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The fishing fleet in Aceh Province, Indonesia

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THE FISHING FLEET IN ACEH PROVINCE, INDONESIA

By

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The cover picture was taken in Pelabutan Pendaratan Ikan (PPI) Kuala Baro, which is a medium sized port in Aceh Province, Indonesia. The vessels in the picture are registered at about 25 GT. All photo credits: David Lymer.

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FOREWORD

The fishing fleet of Aceh Province (*Provinsi Nanggroe Aceh Darussalam)* in Indonesia has been subject to much scrutiny over the last five years. In response to the impact of the tsunami in 2004 a considerable national and international effort has been directed to restoring the fishing fleet to pre-tsunami levels through a variety of fishing vessel building schemes. Furthermore, there have been complementary activities to assess the success of this fleet rehabilitation and development activity and associated issues.

The main characteristics of the fleet in Aceh Province, as found in the census, are that it comprises relatively newly built and highly motorized vessels, most of which have inboard engines. The fleet is largely privately owned and the vessels were acquired by private funding, although in 2005 and 2006 a large proportion of the new boats were provided by donors. The vessels mainly operate nearshore, between 0 and 3 nautical miles offshore, and are not usually equipped with navigation or communication equipment, although a large share of the larger vessels carry both. There are also minor differences between the east and west coast fleets. The fishing fleet in Aceh Province can be summarized as comprising largely small boats (average 3.2 GT) with relatively small motors (average 16 Hp). There is a general trend of these small boats being replaced by larger vessels and hence the fleet tonnage has increased in recent years.

This document provides an overview of the status of the fishing fleet in Aceh Province at the end of 2006 based on a fishing vessel census that was carried out in the province. It is hoped that this can be used as a reference in the sustainable restoration of the small-scale fisheries subsector in the province of Aceh, Indonesia.

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ABBREVIATIONS AND ACRONYMS

DKP	Dinas Kelatutan Dan Perikanan
FAO	Food and Agriculture Organization of the United Nations
GRT	gross register tonnage
GT	gross tonnage
Hp	horsepower
IUU	illegal, unregulated, and unreported
kW	kilowatt
MMAF	Ministry of Marine Affairs and Fisheries
NAD	Nanggroe Aceh Darussalam
nm	nautical mile
TPI	Tempat Pandaratan Ikan
YLLI	Yayasan Laut Lestari Indonesia

INTRODUCTION

This publication presents a picture of the fishing fleet[1] in Aceh Province (*Provinsi Nanggroe Aceh Darussalam*), Indonesia. Using different sources of data, but focusing on a census conducted in 2006, the aim is to give a view of the status of the fleet. It is important to note here that the census data can only be viewed as an estimation of the true data, as there were several problems associated with the data collection and data entry into databases.[2] Hence, it was seen as important to compare this data to other sources and to highlight differences and discrepancies when comparing the different data sources. To summarize, this publication can be seen as a review of the data associated with the fishing fleet in the province of Aceh, Indonesia, and it possibly provides a baseline on the current status of the said fishing fleet.

IMPORTANCE OF FISHING

The activity of fishing is important throughout Aceh Province and people fish either for the purpose of selling their catch domestically or simply for food, but there is also fishing for export (commercial fishing). The province includes 18 coastal districts and in 67 percent of these there is an official port (Table 1) which can facilitate landings from large boats. In addition, there are several identifiable smaller ports and landing places in each district and of course smaller vessels landing directly on the beach.

Table 1 Coastal districts and official ports in Aceh Province, by coast in 2009

Coast	District	Official port
East Coast	Aceh Tamiang	
	Kota Langsa	Kuala Langsa
	Aceh Timur	Idi Rayeuek
	Kota Lhokseumawe	Pusong
	Aceh Utara	
	Bireuen	Peudada
	Pidie Jaya	
	Pidie	Kuala Peukan Baru-Meuruedu
	Banda Aceh	Lampulo
	Sabang	Sabang
	Aceh Besar	Peukan Bada
West Coast	Aceh Jaya	
	Aceh Barat	Padang Sirait Ujung Kareng
	Nagan Raya	
	Aceh Barat Daya	Ujung Serangga
	Aceh Selatan	Labuhan Haji Samang Ba'u Lhok Bengkuang
	Aceh Singkil	Ujong Baro
	Simeulue	

[1] The term "fishing fleet" refers to mobile floating objects of any kind and size, operating in freshwater, brackish water and marine waters which are used for searching, catching, harvesting, transporting, landing, preserving and/or processing fish, shellfish and other aquatic organisms, residues and plants. The term "fishing vessel" is used when the vessel is engaged only in catching operations.

[2] Lymer (2009); Hoekstra (2007).

Traditionally, fishing in Aceh Province has been small-scale though there are more motorized boats here than in other parts of the country.[3] Levels of exploitation have historically been higher on the east coast than on the western part of Sumatra and the fishing has focused on inshore demersal and small to medium pelagic species. The traditional view of the fishing fleet is that it consists mostly of wooden boats 4 to 24 metres long which use trammel nets for shrimps, gill nets for fish and bottom set longlines for larger species. There are also small purse seiners (20 to 25 metres long) that fish for small pelagic species. Most of the fishing vessels are single-day and operate in coastal waters, with only the purse seiners making extended trips of up to two weeks. Few vessels are active in deep sea fishing, and trawling was officially banned in 1980. The main gears in use are nets, but hook and line methods, hand collecting and spearing are used commonly also.

AVAILABLE DATA ON THE ACEH FISHERIES SECTOR

There are several data collection efforts on the fishing fleet of Aceh Province, some that have been ongoing for several years (i.e. local statistics collected by Dinas Kelatutan Dan Perikanan (DKP)). In addition, the recent tsunami and the response from the international community resulted in several new data collection efforts, both as a needs assessment (FAO assessment) but also for longer usage with a longer perspective in time (census, boat registration). All these data collection efforts can be used in various ways to develop a snapshot of the status of the fishing fleet of Aceh Province.

FAO reports and statistics

Based on the international convention in use, FAO fleet data on the vessel tonnage are measured according to the Oslo Convention (1947) expressing data by gross register tonnage (GRT) until 1995; and according to the London Convention (1969) expressing data in gross tonnage (GT) since 1996. GRT represented the total measured cubic content of the permanently enclosed spaces of a vessel, with some allowances or deductions for exempt spaces such as living quarters (1 gross register tonne = 100 cubic feet = 2.83 cubic metres). GT for ships of 24 metres in length and over refers to the volume of all the ship's enclosed spaces (from keel to funnel) measured to the outside of the hull framing. The two conventions produce very different tonnage values. Although GT measurements are higher than GRT, there is no simple correlation between the two units (GT is often double the GRT, but sometimes as much as four times the GRT). For fishing vessels under a certain size, GT is preferred as it is more accurate. It is important to note that historical data are often expressed as GRT (i.e. prior to 1995) and it is therefore possible that fleet capacity may appear to decline when switching to the use of GT.

FAO global statistics

The data reported by the national agency is collected by FAO. FAO has collected data on catch and value of catch since 1952. Additional data on export and import of fishery products are also collected (since 1980). All this data is then published each year in the *FishStat* database.[4] In addition to these published data, FAO also invite the national agencies to submit data on fishing fleet and number of fishers. The data on the fishing fleet and the number of fishers are available as publications from FAO,[5, 6] however, they have not been updated in recent years. Both of these collections only report the national figure.

Assessments (tsunami related)

FAO (in collaboration with local partners) carried out several early attempts to assess the impact of the December 2004 Asian tsunami on fisheries in Aceh Province. One of these assessments related

[3] FAO (2007)
[4] FishStat (2008)
[5] FAO (1998)
[6] FAO (1999)

directly to the fishing fleet and the results were published in 2006 as the *Damages and needs assessment result* report. One outcome of the initial assessment was that there was a recommendation for a more formal census to be carried out.

Other reports

In addition to the FAO reports on the impacts of the tsunami there are several reports that contain information related to the fishing fleet in Banda Aceh, especially conducted post-tsunami, either as assessment papers or as a follow-up to the support (boat building) given to the province.

Provincial statistics

The local government in Aceh Province routinely collects data on fisheries in the province. Data from 1994 and onward are readily available and tables are translated into English. The data are collected at district or even subdistrict level and are then aggregated/compiled to give a provincial figure and published in a yearbook. In the printed yearbooks on fishery statistics, data on production (by species and district) and the number and size of vessels can be found. The data is then sent to the national agency responsible for fisheries statistics which compiles the national figure and reports this to FAO.[7] FAO then corroborates and publishes this data in its annually updated *FishStat* database (production figures).

