
From these individual schedule of activity, the main fishing strategies of this coastal fleet are presented.

Keywords: purse seine, artisanal fishery, fishing activity, methodology, Java Sea, Indonesia.

The global fishing activity of the coastal seiners fleet of the Java Sea was studied by using a global schedule of activity (Ecoutin and Dharmadi, 1998). This study describes the global activity of the fishing units without individualizing them by following the landing catches. It allowed us to show that this traditional fishing fleet depicts a steady global activity as in 1995 it worked between 330 and 340 days (Ecoutin and Dharmadi, 1998). The study on the global activity of the fleet has also permitted the observation of differentiated activity dynamics depending on the ports investigated. Such differences can be explained either by the physical configuration specific to each port or by the social behavior of the units related to the owners (Ecoutin and Dharmadi, 1999).

Although this global approach gives us a lot of information on the dynamics of the fleet it does not enable us to estimate the parameters necessary to evaluate the contribution of this fleet to the fishing production of the Java Sea. An estimate of the fishing effort, eventually expressed in numbers of outings by unit of time, is inevitable to get this information.

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The size of this inshore fleet is now known thanks to the censuses carried out in 1995 (Jung, 1998; Jung and Ecoutin, 1999). About 1,500 to 1,600 mini seiners share out the North coast of Java Island between Sunda Strait in the West and the Strait of Bali in the East (fig. 1). The geographic distribution of these units is known now and a stratification by large geographic zone is possible (Jung, 1998; Jung and Ecoutin, 1999).

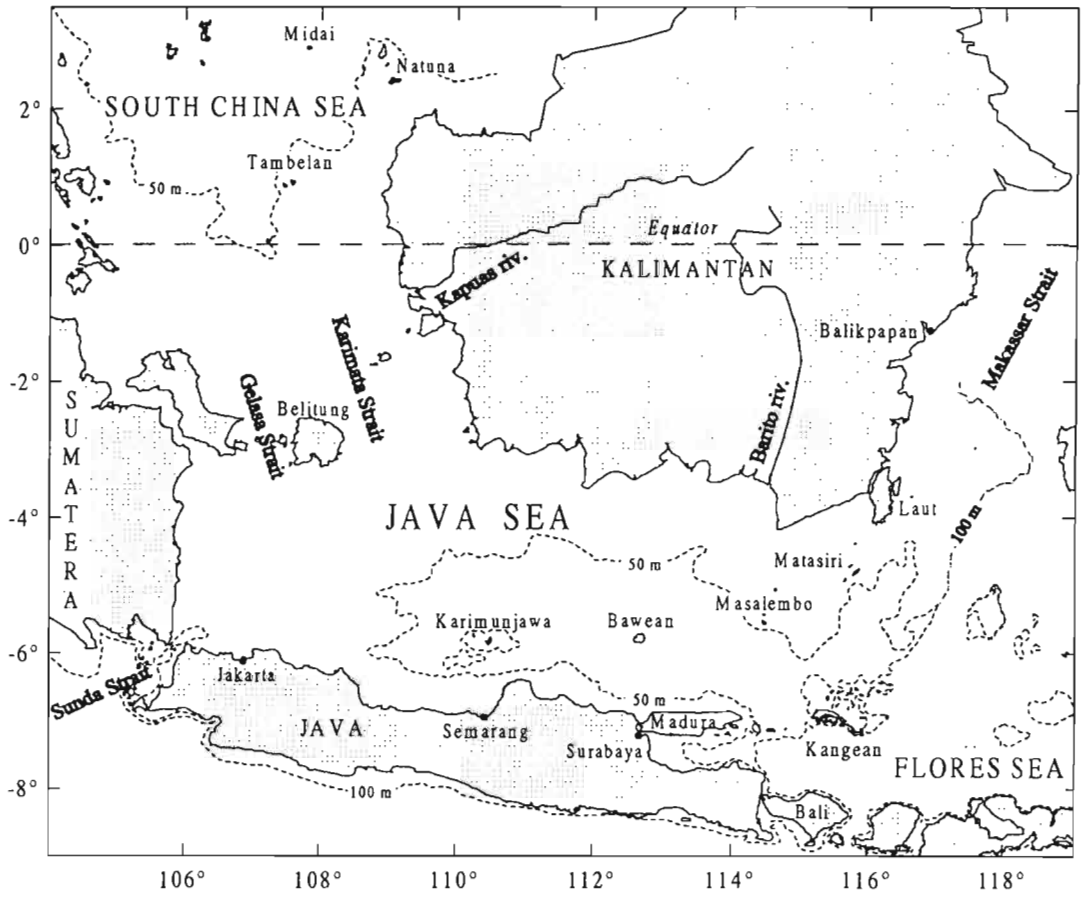


Figure 1: The Java Sea and its environment

The purpose of this study is to take the first steps to comprehend the fishing effort of this inshore fleet in methodological terms. An important part of this work deals with the analysis of biases leading to an undervaluation of this parameter.

The approach using individual schedules allows the study of long-distance migrations or moving between nearby ports. The aforementioned authors have already brought up these aspects.

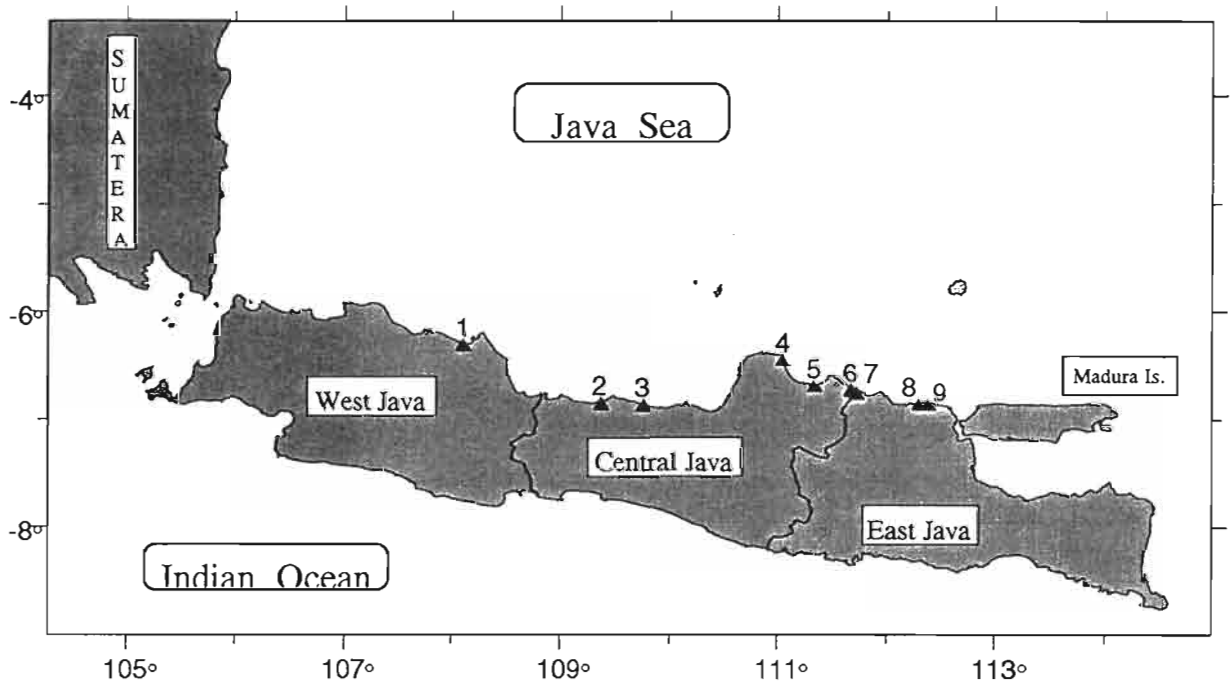
During the year 1995, many investigations on the landings of these units in various places along the coast allowed the estimation of how important the landings were both in weight and revenue (Ecoutin and Atmaja, 1999). These landings are described in global quantity and according to the main marketing categories (grouping together of close species, both biologically and commercially). The average yields may as well be presented according to a geographic stratification.

Material and methods

1. Presentation of the investigations

The study is carried out from daily statements of the unloading of the inshore small seiners. In 1995 these investigations were made in eight important ports of the North coast of Java Island (fig. 2). This choice draws on the first censuses taken of the coastal small seiners, which operate in the Java Sea (Ecoutin *et al.*, 1997).

The selection plan included a ninth point of inquiry, the port of Brondong situated in the province of East Java (fig. 2, n°8). This port was the object of a specific monograph (Luong, 1997); its results could not be taken into account in this article.



Port n°1 - Eretan Wetan
Port n°2 - Pekalongan
Port n°3 - Batang
Port n°4 - Banyutowo
Port n°5 - Tasik Agung
Port n°6 - Sarang
Port n°7 - Bulu
Port n°8 - Brondong
Port n°9 - Kranji

Figure 2: Geographic zones of the ports in the study

Each sale of a part of a fish landing per fishing unit is registered in a buyer 's book[4] by the administration of each auction (TPI, *Tempat Pelelagan Ikan).* The investigations are then regrouped by fishing units and copied out on specific sheets. On these sheets indications may be found allowing the identification of the fishing unit (names of the boat, the owner and the captain; the fishing unit place of origin), information on the fishing outing (location, time spent at sea, possible use of fishing aggregating device), as well as the composition of the catches by species categories, generally ranging from 6 to 8. The composition is given in weight and often in value (Ecoutin and Atmaja, 1999).

[4] This book is called *buku bakul.*

In 1995 about 20,100 investigations[5] were carried out and validated for six villages taking part in the study. The investigations of the port of Batang (fig. 2 n°3) are partially validated and can be used for a study on the fishing activity; they will be used case by case depending on their level of validation. The data on Bulu village (n°7, fig. 2) were far too incomplete in 1995 to be taken into account for this study.

2. Observation unit

The observation unit is made up of a fishing unit, which lands its catches one day of the year in one of the investigated points. This analysis is based on the individualization of each fishing unit by a unique identifier composed of a name describing the boat and, if possible, the village of origin of the unit. The village of origin is defined by the owner's place of residence (Jung, 1998).

The notion of village of origin of a fishing unit allows linking the study files of the daily landings of the units to that of the three censuses conducted in March, June and November 1995 (Jung, 1998; Jung and Ecoutin, 1999). The last series of investigations may help the validation of the activities observed and has the great interest of having been registered independently of the collection of data on the *buku bakul.* Indeed, Pelfish teams conducted the censuses; therefore the results are independent of those provided by the fishing services in authority over the auctions.

3. Analysis principle

The principle of this analysis is based on the creation of a 365-day chart describing the daily information collected for each fishing unit. This chart is filled in with the code of the observed location where a daily investigation was conducted for the studied fishing unit. This schedule of yearly investigations (activity diagram) is completed with the information on sea outings lasting more than one day. Some investigators point out the fact when the unit spends more than one day at sea, therefore the days before landing are registered as days at sea.

Example n.1[6]: during the 12 months of 1995, the unit *Tambah Sumber* was under investigation 72 times in the auction place of Tasik Agung (Rembang), 6 times in Tayu and twice in Sarang (fig. 2). On this group of investigations, 70 days with the observation of landings (see the 1st of January, code 'TAA' of the chart in annex) and 7 days spent at sea (code 'sea', the 28th of January) were positioned without any problem. The ten investigations that are not positioned on this chart (80 investigations – 70 days of landing shown on the activity schedule) describe the first two problems encountered during this analysis:

- The information on a landing day may be completed by an indication of presence at sea that very day. This indication comes from an investigation subsequent to this landing day. For the example studied, this case was noted 6 times (see code 'TAA*' on the February 19th: that day the fishing unit landed at Tasik Agung auction and the day after at Sarang 's while the investigator of the latter village pointed out that the unit was out at sea the day before, that is to say the whole of the 19th).

[5] An investigation corresponds to different information describing the full unloading of a fishing unit; indications on the unit identification, information about the fishing outing and the composition of the catches from this fishing outing.

[6] All the examples cited in the article, are described in final annex.

- Two investigations may be recorded on a same day[7] for a same fishing unit identifier (example on February 3 where code 'TATA' shows the presence of two inquiries for the same auction at Tasik Agung). This problem was here observed twice (February 3rd and March 12th).

An intermediate case was noted by code 'sea*' (observed once, December 17th). It points out that for the same day, two different investigations give an indication on the presence at sea of unit *Tambah Sumber*: investigated on December 18th, the unit is seen out at sea the day before, investigated on the 19th as well, it is said to be at sea on the 17th and the 18th.

Example n.2: the fishing unit *Akar Sakti* was observed 77 times during the 12 months of 1995 (74 at Sarang, its port of origin, twice at Tasik Agung and once at Tayu, fig. 2). For 56 of the landings there is no problem whatsoever; these observations are completed by 30 indications of presence at sea. Moreover 4 indications of investigation of landing are associated the same day to an indication of presence at sea and 6 indications of multiple daily investigations are observed. Three days describe new major problems:

- indication '****' (observed on August 21st) shows a minimum of three pieces of information for the day: that is to say, one landing of the catches at Sarang on the 21st and two indications of presence at sea due to two landings observed on the 22nd at this same auction;

- on March 25rd (code 'SAS*') with two landings observed the same day at Sarang and an indication of presence at sea via the investigation of the 26th. We have three different indications for a same day here as well;

- finally on October 14th (code 'SATA') this same fishing unit is pointed out as landing both at Sarang and at Tasink Agung. Despite the short distance between the two auction places, the case is usually considered as abnormal.

Although they may be explained in the example above-mentioned, the three problems demand that the status of uniqueness of the fishing unit studied should call for caution.

Their repetitions along the year indicate that the unique identifier might not describe only one fishing unit but several units identified under the same name.

Example n.3: the case of *Hasil Laut* where 24 days show a discrepancy among information to which 45 days describing problems of interpretation as encountered in the first example should be associated; under this denomination at least 4 units *Hasil Laut* numbered from 1 to 4; they are all originated from the same village and probably belong to the same owner. The existence of these four fishing units *Hasil Laut* was confirmed by the results of the 1995 censuses. The distinction between these units said composite unit is not necessarily noted on the *buku bakul* by the staff of the fishing department during registration of the landing.

4. Analysis of the biases

The three examples above-mentioned describe the main difficulties encountered in the context of this study of the fishing activity using daily activity diagrams. Most of these problems are related to the identification of the fishing unit; they may be divided into two groups:

[7] In this article, two (or more) investigations conducted the same day, in the same port or in two different ports, are called "multiple daily investigations".

- copying or translating mistakes of data capture at the auction places or eventually during the data keyboarding;
- omissions in the collection of the information making a proper identification of the units impossible.