Boat registration project

Within the project "Rehabilitation of livelihoods in the fisheries sector affected by the tsunami and earthquake in Indonesia (GCP/INS/076/GER)" there is a component to develop a fishing vessel registration scheme for fishing vessels[8] above 10 GT in Banda Aceh. Previously, fishing vessels above 10 GT were required to travel to Jakarta and register with national authorities, but with this new scheme, local registration will be possible. This component of the project started in 2006 and is ongoing with an expected finish date of august 2009. The project focused on 11 major ports and 11 landing places in Aceh Province assuming that all large vessels (above 10 GT) would need access to a relatively large landing facility.

FAO's strategy for medium- and long-term rehabilitation of capture fisheries in Aceh Province is to ensure that the fishing capacity that is being rebuilt (to offset loss by tsunami) is compatible with sustainable resource use, related precautionary principles and the rights of small-scale fishers to have a secure livelihood. The fishing boat registration project is crucial for handling the issue of illegal, unregulated, and unreported (IUU) fishing.

The objectives of the fishing boat registration project implemented in Aceh Province are to: strengthen the old registration system; make it more effective and efficient by the use of a computerized system; adapt (harmonize) the old system with the national level system and connect them; and develop an integrated fishing boat registration system to optimize the function of strategic fishing ports.

The output of the fishing boat registration project is the issuing of a fishing vessel book which contains information related to fishing gear, fish hold capacity, ownership, and physical visualization. The document has the potential to become banking collateral for fishers and can form the basis of a database about fishing boat registration focusing on boats with volume over 10 GT. A fishing boat that has a fishing license will then be integrated into the computerized network system of FBR at the level of DKP and fishing port.

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[7] The data are entered into a FoxPro database in Banda Aceh and then sent to the national agency in Jakarta. The team at Banda Aceh re-enter the summary data into the Excel tables to produce their statistics yearbook. The database only has data from 2004 (at Banda Aceh).

[8] The term "fishing vessel" is used when the vessel is engaged only in catching operations as opposed to when it is used for transhipment or transport.

The steps of implementation of the project that were undertaken during 2007 and 2008 were: 1) assessment activity; 2) technical guideline development; 3) application form and Web based application (January 2008); 4) trial registration (February 2008) in Lampulo fishing port. The next step was a workshop in April 2008 with the following stakeholders invited: government officials, Ministry of Marine Affairs and Fisheries (MMAF), DKP provincial/district, fishing port officials, transport department, Panglima Laot, navy, and marine police. A brief presentation about fishing vessel registration in general was made and the results of the trial were presented. The objective of the workshop was to get inputs and/or suggestions from the stakeholders.

The next activity was training (June 2008) for the official team in the field. The team comprised representatives from Panglima Laot, transport officials and fisheries officials. The final activity before the team was deployed on the registration scheme was information dissemination by Panglima Laot provincial office to fishers in each fishing port. The Panglima Laot officials informed the fishers about the registration procedures, announced the schedule of registration and then the registration activity started.

The 2006 fishing vessel census

FAO in collaboration with local authorities, and with support from the provincial government, carried out a census in 2006 to estimate the size and activities of the fishing fleet in Aceh Province. The census was carried out as one component of the project "Rehabilitation of livelihoods in the fisheries sector affected by the tsunami and earthquake in Indonesia (GCP/INS/076/GER)". The census design/development/implementation was carried out by a local consulting company (*Yayasan Laut Lestari Indonesia* (YLLI)) and was executed during two weeks in December of 2006. The data collected in the census was then transferred to a database. Unfortunately, the database developed using the census results as the basis revealed that there were some serious faults in the design and data collection of the census.[9] However, these problems were solved and a final database consisting of 17 variables, with almost complete coverage of four of these variables, was completed in 2009.[10]

For those variables lacking full coverage (i.e. 13 360 responses), the coverage of that variable was assumed to represent the full population. The raw data can be found in a database[11] which includes a simple menu system for certain key queries. These queries (based on sample size) were then transformed (normalized to population size) to make comparison among different variables easier.

The data presented in the following chapter represents a picture of the fishing fleet in Aceh Province in December 2006. Hence, any comparisons with other data collection efforts will differ if these are done at another time or in another way. The data should be viewed as an indicative figure of the fishing fleet and treated as such (i.e. any reference to the data should mention that they are indicative figures).

[9] Hoekstra (2007)
[10] Lymer (2009)
[11] The database is available on request from FAO and copies were provided to the local fisheries authority in Banda Aceh.

THE 2006 FISHING VESSEL CENSUS

Some of the data collected through the census in December 2006 are presented below.[12] As the data were collected once over a short time period and not over a whole year, they can be said to represent a snapshot of the situation in that particular month. It is useful to carry out a census (complete coverage of a few key variables) at regular intervals to ensure that the statistics collection system is up-to-date and functions properly. Hence, the purpose of presenting the census data below is to allow comparison with existing data collection systems (i.e. local statistics collected at district level and compiled at province level).

SIZE OF THE FLEET

Total number of boats

There were a total of 13 360 data entries in the census that contained data on the province's fishing fleet. Included in the following sections are data on fishing vessels only, hence a total of 13 360 vessels form the basis for the data presented below.

Size by Gross Tonnage

The vessels were divided into different size classes depending on their gross tonnage (GT). For examples of vessels falling into the different size categories see Annex 1. The size by gross tonnage (GT) for the fishing fleet was calculated to be 42 785 GT (Table 2). However, if only the active vessels are included, the fleet total GT is 36 587 GT. The average GT for the different size groups shows that in the 0 to 5 GT group the sizes of the vessels are towards the lower end of the spectrum. However, on a GT basis the 0 to 5 GT vessels have the largest gross tonnage compared to the other groups. The percentage of the total tonnage in the 0 to 5 GT group is 41 percent. The 10 to 30 GT has the second largest tonnage with about 24 percent of the total fleet tonnage. The remaining tonnage is divided equally between the other two groups: 5 to 10 GT and above 30 GT, with 18 percent of the total tonnage each.

Table 2 Average gross tonnage (GT) per fishing vessel: by class, extrapolation of above to calculate total GT by class and then overall total GT for fleet (N = 12 993)

Size (GT)	Average GT	# Fishing vessels	GT by group	Fleet GT
0 to 5	1.5	11 596	17 394 (41%)*	42 785
5 to 10	8.01	953	7 633 (24%)	
10 to 30	15.78	639	10 080 (18%)	
Above 30	44.58	172	7 678 (18%)	

* All percentages have been rounded up.

Size by engine power

In the group of fishing vessels that were identified as active fishing vessels, the degree of motorization is high (Table 3). An average of 86 percent of the whole fleet is motorized and there is a trend of increasing motorization with fishing vessel size. Of the motorized fishing vessels, the majority has an inboard motor. Interestingly, the percent is larger in the 5 to 10 GT vessels group than in the 10 to 30 GT vessels group. The average engine size for the entire fleet was about 16 Hp and there is

[12] See previous section on coverage of variables and data transformations.

Table 3 Proportion of boats motorized, by group (only active vessels, N = 11 565), proportion of boats having inboard engines and the average Hp for motorized vessels

Size (GT)	Motorized (%)	Inboard engines (%)	Average Hp
0 to 5	84	89	15.5
5 to 10	96	94	20.2
10 to 30	98	86	20.6
Above 30	97	100	20.5

a trend that larger fishing vessels have larger engines. There are also differences in engine size between the two coasts. The east coast has an average engine size of 18.1 Hp whereas the average engine size is 11.5 Hp on the west coast.

All motorized vessels above 30 GT had an inboard engine, whereas there are a significant number of vessels that have outboard engines in the 5 to 10 GT group and especially in the 10 to 30 GT groups where 14 percent of the motorized boats had outboard engines. The percentage of inboard engine vessels shows that there are differences at district level: mainly the districts of Aceh Besar, Pidie Jaya, Sabang, Aceh Barat and Pidie show a lower percentage of vessels with inboard engines (Table 4). Examples of these large and small boats with outboard and inboard engines, respectively, belonging to the fishing fleet of TPI Pante Raja in Pidie, can be seen in Box 1 and Box 2.