The analysis of these difficulties that generate biases in the handling of the information still allows the information to be sorted out in order to find out what may be used and what may not be used later on.

In 1995 the file with the data collected in the six ports of study contains 1,693 denominations of fishing units, which would mean that the fishing units investigated in those ports would represent the whole fleet listed in Java Island, including the one observed in Madura Island and in the ports located in the South of Madura Bay (Jung, 1998). Yet according to censuses conducted in 1995, about 50% of the inshore seiners are to be found in those two geographic zones.

The number of fishing units investigated less than 10 times represent 75% of the whole number of units observed in the six points of investigation. Only 17% of the units present over 20 observations during the year 1995 (tab. 1). This aspect is a real problem for a study on the fishing activity of the mini-seiners fleet.

Table 1: Distribution of the number of denomination of fishing units by category of investigations conducted

Number of investigations conducted	Number of unit denominations		
	original file	after validation	including composite units
1-9	1295	1185	0
10-19	122	124	2
20-29	65	67	3
30-39	48	51	7
40-49	32	32	7
50-59	28	29	4
60-69	27	27	6
70-79	18	17	8
80-89	13	17	6
90-99	14	9	8
100-109	8	9	8
110-119	4	3	3
120-129	4	6	5
130-139	3	2	2
140-149	4	2	2
150-159	1	2	1
160-169	1	0	0
170-179	2	2	2
180-189	3	4	4
190-199	1	0	0
260-269	0	0	0
Total	1693	1588	78

4.1. Comparing the names of fishing units

The summation of the information contained in the activity schedule allows to spot if two names with only slightly different spelling may correspond to a same fishing unit. By comparing only the cases where the number of grouping is over 50 investigations, it is possible to make a distinction between the following situations:

- Presence of an identifier observed several times with two or several similar names together with a figure listing versions of this identifier. Even if the number observed by numbered unit is low, it always regards a description of several real units that the investigators have not necessarily differentiated (example *Hasil Laut* above-mentioned). The schedule of the composite unit[8] always shows difficulties of interpretation such as the observation of two inquiries a same day at a same auction, and very often discrepancies, major errors, such as the presence of a same unit at two different auctions. This composite unit may correspond to:

  - either the grouping of units that are not well identified but described in theory by an additional identification characteristic; this composite unit does not actually exist (unit *Hasil Laut* is present in four instances identified from 1 to 4 but the term *Hasil Laut* describes no actual fishing unit);
  - or the grouping of units to which a real fishing unit using the composite name should be associated.

- Presence of a basis identifier and of a similar name together with a figure or a letter, still in very low numbers (ex: *Akas Perkasa* and *Akas Perkasa* 2). The two units are first merged under one and same fishing unit denomination.

A first validation of the names of fishing units (1,693 denomination) took into consideration errors in the data capture and information processing linked to a situation explained above. The result of this validation gives a data file with 1,588 different appellations. The hundred of names that have vanished mostly concern the units that were not often investigated upon (fewer than 10 investigations within the year, tab. 1).

The part of the composite units, that is to say the ones, whose denomination matches the presence of several actual units, is predominant in the observed categories in high numbers (tab. 1). They represent over three quarters of the observations for the categories superior to a number surveyed in 100 yearly investigations and 100% of the observations for the two most important categories (more than 170 yearly observations).

4.2. Study of the multiple daily investigations[9]

The fishing units investigated twice or more within a day are spotted out from the 1995 date files. These different observations come either from a same place or different places of investigation.

After the validation of the names, 251 units present at least one observation of multiple daily investigations within the year 1995 (tab. 2), which still represents 1,115 days with this indication.

In 1995, 12% of the investigations encounter this type of problem. Some units are described as making as many as 5 landings the same day; but 90% of these days with multiple investigations report only two landings.

For some of these units it is not really a problem, it corresponds mostly to the observation of composite fishing units that are not identified properly by the investigators; they are not described with their complementary numbers (example n.3, unit *Hasil Laut*). Consequently, all the descriptions of composite units were removed, which corresponds to 78 names of fishing units (tab. 2).

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[8] A composite unit describes a boat whose denomination corresponds to the identification of several actual units.

[9] A multiple daily investigation describes the observation on a given day of several pieces of information, eventually contradictory, regarding one and only fishing unit (example n.2).

This withdrawal represents only 31% of the names, but 66% of multiple investigations and 67% of the number of investigations.

Table 2: Description of the multiple daily investigations before and after the withdrawal of the composite units

	fishing units	Number of days with multiple investigations	investigations
Before the withdrawal	251	1155	2441
After the withdrawal	173	393	812

Regarding the rest, two cases were considered depending on whether the multiple investigations were or were not carried on the same landing spot. About 4/5 correspond to investigations from a same place.

* Landing at a same location

In this case the interpretation takes into consideration the geographic situation of the port as well as the available knowledge on its mode of functioning. About half of the multiple investigations are observed at Tasik Agung with half of the quadruple investigations observed. The example of Eka Perkasa of March 30th shows that it is often an arbitrary creation by the investigator, from two investigations where in fact there must be only one: similar description of the characteristics of the outing, short time between the registrations of the landing, fishing location; moreover at Tasik Agung, an landing in the morning followed by another in the afternoon seems to be rather uncommon. The landing of these fishing units may have taken longer than usual. The investigator, using the files of the *buku bakul* may arbitrarily set up two investigations for one landing.

The observation of these combined investigations at the auction at Sarang is slightly different, as the fishing units may develop, daily, two types of tactics called *anggas* and *tendak*. They correspond to different choices of fishing aggregating device[10] (size, equipment, lifespan, fishing place; Jung, 1998). The former takes place at night and the catches are landed in the morning; the latter takes place during the day and the landing takes place in the afternoon. Some daily multiple investigations correspond to the series of the two tactics within a day. In 1995, 245 investigations involving 119 cases of multiple investigations were observed at Sarang, that is to say about 3% of the total of the investigations. If this bias slightly reduces the estimation of the total yield, on the other hand it interacts with the yield by marketing category.

Among these 119 observations, 40% correspond to changes of tactics within the day. Time proximity of the multiple investigations indicates that the remaining 60% are due to copying errors by the investigator who justifies two investigations when there most probably is only one. For the following handlings the description of two investigations within a day at a same location is therefore taken as only one day of activity, the objective being the validation of the activity diagrams. On the other hand this correction will have to be discussed for other analysis, particularly the ones opposing tactic *anggas* to tactic *tendak*.

The analysis of the few multiple daily investigations conducted at Tayu (1 observation), Eretan Wetan (4), Pekalongan (20) and Kranji (19) draws the same conclusion: the grouping of the investigations whenever there are only one landing location. In the study of fishing activities, only the first investigation is taken into account.

[10] Fishing aggregating device called *rumpon* in Indonesian.

* Landing on different investigation locations

The presence of one unit in at least two different locations is first considered as a major error invalidating the investigation of the fishing activity. This case is observed slightly less than a hundred times in 1995 (0.4% of the investigations conducted) and concerns about fifty fishing units. Some descriptions are made impossible due to the distance between the two points. Others might eventually be given, as some TPI are only distant from 40 to 50 km. Among the fifty fishing units, 34 correspond to:

- either units usually well individualized but belonging to a family of composed names (*Sumber Baru* 1 to 14) a mix-up with two unit numbers may explain the problem;
- or units allowing uncertainty to persist on their individuality status.

These investigations are invalidated for the analysis of fishing activity, therefore the choice of treating this case as a major error remains.

4.3. Study of the double information landing-presence at sea

During the investigations, some investigators give a parameter called "Number of days spent at sea". This parameter was systematically registered at Sarang, at Tasik Agung and at Tayu for the first seven months of the year. Unfortunately the information cannot be fully compared for the three locations.

At Tasik Agung[11], the fishing outing is mainly defined as leaving in the afternoon, spending one or two nights at sea and coming back early morning to unload and sell the catches. For a well-identified unit, code 'TAA*', which represents 1.3% of the observations, should not be observed in an activity chart, for it would mean that a fishing unit unloading its catch one day is registered the day after in a new investigation as fishing two nights in a row. The situation "only one night at sea" does not cause any problem as it means a departure in the afternoon and coming back the following morning, this sequence may be repeated several days in a row.

At Sarang, the outings at sea lasting more than 2 days represent 7.5% of the investigations. It describes two different situations depending on whether the fishing units were registered for a *tendak* or *anggas* outing. The *tendak* outings only can exceed two days (13.7% of specific observations). This sends us back to the study of these two outing tactics.

At Tayu, the outings exceeding two nights represent about 2% of the observations.

This difficulty of interpretation may have several explanations; the first would take into account the possibility of having a fishing unit sell another unit's catches (Luong, 1997). The unit concerned would then remain at sea for an extra fishing night without having to commute from its fishing location to its port. For its captain, this unit is considered as having spent at least 2 nights at sea, whereas according to the TPI it landed twice.

Another explanation may be linked to a succession of different landing places. For various reasons, a captain may choose to say that he spent only one several-day outing at sea, especially if his last catches landing takes place at the unit's port of origin.

Such a problem is considered a small bias if it is not observed on a same activity diagram on the one hand (eventually associated with actual errors) and on the other hand when the various auction places are close enough.

[11] At Tasik Agung, between December 16th and December 22nd, a night was withdrawn for the data of this period.

5. Calculation mode of the activity

The number of potential working days is calculated for each fishing unit. This number corresponds to the period between the first and the last investigation conducted in the year. The activity period in 1995 was recorded without including the days known as showing no activity; these days are defined as days without the slightest observation of landing of mini seiners, whichever the PTI (Ecoutin and Dharmadi, 1998). According to this article, in 1995, eleven days are reported without the slightest activity for this fleet: one day in January and February 6 in March and 3 in December. However, the authors bring to attention the fact that, in 1995, 40 days may be considered as days with low or no activity at all, but the calculations are made on a basis of 11 days without activity.

First, the activity is calculated in two complementary ways: on the one hand by the calculation of the investigation rate defined as the ratio of the number of validated investigations to the number of potential working days; on the other hand by the estimation of a total ratio of activity defined as the proportion of nights at sea[12] compared with the total number of nights that could be spent at sea. For the calculation of the global activity rate, the number of days with a priori validated landing is taken into account as well as the days with the observation of double landing at a same landing place (therefore validated a posteriori) and the days unquestionably spent at sea.

Three types of variables are decided on to analyze the activity of the inshore mini seiners of the Java Sea:

- descriptive variables: name of the fishing unit, number of months of observation in 1995, number of landing places observed in the year, number of registered villages of origin, number of potential working days,
- informative variables: those are different parameters described above: number of investigations conducted, number of validated landings, of days at sea, of days with discrepancy, ...
- synthetic variables: those are the proportions calculated between the informative variables, the calculation of the investigation rate and the rate of global activity.

Results: analysis of the fishing activity of the seiners fleet

Following the different choices resulting from the analysis above (proofreading of the names of the fishing units, withdrawal of the composite units, adding up of the multiple investigations conducted on a same location, specific study of the time spent at sea according to each location, yearly number of observations exceeding 20, ...), the reference file is composed of 197 fishing units

The average global rate of activity calculated from this population is 19% lower for an interval ranging from 5 to 46%. At this level of the analysis, the fishing units would be active less than one day out of five and they would land every eight days.

To continue the analysis on the fishing activity, some specific cases are selected from the database. The units chosen are then studied case by case to interpret the time sequences of the activity described. It is at this stage of the analysis that the results of the various censuses conducted on this fishing fleet in 1995 (Jung, 1998; Jung and Ecoutin, 1999) may be used. They allow the interpretation of the activity diagrams and the validation of the resulting rates.

[12] The fishing operations take place almost exclusively at night.

1. Units landing in 5 different locations

In 1995, three units[13] respecting the identification criterion landed their catches at least once in five different ports. They were investigated over 80 times during the year and observed in the same five villages (Sarang, Tasik Agung, Tayu, Pekalongan and Eretan Wetan, fig. 2).

Although they were first considered as non-composite units in the activity file, the analysis of the activity schedule of these units, together with information from the censuses, requires reconsidering the status of two of them[14].

Example n.4: unit *Sumber Urip*, observed 99 times during the year presents time sequences of landing places which are hard to explain (see the one given from May 26th to June 3rd). It can not possibly land its catches the same day or with a 24-hour interval at Pekalongan on the one hand and Tasik Agung on the other hand (fig. 2). Moreover, its activity diagram points out that 6% of the observation consists in major discrepancy, throwing a doubt on its status of uniqueness. The further information from the auction at Batang puts the error rate at 23%. The analysis of the censuses file points out the existence of three units spotted under the same name; if one of the three is not involved in our study zone, because observed in the South of Madura Bay, the other two, originated, one from Sarang (Central Java), the other from the province of East Java, must be part of our activity sampling. The merging of the information regarding two fishing units is most probably responsible for these difficulties of interpretation; the analysis of the information collected only at auctions of Rembang Bay produces a legible activity diagram.

Only one unit of this selection seems to meet the criteria allowing the study of the inshore seiners fishing activity, it is *Jaya Sakti*, originated from Sarang. Only one investigation conducted at Eretan Wetan, on February 23rd, might cast doubt on the uniqueness of this fishing unit; this observation is noted down in an activity sequence in Rembang Bay (fig. 2). This unit listed as one and only, originated from Sarang, is taken into account as not composite and the investigation conducted at West Java is invalidated. Once this correction is accepted, the activity global rate may include the days involving landing together with an indication of presence at sea (cf. 1.4.3), this rate is then estimated at 29%.

2. Units landing in four surveyed villages

A few units were observed at four different auction places during 1995. Two of these locations, Sarang and Tasik Agung, are always represented and constitute the majority of investigations forming the activity diagrams. The other three (Pekalongan, Eretan Wetan and Tayu) of close importance in numbers of described units, present two patterns: at Tayu, the units land alternately with the two main villages; for the two other ports, the activity diagram describes either one or two yearly observation of presence within a pattern centered on the two main ports, or a time sequence superior to one month.

Three validation outlines are identifiable for the six units in this case:

- two units must be interpreted as composite units[15] as, in the censuses file, they refer to more than three fishing units presenting the same identifier (*Barokah*, *Jati Kembar*);

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[13] A fourth fishing unit should have integrated this selection, unit *Rahayu* , which is observed at Eretan Wetan, as a mini seiner unit as well as a unit *chantrang*. From the results of the landing in this port, this fishing unit is considered as a *chantrang* and therefore withdrawn from the lists. Moreover, during each census, at least nine units *Rahayu* are well identified as inshore mini seiners.

[14] *Sumber Urip*, *Usaha Jaya* and *Sumber Jaya*.