Table 4 For motorized vessels, proportion with inboard engines, by district (only active vessels, N = 7 154)

Coast	District	Inboard engines (%)
East Coast	Aceh Tamiang	100
	Kota Langsa	99
	Aceh Timur	99
	Kota Lhokseumawe	98
	Aceh Utara	100
	Bireuen	97
	Pidie Jaya	67
	Pidie	88
	Banda Aceh	99
	Sabang	82
	Aceh Besar	29
West Coast	Aceh Jaya	99
	Aceh Barat	87
	Nagan Raya	100
	Aceh Barat Daya	100
	Aceh Selatan	97
	Aceh Singkil	95
	Simeulue	96

Box 1 Large vessels propelled by outboard engines

An example of these large boats propelled by outboard engines is the fishing fleet of *Tempat Pandaratan Ikan* (TPI) Pante Raja in Pidie. A large proportion of the fishing fleet in this port (landing place) is made up of large boats, 16 m and above, that measure between 9 and 15 GT. Each of these boats is propelled by an outboard motor (40 Hp) and one auxiliary motor for pulling the gear line. The average crew on these boats comprises 25 members per boat who are usually men. The women are involved in fish handling and this amounts to another 25 (women) members per boat. Hence, the activity of these boats sustains a very large number of people. A rough estimate of the number of boats is 100 and hence that would sustain a total of 5 000 people either in catching operations or post-harvest handling.

A number of large fishing vessels (9 to 15 GT) in Tempat Pandaratan Ikan (TPI) Pante Raja are propelled by outboard engines

The 40 Hp outboard engine that is used to propel the fishing vessels

Box 2 Small inboard engine propelled vessels

In addition to the large number of vessels propelled by outboard engines shown in Box 1, the fishing fleet in *Tempat Pandaratan Ikan* (TPI) Pante Raja in Pidie also consists of small inboard engine propelled vessels. These boats are usually about four metres with an inboard engine size of 5 Hp. The main gear operated by these small vessels are gill net but hook and line are common too.

Two small (4 m) boats with inboard engines showing the propeller

This type of boat can also be found in *Pelabutan Pendaratan Ikan* (PPI) Kuala Baro which is a medium sized port. Here some of the small vessels (4 to 5 m) are also operated with inboard engines usually about 10 Hp.

A number of small (5 to 6 m) boats in Pelabutan Pendaratan Ikan (PPI) Kuala Baro which are operated with a 10 Hp inboard engine

GEOGRAPHICAL DISTRIBUTION OF THE FLEET

Of the 13 360 fishing vessels, the east coast had more than the west coast – 8 291 and 5 069 vessels, respectively. The west coast had, relative to numbers, a large proportion of the 5 to 10 GT and 10 to 30 GT vessels, whereas the east coast had a larger proportion of the 0 to 5 GT and above 30 GT groups (Figure 1).

The largest difference at the district level (compared to the average for all districts) is that the districts of Aceh Timur, Aceh Barat and Nagan Raya had proportionally fewer small vessels (0 to 5 GT) and proportionally more vessels in the 5 to 10 GT class (Table 5). Aceh Timur and Aceh Barat also had relatively more 10 to 30 GT vessels than the average for all districts. The districts of Aceh Besar, Simeulue, Aceh Utara, Aceh Tamiang and Sabang had relatively more small vessels (0 to 5 GT) than the average for all districts.

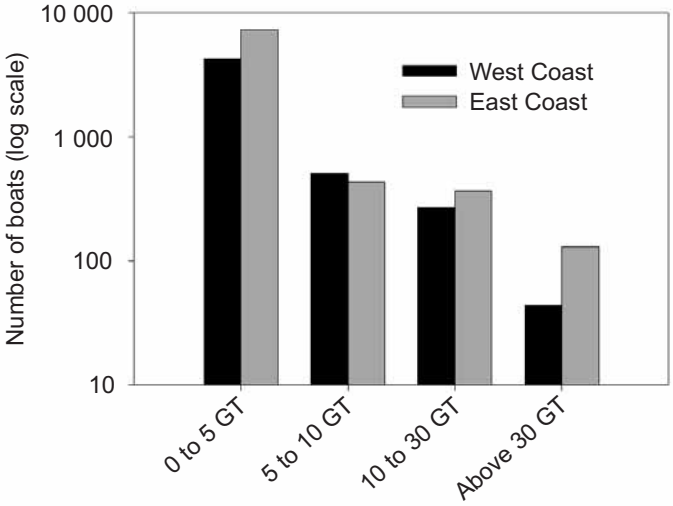

Figure 1 Number of fishing vessels by coast. Grouped by size (GT). Log scale

Table 5 Number of fishing vessels, by district grouped into size (GT)

Coast	District	0 to 5 GT	5 to 10 GT	10 to 30 GT	Above 30 GT
East coast	Aceh Tamiang	1 061	27	9	4
	Kota Langsa	318	61	17	5
	Aceh Timur	954	236	156	17
	Kota Lhokseumawe	550	13	42	30
	Aceh Utara	1 344	16	6	2
	Bireuen	766	35	22	14
	Pidie Jaya	659	6	38	21
	Pidie	677	13	49	13
	Banda Aceh	180	19	15	20
	Sabang	407	8	9	4
	Aceh Besar	414	1	1	0
West coast	Aceh Jaya	275	12	10	1
	Aceh Barat	48	81	87	3
	Nagan Raya	82	75	2	0
	Aceh Barat Daya	502	76	65	12
	Aceh Selatan	1 414	162	83	27
	Aceh Singkil	655	96	19	1
	Simeulue	1 296	9	3	0
Average for all districts		645	53	35	10

FLEET CONSTRUCTION (BY YEAR BUILT)

Vessel construction in the provinces shows big increases in 2000, 2003 and 2005 (Figure 2). The 2005 increase coincides with the delivery of new fishing vessels to offset the vessels lost in the tsunami. It is not known whether (and why) there was intensified boatbuilding in the year 2000. It can also be noticed that boat building activity sharply declined from 2005 to 2006. This is probably, among other reasons, because of the departure of a number of NGOs/humanitarian agencies in 2006 that were still active in boat building in 2005.

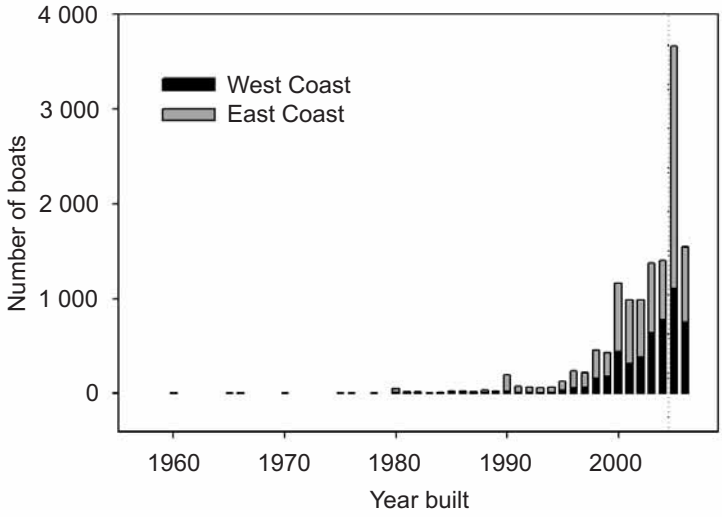

Figure 2 Year fishing fleet built, by coast (west/east)

The districts with an older fleet are Aceh Timur; Aceh Tamiang; Kota Langsa; Kota Lhokseumawe and the districts with a newer fleet are Aceh Besar; Banda Aceh; Nagan Raya; and Aceh Jaya. As you would expect, the non-active vessels (see picture below) of the fleet tend to be the older ones.

A few (of the many) inactive vessels at the docks in Pelabutan Perikanan Pantai (PPP) Banda Aceh port. The ships are in varying degrees of need for renovation/repair. For reference, the boat to the left (being repainted) is registered as 5 GT

ACQUISITION/OWNERSHIP

There were 18 different labels recorded for the census "Ownership" variable in the original census dataset. These were transformed into four different groups: 1) privately-owned vessels; 2) cooperatively-owned vessels; 3) government-owned vessels; and 4) vessels owned by non-governmental organizations (NGOs). The census variable "Acquisition" contained three different labels: 1) boat obtained with own capital; 2) boat obtained as a donation; and 3) boat obtained by the owner taking a loan.