- a second group is composed of fishing units that are individualized clearly during the censuses: they pointed out the presence of two units under the same identifier; one of these units is generally listed in the Tasik Agung- Sarang sector, and the other is observed in the West of Pekalongan, but often originated from East Java province (*Eka Jaya*, *Mulyo Jaya*). This concurs with the example described with *Sumber Urip* (example 4). The presentation of two different activity diagrams allows a better legibility of the information.

- finally a last group is formed by units identified as unique during the censuses, without major discrepancy in their activity sequences, but with one or two observations of presence in an inexplicable location during one of these periods. These few observations are invalidated in the activity diagram (*Mekar Jaya 3* and *Sumber Hidup*).

3. Units describing the highest activity rate

Out of the whole reference file, 18 fishing units present a validated activity rate superior to 30%. Among these eighteen seiners, three probably represent composite units that could not be spotted before: time sequence of landing on distant locations, high rates of major errors, steady indications of discrepancy and multiple daily investigations (*Nusantara*, *Sumber Baru 1*, *Sumber Baru 3*).

Among the remaining units, seven represent a perfectly legible activity diagram; these diagrams are confirmed by the information on the censuses, indicating the status of unique identity of the fishing unit. The other eight units are adopted as representative units, but give in their activity diagrams some information that is hardly consistent with the rest of the diagram: one fatal error in a diagram, in fact quite legible and confirmed by the censuses; the presence of the fishing unit, once or twice during the year, in zones that are far away from the main landing sector. Removing one or two investigations from a group of hundred by unit makes the activity diagram perfectly understandable. This type of validation was presented for unit *Jaya Sakti* (above).

Fifteen fishing units were finally adopted (tab. 4). In 1995, they were under investigation between 3 to 12 months; five units were registered within eight months or less, the other ten were observed during nearly the whole year. Their validated activity rate (column %act tab. 4) ranges from 30 to 46% for investigation rates ranging from 22 to 35% (%invest, tab. 4).

The average activity rate calculated for the validated fishing units, the most active of our group of fishing units, is on the order of 36%, which means that these fishing units were at sea one day out of three in 1995. Seasonal variations may be observed around this average (tab. 5). The average monthly values go through two optimum: on the one hand in March-April, on the other hand from July to November with a value superior to 40% in September.

[15] A composite unit describes a boat whose denomination corresponds to the identification of several actual units without possible selection among these fishing units.

Table 4: *Main parameters describing the activity of the most active fishing units (15 validated units, 3 invalidated units, see text)*

Name of the fishing units	Invest	month	place	origin	landing	at sea	day	m.d.i	%act	%inv	discr
Agung Jaya	77	12	2	3	69	26	348	10	30	22	0
Akas Baru	93	11	2	1	78	41	318	12	41	28	0
Bentul	91	12	2	1	74	24	342	11	32	27	1
Bintang Hikmah	75	12	2	1	67	33	343	6	30	22	0
Jawa Pos	87	8	1	Unkn	87	0	245	0	35	35	0
Liberal	25	3	1	1	23	4	73	2	39	34	0
Maju Mapan	94	12	3	3	82	32	351	7	35	27	0
Manteb	70	8	1	1	66	23	221	4	42	32	0
Othak	36	4	1	1	30	9	118	5	37	31	0
Perkasa	91	12	2	1	71	37	346	18	36	26	1
Sumber Baru 14	37	4	2	1	31	12	106	6	46	35	0
Sumber Baru 5	106	12	3	1	89	20	348	12	34	30	3
Sumber Hidup	84	12	3	1	66	30	351	14	31	24	1
Tambah maju	86	12	2	1	66	30	343	17	32	25	0
Usaha Jaya	91	12	3	1	84	23	349	7	33	26	0
Sumber Baru 1	142	12	3	1	98	24	353	22	40	40	8
Sumber Baru 3	161	12	3	1	96	16	352	31	40	46	11
Nusantara	109	12	3	3	71	26	351	22	33	31	7

Table 5: *Seasonal variation (in%) of the activity rate of the 15 validated units*

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Agung Jaya	37	26	8	43	45	23	29	29	47	26	20	18
Akas Baru		48	40	20	29	30	48	**71**	**50**	39	43	25
Bentul	10	26	40	27	35	20	48	32	43	35	23	32
Bintang Hikmah	10	22	28	43	19	10	35	45	40	48	43	11
Jawa Pos			32	43	42	17		32	**53**	48	27	
Liberal										26	**50**	21
Maju Mapan	43	26	40	23	23	23	32	35	27	35	43	46
Manteb					13	27	39	45	**53**	**52**	43	29
Othak									47	35	40	21
Perkasa	40	26	40	**50**	35	40	23	45	23	39	47	21
Sumber Baru 14									40	35	37	**50**
Sumber Baru 5	33	22	24	37	26	13	35	39	47	48	37	**57**
Sumber Hidup	27	30	**68**	37	29	27	29	19	23	35	37	18
Tambah maju	3	22	**60**	13	32	10	32	45	**57**	39	43	29
Usaha Jaya	30	18	44	30	32	30	42	35	40	23	23	39
Average	26	27	39	33	30	22	36	39	42	38	37	29

3.1. The example of *Akas Baru*

Akas Baru (example n.5) is the typical example of a fishing unit noted down in the village where it lands its catches: during the 11 months of known activity, 97% of the landing are observed at Sarang without the slightest discrepancy or serious error. The average rate of activity in 1995 (the month of January not taken into account) is of 41% and it lands about one day out of four. Its monthly activity changes from 20% and 71%, this figure being the highest monthly value noted in 1995 for a fishing unit. During these activity months we may observe 66 periods without investigations, lasting from 1 to 18 days. These periods without investigation may be observed every month at the rate of 4 to 9 times a month and the average length of this halt is on the order of 3 days; two thirds are inferior to this average. Most

periods without activity is very short with a few longer periods, some of which correspond to the general non-activity period of the fleet (Ecoutin and Dharmadi, 1998).

The activity diagram for the fishing unit *Akas Baru* serves as an example for 6 other units of the selection studied[16]. These units are observed six times out of seven in the port of Sarang, originated from the same auction place. The seventh case, which lands almost exclusively at Tasik Agung, is originated from Kragan.

These fishing units correspond to units whose village of origin is identified either the landing investigations or during the censuses. Almost all their landings are carried out at the same auction throughout the year and it mainly concerns the auction place of the unit village of origin: however the unit may change its landing place to an auction place closer to its usual spot, which is observed in at least 10% of the investigations.

Following his study in 1997, Jung (1998) describes a type of fishing strategy under the term strict *tetap* strategy that might correspond to the results described above. For this author, "units using a strict *tetap* strategy have a steady and uniform fishing activity throughout the year, with a fishing rhythm based on one or two nights at sea, without distinction of lunar phases".

3.2. Unit *Sumber Baru* 14

This fishing unit (example n.6) is originated from Pandangan like all the units named *Sumber Baru*; it was never noted down in a census before November 1995 whereas in June units *Sumber Baru* 1 to 12 were all seen. It must be a new fishing unit. During the last four months of the year, it shows a steady activity close to 47%. During this activity period, *Sumber Baru* 14 shows 18 periods without investigation for an average halt of 3.3 days. As for the previous unit, the short-timed periods are dominant (75% under average). The interesting point of this unit is its landing time sequence at Tasik Agung and at Banyutowo. This example shows how easy and fast it is to change landing place , the locations never being far one from each other.

The activity diagram of this unit is representative of the diagrams established for 5 or 6 units of our sampling[17]. These fishing units are originated from different villages of this part of the coast: they land their catches according to the exploited fishing zones. In his study, Jung notes down this type of strategy under the term *tetap pindah pindah.*

3.3. Unit *Jawa Pos*

This fishing unit, originated from Weru (example n.7) is noted down in the census in its village of origin beginning of March 1995, then it is observed in activity exclusively at the auction place at Pekalongan. It goes out 5 to 16 times a month during its months of activity: from mid-March to June, from August to November. This fishing unit has the feature of spreading its activity depending on a lunar cycle; it goes out at sea only from the sixth or seventh day after the full moon until the 20th or 21st day of the cycle. During these activity phases, it works almost every day. If the monthly activity rate is inferior to 50%, it strives to 100% in the activity phase linked to the lunar cycle. While at Pekalongan, *Jawa Pos* shows only one or two halts a month, one of them, the one centered around the full moon lasts from 14 to 16 days.

The story of this unit in 1995 is that of a migrant unit originated from Weru (East Java); during two four-month periods, it operates in the fishing zones close to Pekalongan and it goes back to its village of origin during the rainy season and *Lebaran,* both periods merging

[16] *Bintang hikmah, Bentul, Liberal, Manteb, Othak, Perkasa.*
[17] *Agung Jaya, Maju Mapan, Sumber Baru 5, Sumber Hidup, Tambah Maju* and *Usaha Jaya.*

in 1995. According to the interviews conducted during the censuses, the crew of a migrating unit takes advantage of the inactivity period of 14 to 16 days, centered on the full moon, to go back to their villages. They go back by road as the boat is moored at the fishing activity port. July is a month of low activity of this unit at Pekalongan and corresponds to the season between the rainy season and the dry season, it is a period of high hydroclimatic activity (strong winds and currents, Durand and Petit, 1995).

This activity cycle, modeled on the lunar cycle, has already been described for the whole of the activities observed at Pekalongan (Ecoutin and Dharmadi, 1998). This activity diagram applies to the fishing units landing at Batang. The sampling plan established for 1995 makes it possible to spot well-identified fishing units, among which *Jawa Pos* is the typical example:

- activity cycle modeled on the lunar cycle,
- 17 to 20 days of steady activity and 10to 12 days off,
- two main yearly activity periods from mid-March to mid-June and from mid-August to the beginning of November; some units are observed before the first period or after the second one, but it is rather uncommon,
- steady daily landing in different ports of Central Java or West Java during the seasonal migration,
- landing of the catches mostly in the same location during a lunar cycle,
- activity diagrams never describing difficulties of interpretation or major errors, the observed investigations correspond to the validated investigations,
- the boats used by these units are mainly kranji-shaped (Ecoutin *et al.,* 1997)
- units generally originated from the area of Lamongan.

Further to interviews conducted in 1997, Jung (1998) describes a diagram of migrating fishing units originated from this part of the province of East Java; these units head towards a port located in the province of Central Java, West Java or even South Sumatra. These fishing units operate according to the lunar cycle; Jung uses the Indonesian word *amen* to name this diagram.

4. Discussion

Despite a description of various biases and after discussion on the activity modes of the seiners, the highest activity observed in our inquiries never exceeds 50%. Our results are quite different from Jung's (1998) following the interviews conducted with the captains and owners of Javanese inshore seiners. According to Jung, the number of activity days during the month would be of 211 for the *tetap* type units and 188 days for the strategic *amen* units that is to say activity rates of respectively 72 and 65%.

Adding up the activity schedules of the whole of the migrating units investigated in 1995 to remove some individuals, the number of activity days is about 110 days. There is no observation of fishing outings for the period starting on November 20th and ending on February 20th; from February 20th to March 20th, from June 30th to August 15th and from November 1st to November 20th, the number of inquiries conducted seems to point out a lack of activity; from March 20th to November 1st, 10 days a month are days off. The difference between the value observed in 1995 (110 days) and the results gathered in 1997 (188 days) may be the fact of not taking into account the activity of a migrating fishing unit coming back to its village of origin; this period of presence in the village of origin is included between December and March; it corresponds on the one hand to the three inactivity sequences observed for the inshore mini seiners fleet (Ecoutin and Dharmadi, 1998), on the other hand to the winter monsoon season, time when the fishermen are less active. The difference of 70-80

days of activity seems too big to correspond only to the activity of the unit once back at its location of origin. The study of the 1995 data based on the adding up of fishing activities, the results involve only the most active migrating units, that is to say landing every day catches registered at an auction place, which makes an even bigger difference between the data.

The comparison of the results collected for the strategy *tetap* units (sedentary) is more difficult to establish. If we seem to have observed that some units describe a strict strategy *tetap* nothing can prove that no information means no activity; it might correspond to:

- unloading at auction places that are not under investigation, which would be contrary to the notion of fishing units with strict strategy *tetap* as described by Jung and confirmed here,
- unloading in the village under investigation, but not passing through the auction: low value landing, sale to a privileged buyer (Luong, 1997; Jung, 1995),
- no actual fishing outing, inactivity linked or not to the maintenance of the fishing unit.

Therefore the problem lies at the level of the estimation of the second proposition. The difference observed between the two sources of data is still quite important; in 1995, very few units describe a monthly validated activity rate equal or superior to the average rate calculated from the observations collected in 1997 (67%, a value reconstituted with the figures provided).

Comparing the two series of data is difficult for the units using a *tetap pindah pindah* strategy as the very definition of the strategy might explain the lack of information.

Elements of comparison

One comparison with close studies either in term of geographic zone, or in term of similar fishing techniques, may allow to put the results into perspective.

Pet *et al.* (1997) worked on a study on the coastal seiners of East Java area. Part of their data comes from the seiner fleet operating in Madura Bay and landing at Probolinggo (East Java). This fleet was taken into account during the 1995 censuses (Ecoutin *et al.*, 1997; Jung, 1998; Jung and Ecoutin, 1999). By reconstituting the information from the effort estimations provided by the District Fisheries Service in Probolinggo, the yearly activity would be of 44% for units going on one night fishing outings. This effort estimation is calculated from the average number of fishing units observed on a given day in the port of this province. Moreover, the official statistics come up with a total effort of 5,000 outings for 1993. Given a population estimated between 40 to 70 units[18] (Pet *et al.*, 1997), the activity rate would range between 20 to 35%, data similar to the observations collected on the North Coast of Java Island.

For the period between 1965 and 1967, Unar (1988) reports a yearly activity estimated to 169 days for a fleet of fishing unit using *chantrang* nets (identical to a Danish seine). It operates on the seabed between 5 to 30 meters in the Batang zone (Central Java). It represents a 46% activity rate. This figure is only slightly higher than the values above mentioned for the most active units. Unar has followed a small number of fishing units, all of new construction, registered in a fish cooperative; this activity may correspond to fishing

[18] The 1995 census provides the same kind of figures, between 48 and 71 units observed.

units of an active type: wish to reimburse the investment, coming up of a new fishing technique leading to the exploitation of a new option,...

At Pekalongan (Central Java area), the activity of a sampling of fishing units using gillnets is estimated at 132 days in 1993 (44 outings with an average of three-days outings, Wiratno and Mudiantono, 1995)

Although they are scattered and fragmentary, the three Indonesian studies give estimations that are of the same kind as those provided for the units estimated as the most active.