The majority of the vessels are privately owned, although some are owned by cooperatives and a few vessels are either owned by the government or by NGOs (Table 6). The majority of the boats are obtained by own capital (81 percent) but there is still a significant number (17 percent) of vessels that were donated (Figure 3). The donated boats are mainly in the smallest boat class (0 to 5 GT).

Table 6 Ownership structure of the fishing fleet in Aceh Province, December 2006 survey

Size (GT)	Private	Cooperative	Government	NGO
0 to 5	11 381	211	5	3
5 to 10	888	56	1	0
10 to 30	627	15	0	0
Above 30	169	3	1	0
Total	13 064	285	7	3

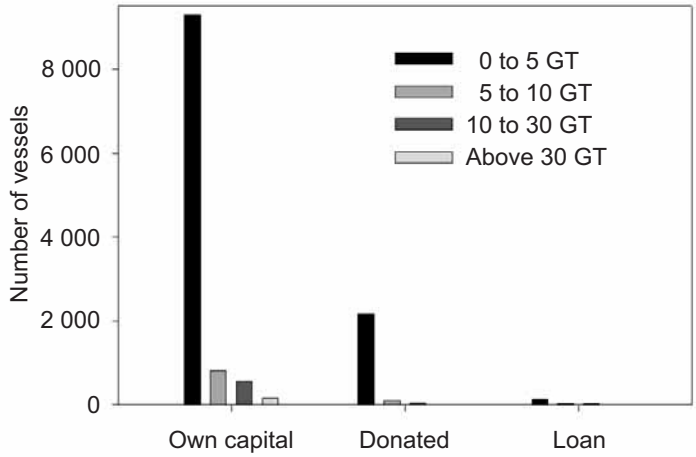

Figure 3 Acquisition mode for fishing vessels in Aceh Province, December 2006

HULL MATERIAL

The majority of boats (99.1 percent) in the province are made of wood (Table 7). The remainder are made of glass fibre (0.8 percent) and steel (0.1 percent). There is no difference between coasts, but there was a higher than average number of glass fibre boats in the districts of Aceh Jaya, Sabang, Aceh Barat, Aceh Besar, Aceh Selatan and Simeulue. Less than half the districts had boats with steel hulls with only one district, Kota Langsa, having more than one. There was a clear difference between the average size of the boats with different hull material: The wooden vessels were the largest (3.22 GT) followed by the steel vessels (3.07 GT) and the glass fibre vessels (1.54 GT, see picture below for examples).

Table 7 Fishing vessel hull material, by coast and district (number of boats)

Coast	District	Wood	Glass fibre	Steel
East Coast	Aceh Tamiang	1 106	1	0
	Kota Langsa	400	2	2
	Aceh Timur	1 358	2	0
	Kota Lhokseumawe	638	0	1
	Aceh Utara	1 383	3	1
	Bireuen	835	5	0
	Pidie Jaya	734	1	0
	Pidie	755	1	0
	Banda Aceh	222	0	1
	Sabang	406	19	1
	Aceh Besar	406	8	1
West Coast	Aceh Jaya	236	22	1
	Aceh Barat	215	6	0
	Nagan Raya	161	3	0
	Aceh Barat Daya	657	2	1
	Aceh Selatan	1 669	10	0
	Aceh Singkil	769	2	0
	Simeulue	1 294	19	0

Outboard propelled glass fibre boats in Pelabutan Perikanan Pantai (PPP) Banda Aceh port used for transport of catch from larger fishing vessels offshore. This method of bringing in catch from nearby fishing vessels is used particularly when the catch is too small for it to be economically viable for the fishing vessels to go to port and land

Fishing gear

There were nine different gear types in the census: purse seine, gill net, trawl, traps, spear gun, seine net, lift net, hook (troll line, handline and longline) and grappling gear (Table 8). Of these, hook and line dominates on both the west and east coasts (64.4 and 45.1 percent, respectively). The second most common gear is gill net with 24.9 percent on the west coast and 29.9 percent on the east coast.

The third main gear for both coasts is lift net, again there is a large difference by coast with the west coast having 5.5 percent and the east coast 12.1 percent. Additionally, purse seines are relatively more common on the east coast (5.5 percent) compared to the west coast (2.1 percent). Trawls are relatively evenly distributed, although they are relatively more common on the east coast (2.9 percent) compared to the west coast (2.4 percent). The average number of gears used differed between the two coasts (Figure 4).

Table 8 Nine different gear groups (in English and Bahasa Indonesian)

English		Indonesian
Purse seine		Purse seine
Seine		Pukat kantong
Trawl		Pukat tarik
Lift net		Jaring angkat
Troll line		Pancing tonda
Longline	Hook	Pancing rawe
Handline		Pancing biasa
Traps		Perang-kap
Gill net		Jaring insang
Spear gun		
Grappling gear		

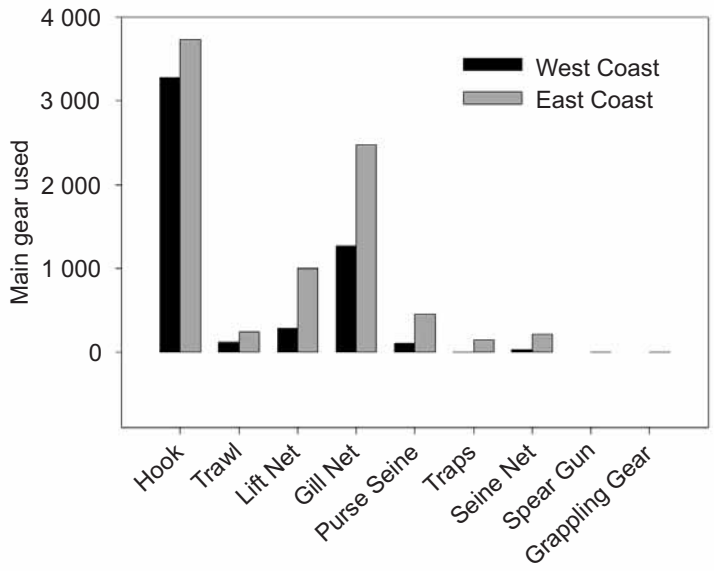

Figure 4 Main gear (of nine) used by coast

The west coast fleet used an average of 1.66 gears/vessel whereas the east coast fleet used 1.39 gears/vessel. The average number of gears used also differed by size of vessel: 1.57 (5 to 10 GT); 1.49 (0 to 5 GT); 1.48 (10 to 30 GT); and 1.15 (above 30 GT).

The different classes also displayed differences in their preferred gear (Table 9). For the class 0 to 5 GT the top three gears used were hook, gill net and lift net (95 percent of total). For the 5 to 10 GT group hook, gill net and purse seine were preferred (77 percent of total). For the 10 to 30 GT group the main gears were hook and purse seine (80 percent of total) and for the above 30 GT group 73 percent of the total number of vessels comprised purse seiners.

Table 9 Main gear used by size of boat (gross tonnage)

Size (GT)	Hook	Trawl	Lift net	Gill net	Main gear Purse seine	Traps	Seine net	Spear gun	Grappling gear
0 to 5	6 288	246	1 176	3 561	74	153	153	1	2
5 to 10	388	72	78	182	117	5	48	0	0
10 to 30	261	35	25	31	245	2	32	0	0
Above 30	12	8	10	7	134	1	12	0	0

A gill net fisher using a small non-powered boat

Crew size (Fishers)

The variable "Crew size" was constructed from the two census variables "Temporary crew" and "Permanent crew" – these two variables were added together to get the total crew size. From the variable "Total crew size", the average crew by boat class was calculated (Table 10). This variable was then used to calculate the number of active fishers. The total number of fishers in Aceh Province in December 2006 was 32 372.

Table 10 Average crew size per boat and by class extrapolated for active boats to estimate minimum number employed

Size (GT)	Average crew	Active boats	Number employed
0 to 5	2.0	10 215	20 430
5 to 10	4.9	778	3 812
10 to 30	9.6	544	5 222
Above 30	19.0	153	2 907
Total			**32 372**

Fishing area

The sea around Aceh is divided into four different fishing areas: 1) 0 to 3 nautical miles (nm) from the shore; 2) 3 to 6 nm from the shore; 3) 6 to 12 nm from the shore; and 4) beyond 12 nm from the shore (>12 nm). The data presented below (Figure 5) from the census on fishing area focuses on the main fishing area only.[13] There is a clear correlation between size of the boats and the distance they

[13] There are instances were vessels are fishing in different areas in different seasons or even within the same season, but the focus here is on the main fishing area over the whole year.

travel from the shore, i.e. the larger the boat the farther the distance. However, the smaller size boats (0 to 5 GT) are still relatively common in all the fishing areas. The 5 to 10 GT vessels have an equal distribution over the different fishing areas whereas the larger boat classes become more common in the fishing areas farther from shore. However, all boat classes are present in all fishing areas. There are no large differences when looking at the vessels by coast (Figure 6). There is a minor trend that fishing in the 3 to 6 nm zone is more common on the east coast and that nearshore fishing (0 to 3 nm) is more common on the west coast. There are also relatively more boats fishing beyond 12 nm from the shore on the east coast than on the west coast.