In the Ivory Coast, a seven-year study described a rather similar fleet in terms of fishing device, as it refers to purse seines (Ecoutin, 1992). The yearly effort of this unit, effort calculated on the whole fleet, ranges from 120 to 150 outings. But reported to an individualized fishing unit that is active throughout the year, this average effort is then superior to 190 outings, that is to say a rate of about 62%.

In Guinea, several traditional fishing fleets were investigated upon early 1990. The yearly estimated outing and activity rates are presented table 6. They are average values calculated for fleets composed of 50 to 200 units. Outing rates different from activity rates show that the fleet concerned goes at sea for several days and therefore, in terms of activity, the time spent at sea is taken into account.

Table 6: *Average activity values observed in 1991-1993 for a few traditional fishing units in Guinea (data not published)*

Type of fleet	Number of outings	Outing rate	Activity rate
Purse seine	197	54%	54%
Purse seine	131	36%	36%
Fixed gillnet	53	14%	53%
Fixed gillnet	149	41%	41%
Encircling gillnet	229	63%	63%
Hand line	48	13%	70%
Hand line	72	20%	33%

Discussion

The main problem raised by the results provided for the fifteen most active units in 1995 is linked to the low activity rate values. The few comparative values given above show the problem since the comparison applies to maximal observed values following our sampling protocol in Indonesia and to average values for the other fleets.

For the fifteen units, a monthly activity superior to 50 % is observed only twelve times (tab.5). During an activity month, there may be many days off, in the order of one out of three days for the migrating units, more for the sedentary units. These days off include halts linked to maintenance (boat, engine, net). But what can be thought about the activity of the other months? Does the lack of information on the activity for a given month mean actually no activity or a mere lack of information?

For example, what does the lack of information for the *Jawa Pos* unit in June-July mean (example n.8)? Is it or is not it inactive? June is a month submitted to strong winds therefore with low yields; does the yearly attitude of the unit match the attitude linked to the lunar cycle? Has it migrated to another landing place with better environmental conditions?

Two main hypotheses may be discussed to explain the poor activity:

- The values observed are close to the reality; the individual activity is low, in the order of one working day for an average of two days off. This hypothesis may be reinforced by the observations on the other Indonesian fleets (Unar, 1988; Wiratno and Mudiantono, 1995; Pet *et al.*,1997). This low activity concerns seasonal variations too. The months when the environmental conditions are unfavorable, the activity is lower, not to say nil. In this case, how can we interpret units whose activity observed is inferior to 15%? What is their economic yield if this parameter is decisive in the fishing unit management? What are the social consequences for crews that work at best one day out of three and who land catches at best one day out of five? In this hypothesis, the pattern of allotted time of the fishing activity would be a rare and unique case of limitation of the fishing effort in the world of small scale fishery.

- The units observed in 1995 can land their catches at auction places that are not being investigated; concentrating our investigation only on some auctions would therefore minimize the values described. This could be the case of migrating units originated from Lamongan area and which during their four months of presence in their village of origin (December-March) would go out at sea from their respective villages. We may consider as well that the units originated from Pandangan (Rembang), even though they land regularly at Tasik Agung would sometimes land in their port of origin.

A variant of this second hypothesis would be that the units may not have all their fishing outings systematically registered at the TPI: low result of the outing, privileged commercial circuits, keeping off the TPI to avoid taxes,... all sorts of biases that have direct consequences on the yield estimation and on the fishing units activity.

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Example n.1 *Tambah Sumber*

I. Data from auction places

Ports of investigation	origin	Number of investigations	month
BAY		6	2
SAR	PAN	2	2
TAA	KRA	14	6
TAA	PAN	55	12
TAA	SAR	3	2

Day	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
1	TAA			TAA								
2				TAA			TAA	TAA		BAY		
3		TATA		TAA			TAA			BAY		
4						TAA			TAA			
5												
6									TAA			
7	TAA											
8												
9					TAA							
10					TAA			TAA				
11			Sea	TAA				Sea		TAA		
12			TATA			TAA		TAA	TAA*	TAA		
13						TAA			TAA			
14											TAA	
15							TAA	TAA*		TAA*	TAA	
16								TAA		TAA	TAA	
17				TAA		Sea			BAY			Sea*
18						TAA	TAA	TAA				TAA*
19		TAA*						TAA	TAA			TAA
20		SAR					TAA					
21									BAY			
22					TAA		Sea					
23		TAA				TAA	TAA	TAA				
24			TAA	TAA		TAA		TAA				
25			TAA	TAA			TAA		BAY	TAA*	TAA	
26							TAA			TAA		TAA
27	Sea							TAA				
28	Sea						TAA					
29	SAR						TAA	TAA			TAA	Sea
30			TAA	TAA				TAA	BAY		TAA	TAA
31			TAA									

Recorded landings: 80

II. Data from censuses

This unit was observed at Pandangan during the 1995 censuses on the 10th of March, the 15th of June and the 8th of November.

Example n.2 *Akar Sakti*

I. Data from auction places

Ports of investigation	origin	Number of investigations	month
BAY		1	1
SAR	SAR	74	12
TAA	SAR	2	2

Day	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
1								SAR	Sea	SAR		SAR
2	Sea			SAR					SASA		SAR	
3	Sea											
4	SAR	Sea				Sea		Sea	Sea	SAR*		
5	Sea	Sea				SAR		SAR	SAR	SASA		
6	Sea	SAR									SAR	
7	SAR											
8									TAA			
9										SAR		
10				SAR					SAR		SAR*	
11	SAR		Sea	SAR							SAR	
12			SAR							SAR		
13			Sea							Sea		
14			SAR			SAR		SAR		SATA		SAR
15									SAR			
16											SAR	SAR
17		Sea					SAR				Sea	
18		SAR		SAR					Sea	SAR	SAR	
19									SAR	SAR		
20								Sea			SAR*	
21								****	SASA		SAR	
22								SASA				
23			Sea						SAR		SAR	
24			Sea		Sea						Sea	Sea
25			SAS*		SAR			Sea	SAR	SAR	SAR	SAR
26			SAR				SASA	SAR	SAR			
27						Sea				SAR		
28			Sea			SAR	SAR	Sea				SAR*
29	Sea		SASA					SAR		Sea	SAR	SAR
30	Sea									SAR	Sea	
31	SAR				SAR							

Recorded landings: 77

II. Data from censuses

This unit was observed at Sarang during the 1995 censuses on the 10th of March and the 15th of June.