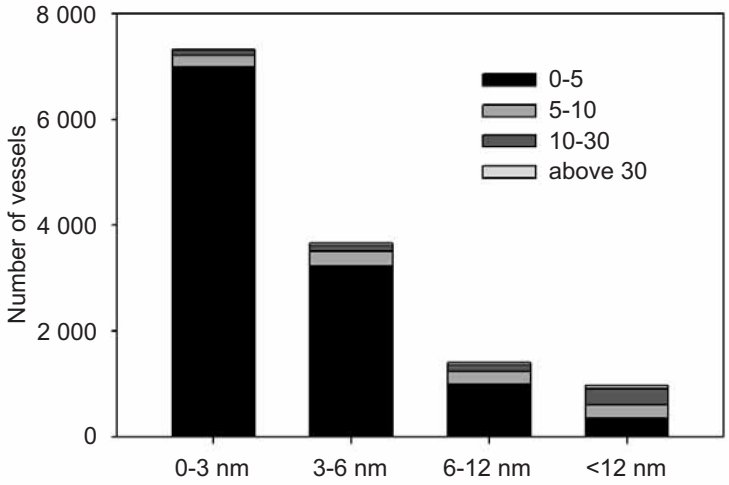

Figure 5 Number of fishing vessels in different fishing zones (main area) grouped by boat size (GT)

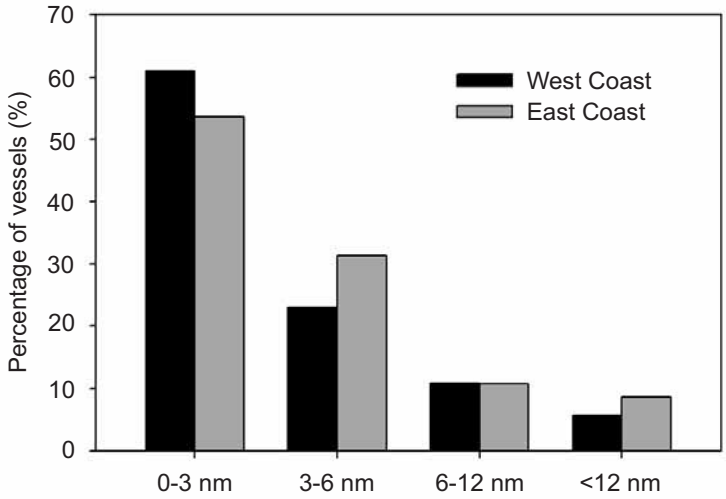

Figure 6 The percentage of fishing vessels in different fishing zones (main area) divided by east and west coast

LANDING SITES

About 2 500 different labels where recorded for the three different census variables dealing with landing places (“Fish landing east season”, “Fish landing west season” and “Fish landing transition”). These 2 500 labels were recorded in the district in which the fish was landed. The fish landing largely takes place in the district in which the vessel is stationed, however in some instances the catch is landed outside of Aceh Province (Table 11). There are also some differences at district level when comparing the number of boats registered in the district and the number of boats landing in that district

(Figure 7). The distribution patterns in boats and landing places show that relatively more boats land in Banda Aceh, Sabang, Kota Lhokseumawe and Pidie than are registered in these districts. The opposite (i.e. fewer boats landing than registered) is largely the case in the districts of Simeulue, Aceh Barat Daya and Bireuen. It is mainly boats in the 0 to 5 GT that land outside their "home" districts, but a relatively large percentage of the total number of boats in the other size classes also land in other districts.

Table 11 Landing by district for different size boats

Landing site		0 to 5 GT	5 to 10 GT	10 to 30 GT	Above 30 GT
East Coast	Aceh Tamiang	1 003	28	12	4
	Kota Langsa	361	46	20	5
	Aceh Timur	1 102	255	175	21
	Kota Lhokseumawe	224	7	33	21
	Aceh Utara	1 520	14	7	3
	Bireuen	969	43	25	17
	Pidie Jaya	778	8	49	29
	Pidie	658	16	43	3
	Banda Aceh	175	17	21	22
	Sabang	490	10	9	5
	Aceh Besar	400	1	0	0
West Coast	Aceh Jaya	234	1	1	1
	Aceh Barat	58	104	105	4
	Nagan Raya	87	93	3	0
	Aceh Barat Daya	614	81	73	14
	Aceh Selatan	1 659	186	96	28
	Aceh Singkil	471	70	13	1
	Simeulue	696	1	7	0
Outside Aceh Province	Sumatera Utara	0	8	5	0

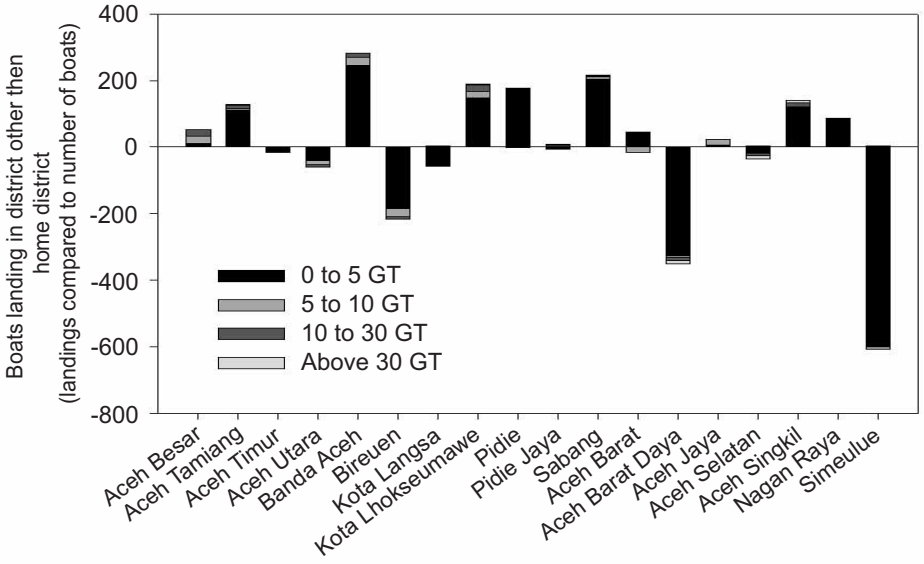

Figure 7 Landings[14] by district other than district in which boats registered

[14] A positive value indicates that district has more landings than boats registered and a negative value means more boats registered than landings.

The post-harvest fish handling, landing place in Pelabutan Perikanan Pantai (PPP) Banda Aceh port with ice facilities

NAVIGATION AND COMMUNICATION EQUIPMENT

Overall there is a low use of communication and navigation equipment in the fishing fleet of Aceh Province (Table 12). Of the total fishing fleet, only 488 vessels report having any form of communication equipment and the use of communication devices increases with the size of the boat. A total of 1 516 boats report having navigation equipment and the larger the size of the vessel the more likely it is to have navigation equipment. To summarize, the small vessels usually operate without navigation or communication equipment whereas the larger vessels usually have both.

Table 12 Number of boats equipped with navigation or communication equipment or both, by size (GT)

Size	Navigation equipment	Communication equipment [No]	Communication equipment [Yes]
0 to 5	No	10 736	43
	Yes	753	52
5 to 10	No	709	11
	Yes	223	164
10 to 30	No	295	11
	Yes	99	136
Above 30	No	33	4
	Yes	24	65
Totals	**1 516**[15]	**12 872**	**488**

NB: With regard to questions about using navigation and communication equipment in the census report, it was found that No answers also included those cases where the answer space had been left blank. Hence, only Yes answers can be evaluated and compared with other variables.

[15] Figure refers to Yes answers only.

OTHER REPORTED DATA ON FISHING VESSELS AND FISHERS

There are several sources of data on fisheries in Indonesia in general and for Aceh Province in particular. The global data sets of FAO contain information relating to catch, employment and fishing fleet for Indonesia. There are also substantial regional reviews of theses datasets performed biannually (e.g. see Lymer 2008) Local statistics provide data on catch (volume and value), fleet and employment. Scattered data can also be found in various reports, especially in the post-tsunami period. The most detailed data is however available in the form of the census performed in 2006, hence the main part of the data presented will be derived from the census.

FAO STATISTICS ON INDONESIA

These global datasets have detailed data at the level of country and fishing area (FAO Fishing area). Indonesia reports catch in two of these areas to FAO, namely fishing area 57 and 71, which are located in the Indian and Pacific Oceans, respectively. Data on the fishing fleet were routinely collected and compiled by FAO up until 1995 and data on the number of fishers have been collected and compiled up until 2006. The data on number of vessels show that the Indonesian fishing fleet was dominated by small (0 to 5 GRT) and non-powered fishing vessels until 1995 (Figure 8).

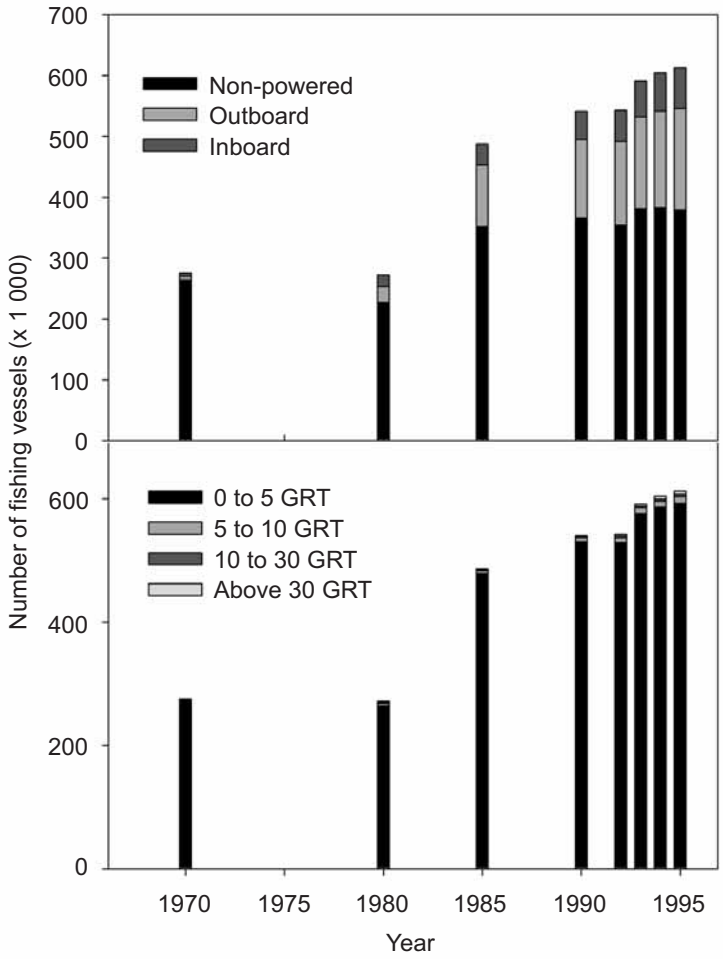

Figure 8 Number of fishing vessels in Indonesia from 1970 to 1995, grouped by power source (top) and by size (bottom)[16,17]

[16] Adapted from FAO (1998).
[17] Based on the assumption that all decked vessels are operated by inboard engines.

The fleet increased rapidly during the 1970s and 1980s and was the 13th largest in the world (tonnage)[18] in 1995. This value however only reflected part of the fishing fleet and if all fishing vessels (numbers) were to be included, Indonesia would probably have climbed into the top five list (1995 data).[19] The fishing fleet was largely non-powered until the mid 1980s, when the numbers with outboard engines started to increase. In the 1990s the number with outboard engines continued to increase and was accompanied by an increase in the number of vessels powered by inboard engines. In 1995 the fleet was made up of 61 percent of non-powered fishing boats and 97 percent was below 5 GT. No data on the development of the fleet since 1995 is available in the global records compiled by FAO.

The data on total catch from Indonesia (reported to FAO) show that the main production is from FAO Area 71 and only about 25 percent is from the Indian Ocean[20] (Figure 9). All production from the districts in Aceh Province is reported as production from the Indian Ocean. There has been a steady increase in the production, mainly driven by increased production from the Pacific. Hence, the relative share from the Indian Ocean has been decreasing.

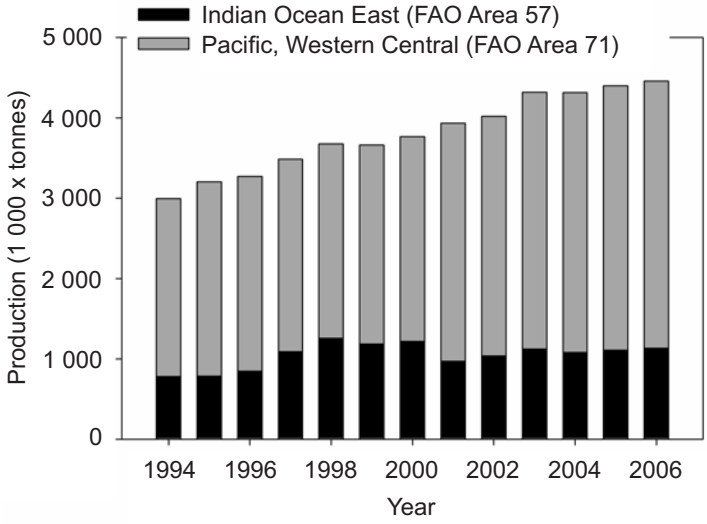

Figure 9 Evolution of the capture fisheries production from Indonesia 1994 to 2006, reported by FAO fishing area

The number of fishers in Indonesia in 2006 was close to five million.[21] Of these five million, 40 percent was involved in marine fisheries and 50 percent was estimated to be involved in aquaculture and the remaining 10 percent in inland fisheries. Of the 2 million people involved in marine capture fisheries, about 56 percent are full-time fishers; 31 percent are part-time fishers; and 13 percent are occasional fishers (Table 13).

Table 13 Number of fishers in marine fisheries in Indonesia 2004 to 2006, by degree of involvement

Degree of involvement	2004	2005	2006
Full-time	1 182 604	1 145 653	1 147 970
Part-time	826 206	648 591	648 780
Occasional	337 972	263 742	263 870
Total	2 346 782	2 057 986	2 060 620

[18] Only including the vessels grouped as having inboard engines in Table 4.
[19] Because of a large fraction of small and/or outboard vessels.
[20] One problem is that production is reported from where it is landed not where it is caught (e.g. a portion of the catch landed in Jakarta (Pacific) is actually caught in the Indian Ocean).
[21] FAO (2007)

LOCAL STATISTICS

The statistics collected and produced at the provincial level show that there was a total of 16 306 boats in 2006 (Figure 10). Of these, 3 845 were non-powered, 3 717 were powered by outboard engine and 8 746 were powered by inboard engine. The number of boats was highest in 1994 (20 393) and lowest in 2002 (10 768). The number of non-powered vessels has decreased over the years from 14 409 (1994) to 3 804 (2007). At the same time the number of vessels with inboard engines has increased from 2 370 (1994) to 8 835 in 2007, whereas the vessels powered by outboard engines has been relatively stable. By gross tonnage (GT) there has been a decrease in the 0 to 5 GT class – from 19 668 in 1994 to 13 872 in 2007 (13 007 in 2006). The lowest number was however in 2002 with 9 111 vessels. The class 5 to 10 GT has increased from 696 to 1 591 in 2007 (1 939 in 2006). The highest value was in 2003 with 2 039 vessels. The 10 to 30 GT group has increased from 41 in 1994 to 1 005 in 2007 (1 171 in 2006). The number of vessels in the largest vessel size group (above 30 GT) has increased from 0 in 1994 to 151 in 2007 (191 in 2006). In conclusion, the main changes that can be seen (from the local statistics) in the fleet are: a rapid decrease in total numbers in the 1990s, mainly because of a decrease in the number of non-powered vessels and/or the 0 to 5 GT group; an increase in 2000, mainly because of the increased fleet of vessels powered by inboard engines. The fleet is getting bigger (by size (GT)) and this is accompanied by an increase in the number of vessels powered by inboard engines, which now make up 53 percent of the fleet, compared to 11 percent in 1994.