Example n.3 *Hasil Laut*

Ports of investigation	origin	Number of investigations	month
BAY		1	1
SAR	SAR	139	12
TAA	SAR	45	10

Day	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
1	****			TAA				SAR*				
2	SAS*			TAA				Sea	SAR*	SAR	SAR*	SAR
3	Sea*			TAA		TAA		SASA	SAR	SAR	SAR	
4	SAR*				Sea				****			
5	SAR				SAR	TAA	SATA		SATA	SAR		
6		SAR*				Sea		Sea			SAR*	
7	TAA	SAR				BAY	SASA	SAR*			SAR	
8							Sea	SAR			SAR	
9			Sea	Sea			SAR					
10			SAR	SAS*		TAA	Sea*		SAR	SAR		
11			Sea	SAR*		TAA	TATA	Sea*		SAR		
12			****	SAR		TAA	SAR	****				
13			****	SAR			Sea	Sea	SAR	Sea	SAR	SAR*
14							SAR	SAR*	SAR	SAR	TAA	SAR
15		Sea*						SAR*			SAR	
16		SAR*					Sea	SAR*	Sea	SAR*		
17		SAR					SAR	SATA	TATA	SAR	SAR	
18		Sea		SAR		TAA	SAR		TAA		SAR	SASA
19	Sea	Sea							TAA*	SASA		
20	SAR*	SAR*				TAA		Sea*	TAT*	SASA	SAR	
21	SAR	SAR	Sea					SAS*	TAA		Sea	
22		TAA	SAR			Sea	Sea	SAR*	Sea	SAR	SAR	
23		****	SAR*			SAR	SAR	****	SAR	SAR	SAR	SAR
24		SAR*	****		TATA	SAR*	SAR	SAR	SAR	SAR		SAR
25		SATA	****			SASA		TAA		SAR	TAA	
26	Sea	*****	SAR*		Sea		Sea	Sea	TAA	SAR		SAR
27	Sea	Sea*	SAR*		TAA	SAR*	SAR	****	TAA	SASA	SAR	SAR
28	SAR*	SASA	****			TATA		****	SAR	SAR		
29	Sea		SAR*		TAA	SAR	SAR	SAR*	Sea		TAA	
30	SAR		SAR		TAA		Sea	****	SATA	Sea	SAR	Sea
31							SAR	SAR		SATA		SAR

Recorded landings: 185

Example n.4 *Sumber Urip*

I. Data from auction places

Ports of investigation	origin	Number of investigations	month
BAY		4	2
ERW		4	3
PK		33	6
SAR	SAR	42	11
TAA	SAR	16	8

Day	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
1	PK *			PK		PK		TAA		TAA		
2	SAR			PKPK		PK			ERW	SAR		
3				PK		TAA		Sea	ERW		BAY	
4				PK				TAA	SAR			
5								Sea		Sea		
6					TAA			SATA		SAR		
7	PK										ERW	
8							SAR		SAR			
9								TAA				
10	Sea										SAR	
11	TAA							SAR*	SAR	Sea	SAR	
12								SASA		SAR	Sea	
13			Sea				TAA				SAR	
14			Sea	TAA						SAR*	SAR	
15			SAR					Sea		SAR		
16								SAR		SAR		
17		Sea								ERW	SAR	
18		Sea										
19		SAR							Sea	Sea		
20									SAR*	SAR		
21									SAR			SAR
22					PK				Sea		BAY	
23			PK	PK	PK	SAR			SAR	Sea		
24			PK	PK		TAA*				TAA		
25			****	PK		TAA*			SAR		BAY	
26	Sea		****		PK	SAR						
27	Sea		PK *	PK	TAA		SAR	PK	Sea	BAY		
28	SAR		SAR*		SAPK		SAR	PK	SAR			
29	TAA		SAPK	PK	PK			PK				Sea
30			SAR*		SAR				Sea			TAA
31			SAPK		PK							

Recorded landings: 99

II. Data from censuses

From the 3 censuses, a first unit was observed on the 7th of November at Ngemplak originated from Ngemplak. A second unit was observed at Pekalongan on the 9th of March and the 11th of November, originated from Pekalongan. The third unit was seen at Weru (East Java) the 9th of March and at Kalimenir (West Java) the 12th of November originated from Weru.

Example n.5 *Akas Baru*

I. Data from auction places

Ports of		Number of	
investigation	origin	investigations	month
SAR	SAR	91	11
TAA	SAR	2	2

Day	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
1								TAA			SAR	
2							SAR					
3						TAA			SAR		SAR	SAR
4		Sea					Sea	Sea		SAR		
5		SAR					SAR	SAR				
6					SAR	SAR		Sea		Sea		
7							SAR	SAR	Sea	SAR	SAR	
8					SAR				SAR			
9				Sea			Sea	Sea			Sea	
10		Sea		SASA			SAR	SAR		SAR	SAR	
11		SAR	Sea		SAR							
12			SAR					Sea				
13						SAR		SASA		SAR		
14					SAR							
15		SAR	SAR				SAR					
16		Sea					Sea	Sea				
17		Sea					SAR*	SAR		SAR	Sea	
18		SAR		SASA	Sea		SAR		Sea*		SAR	
19					SAR		Sea		SASA			
20		SAR*		SAR			SAR	Sea	Sea	Sea	SAR	
21		SAR	Sea			Sea	SAR	SAR*	SAR	SAR		
22			SAR			SAR		SAR	Sea			SAR
23		Sea*	Sea		SAR	Sea		Sea	SAR			
24		SASA	SAR			SAR		SAR*	Sea	SAR	SAR	SAR
25				SAR		SAR		SAR	SAR			
26				SAR			SAR					SAR
27		SAR			Sea			Sea	Sea	SAR		Sea
28			Sea		SAR	SAR		SAR*	SAR		SAR	SAR
29			Sea					SAR	Sea		Sea	
30			SAR					Sea	SAR	SAR	SAR	SAR
31							Sea	SAR		Sea		

Recorded landings: 93
After validation, the 5 multiple daily investigations ('SASA') are moved into simple investigations ('SAR').

II. Data from censuses

This unit was observed at Sarang during the 1995 censuses on the 10th of March and the 15th of June.

Example n.6 *Sumber Baru 14*

I. Data from auction places

Ports of investigation	origin	Number of investigations	month
BAY		7	3
TAA	PAN	31	4

Day	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
1										TAA*		
2										TAA		Sea
3												TAA
4												
5												
6												
7											TAA	
8												
9												
10												
11									BAY	BAY	TAA	
12												
13												
14										TAA*	TAA	
15									Sea	TAA		Sea
16									TAA	TAA	BAY	TAA*
17									Sea	TAA	TAA	Sea
18									TAA			TAA
19											BAY	
20									BAY*	Sea	BAY*	Sea
21									TAA	TAA	TAA	TAA*
22									Sea	BAY*	Sea	TAA
23									TAA	TAA	TAA	
24												TAA
25												
26												Sea
27									TAA			TAA*
28									TAA		Sea	TAA*
29											TAA*	TAA
30									Sea		TAA	
31												

Recorded landings: 38

II. Data from censuses

This unit was observed at Pandangan during the 1995 censuses on the 8th of November.

Example n.7 *Jawa Pos*

I. Data from auction places

Ports of investigation	origin	Number of investigations	month
ERW		3	2
PK		87	8

Day	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
1				PK	PK				PK		ERPK	
2				PK	PK	PK			ERW			
3				PK	PK				ERW			
4				PK	PK							
5				PK	PK							
6												
7												
8												
9												
10												
11												
12												
13												
14											PK	
15												
16									PK	PK	PK	
17									PK	PK	PK	
18									PK	PK	PK	
19									PK	PK	PK	
20									PK	PK		
21				PK		PK			PK	PK		
22				PK	PK			PK	PK		PK	
23						PK		PK	PK	PK		
24			PK			PK		PK	PK	PK	PK	
25			PK	PK	PK	PK		PK	PK	PK		
26			PK	PK	PK			PK	PK	PK		
27			PK	PK				PK	PK	PK		
28			PK	PK	PK			PK	PK	PK		
29			PK	PK	PK			PK	PK	PK		
30			PK	PK	PK			PK	PK	PK		
31			PK		PK			PK		PK		

II. Data from censuses

This unit was observed at Weru: on the 9th of March.