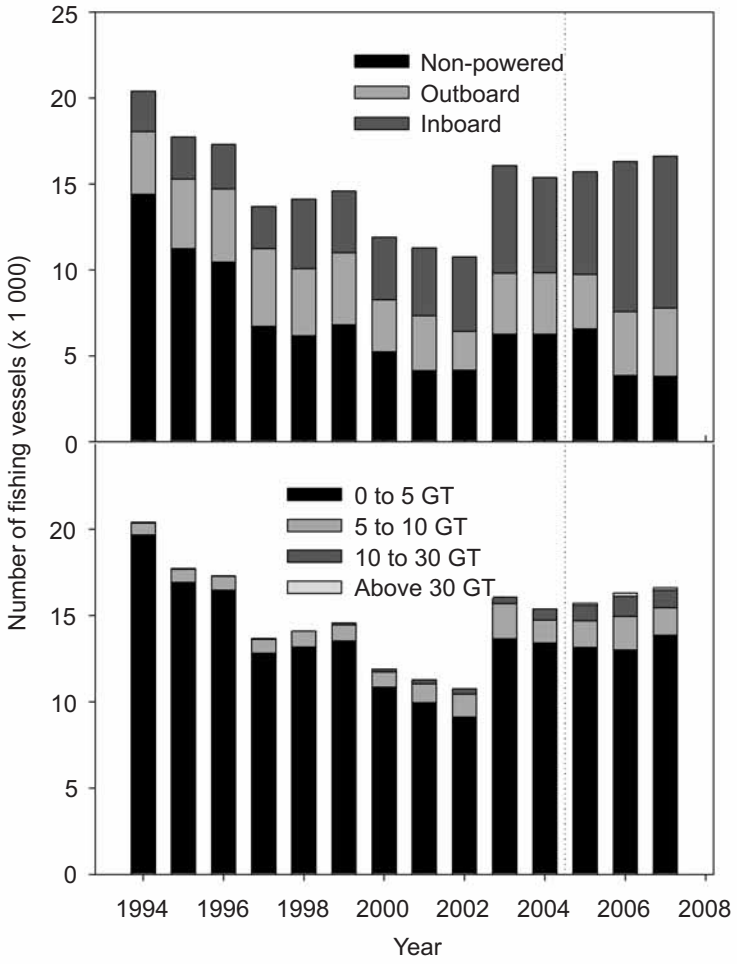

Figure 10 Evolution of the number of fishing vessels in Aceh Province 1994 to 2007, grouped by power source (top) or by size (bottom).[22] Dashed lines indicate the tsunami of 2004

[22] Adapted from DKP (1995 to 2007).

Looking at the change in the fleet structure between years (Figure 11) one can see four main changes in the fleet. These four changes are between the years 1994 and 1995, 1996 and 1997, 1999 and 2000, and 2002 and 2003. All these changes mainly relate to vessels below 5 GT; however the 2002 to 2003 change also included a relatively large portion of the 5 to 10 GT vessels. There is a trend in the yearly changes in the fleet that the larger size classes are undergoing the greatest change (e.g. see 2003, 2004, 2005 and 2006).

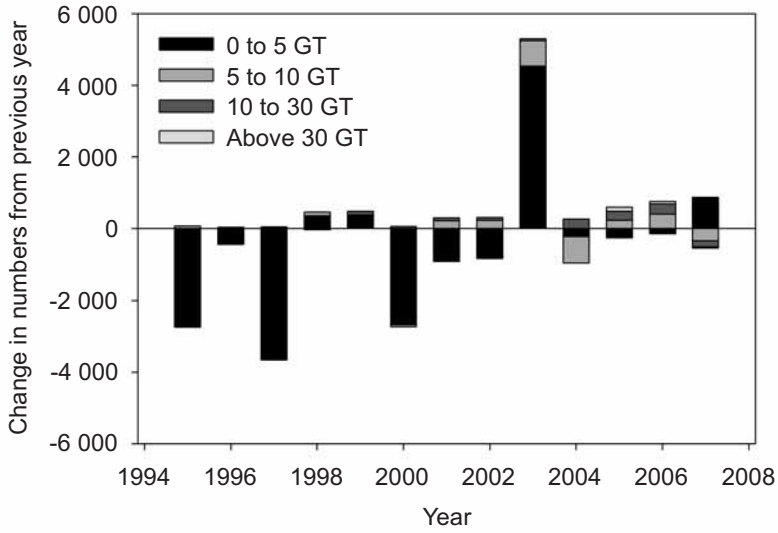

Figure 11 Change in the number of fishing vessels in Aceh Province 1995 to 2007 compared to the previous year, grouped by size[23]

There was a rapid increase in catch in 2003 (Figure 12) that coincided with a rapid increase in the fishing fleet (Figure 11). Hence the catch per fishing vessel was unaffected. The catch per fishing vessel has been relatively stable since 1997 up until 2007 (tonnes/boat) with a drop in production in 2004 and 2005. Even though the production per boat has been stable, the value per kg catch has steadily increased, with a dramatic increase in 2007.

Part of this can be explained by a fluctuating currency. There was a drop in production in 2005 that can easily be explained by the impact of the tsunami on the fishing fleet and its activity. Looking at quarterly production figures it becomes clear that the production was lowered immediately after the tsunami but then regained volume quickly (Figure 13). Already in the third quarter the catches were back to pre-tsunami levels. The first and second quarters showed large drops, with a rapid gain in the third quarter and sustained production in the fourth quarter.

The drop in 2004 (pre-tsunami) compared to 2003 may be an effect of the escalated conflict in Aceh Province, which may have resulted either less fishing activity or more difficult conditions in which to collect statistics. In 2004 there was a state of emergency declared in the province and the effect of this on the fishing fleet (activity of fishers, number of trips) is not known but probably both these variables were negatively affected. Also, the effort to collect data would probably be lower in a conflict situation, hence the data would be more prone to be estimated from previous years.

The catch in the province has fluctuated between 7 and 13 percent of the total Indonesian catch from the Indian Ocean (Figure 9 and Figure 12). On average, the contribution of the production from Aceh Province is about 10 percent of the Indonesian catch in the Indian Ocean and about 3 percent of the total catch reported from Indonesia.

[23] Adapted from DKP (1995 to 2007).

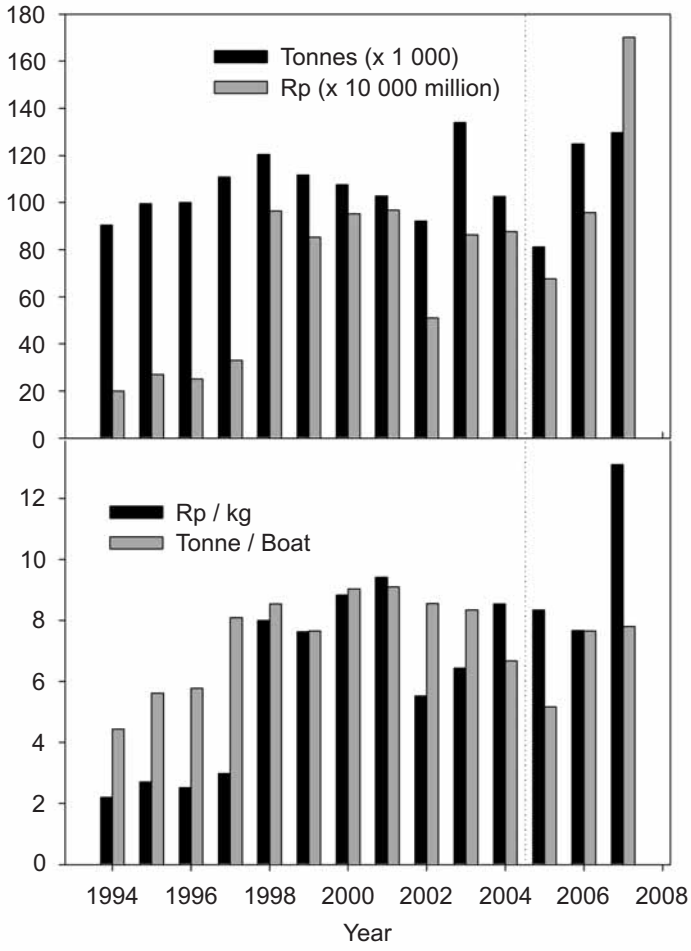

Figure 12 Evolution of volume and value of the catch landed in Aceh Province 1994 to 2007. Dashed line represents 2004/2005

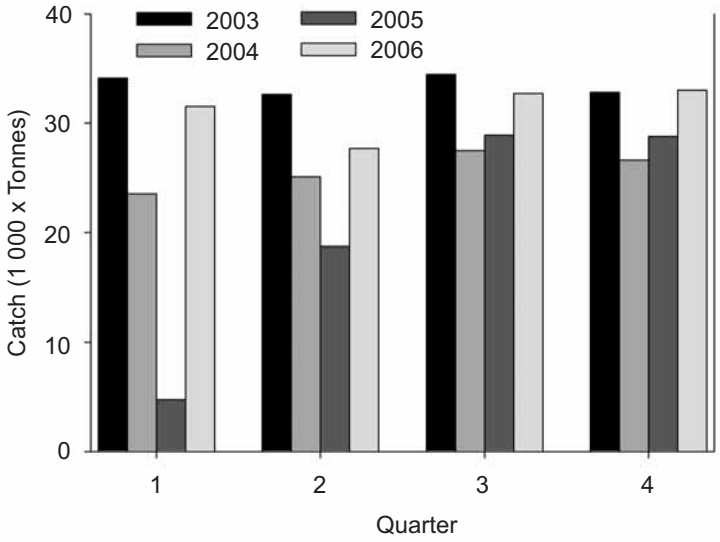

Figure 13 Quarterly production figures for Aceh Province, 2003 to 2006.

OTHER REPORTS

Any description of the fleet development in Aceh Province can of course not ignore the serious impact of the 2004 tsunami. There was a massive loss of fishing vessels as a result of the tsunami (estimates range from 4 756[24] to 7 734[25]). The tsunami had a relatively small impact on the fleet structure if just focus on the three different engine groups: inboard engine, outboard engine and no engine. There was a small increase in inboard fishing vessels (from 48.6 to 49.3 percent of the total fleet) and fishing vessels with no engine (from 35.5 to 37.8 percent). Hence, the group which had the largest fraction of lost fishing vessels as a result of the tsunami was the fishing vessels with outboard engines. However, looking at real numbers the largest loss was recorded in the inboard engine category (3 667) followed by the no engine group (with 2 356) and hence the remaining 1 711 fishing vessels, of the 7 734 lost as a result of the tsunami, were from the outboard engine category (Table 14).

Table 14 Pre- and post-tsunami (2006) status of fishing fleet in Aceh Province[26]

Coast	Pre-Tsunami			Post-Tsunami		
	Inboard engine	Outboard engine	No engine	Inboard engine	Outboard engine	No engine
West	3 350	1 125	4 664	1 980	691	3 855
East	8 558	2 771	4 018	6 261	1 494	2 471
Subtotal	11 908	3 896	8 682	8 241	2 185	6 326
Total			**24 486**			**16 752**
Total lost						7 734

To offset this loss, several schemes where set in motion to deliver fishing vessels to Aceh Province. As of April 2006 a total of 5 166 fishing vessels had been delivered to the fishers who had reportedly lost fishing vessels in the tsunami (Table 15). This is a staggering 67 percent of the fishing vessels reportedly lost during the tsunami that were replaced within 16 months. The downside of this rapid response was that there were reports of fishing vessels being ill-suited for their purpose (i.e. wrong design, badly built and of the wrong material (fibre glass instead of wood). Hence of the 5 166 fishing vessels delivered an unquantified, but probably significant number, was never used and subsequently abandoned. Of the lost fishing vessels 5 121 (66 percent) were from the east coast and consequently 69 percent of the fishing vessels delivered (Table 15) were delivered to the east coast.[27] In addition to the fishing vessels lost, there was also a large proportion of the fishing vessels that were damaged (either structurally or which lost their engines), i.e. 15 percent of the fishing vessels were damaged but not lost. Hence, although a large proportion of the fishing vessels lost were replaced, there was an even greater inactivity in the fleet than the lost numbers would indicate. However, recently it has become evident that the total number of boats has indeed exceeded pre-tsunami levels in some areas of Aceh.[28]

Table 15 Number of fishing vessels delivered to Aceh Province between 2005 and April 2006[29]

Coast	Number of fishing vessels
West	1 602 (31%)
East	3 564 (69%)
Total	**5 166**

[24] YLLI (2007, Appendix 4)

[25] Data adapted from FAO (2006).

[26] Data adapted from FAO (2006)

[27] The post-tsunami assistance for boat building and boat distribution was seemingly considerably influenced by the closeness of a place to urban centres (especially Banda Aceh) and the accessibility by road. This is particularly true of the west coast. So for example Aceh Jaya's fleet rebuilding was affected by its lack of access and is not related to resource plenitude or fisher capability. Whereas in (west) Aceh Besar there seems to have been a surfeit of assistance because of its proximity to Banda Aceh and it is therefore possible that the current fleet size may not be a true reflection of the fishery potential or participation in fisheries.

[28] FAO (2007)

[29] Adapted from YLLI (2007, Appendix 6)

An assessment of the seriousness of the damages was carried out and the value of repairing the damaged fishing vessels was estimated to be US$0.2 million and the value of lost gear was valued at approximately US$18 million and lost engines at approximately US$10 million.[30] Interestingly, the value of lost fishing vessels was US$8.8 million.[31]

Of the approximately 75 000 fishers that were reportedly active prior to the tsunami in 2004 (Table 16), at least 10 percent was reported to have lost their lives.[32] This of course had serious impacts on the productivity of the fisheries sector, as can be seen in the quarterly production figures (Figure 13). By coast, the number of fishers was 37 percent operating on the west coast and the remaining 63 percent on the east coast.

Table 16 Alternative numbers of fishers in Aceh Province according to different sources (pre-tsunami, 2003)

Coast	Fishers[33]	Fishers[34]
West	27 945 (37%)	
East	46 714 (63%)	
Subtotal	74 659 (100%)	87 991
Average	**81 325**	

BOAT REGISTRATION

The target of the fishing boat registration project in Aceh Province is for all fishing vessels over 10 GT to be registered with the provincial authorities. Initial assessments of the number of vessels bigger than 10 GT ranged between 600[35] and 809.[36] The project was designed to cover all districts located directly adjacent to the coastal area (a total of 18 districts). Actually not all of these 18 districts had boats over 10 GT according to the first assessment by the project – only 12 districts had boats larger than 10 GT. As described earlier, the project focused on 11 strategic fishing ports and an additional 11 larger landing sites.

In the initial registration done by Panglima Laot, the project found 550 boats that were above 10 GT, but after the team began registration and verification in the field (September to November 2008) 20 of these boats were found to be below 10 GT. For the remaining 530 boats (Table 17) an assessment of the documentation was done and they were classified into the following categories: 1) fully documented; 2) partially documented; and 3) undocumented. They directly continued the process of issuing a license for the boats in category 1 but not for the boats in the other categories.

[30] FAO (2005)
[31] FAO (2005)
[32] FAO (2006)
[33] Data adapted from FAO (2006)
[34] FAO (2005)
[35] A review assessment from DKP, Transport Department and Panglima Laot Lhok.
[36] From the 2006 census.

Table 17 Number of boats registered as above 10 GT per district

Coast	District	Number of boats above 10 GT	Census 2006 data
East coast	Aceh Tamiang	3	13
	Kota Langsa	41	23
	Aceh Timur	107	174
	Kota Lhokseumawe	54	72
	Aceh Utara	0	8
	Bireuen	23	36
	Pidie Jaya	74	59
	Pidie	31	63
	Banda Aceh	0	35
	Sabang	8	13
	Aceh Besar	87	1
	Subtotal	428	497
West Coast	Aceh Jaya	0	11
	Aceh Barat	22	90
	Nagan Raya	0	2
	Aceh Barat Daya	21	77
	Aceh Selatan	59	110
	Aceh Singkil	0	20
	Simeulue	0	3
	Subtotal	102	314
Total		**530**	**809**

SYNTHESIS AND DISCUSSION

One thing is clear from looking at all of these different sources of data on fishing vessels and related variables, there is a need to harmonize the data and hopefully arrive at a picture of the fleet that more accurately reflects the reality. It is important to remember that all different data collection systems/efforts in this compilation had specific limitations relating to the method of data collection and/or analysis. Hence, the focus of this synthesis is to compare some of the data to arrive at the most likely value among the various estimates. The only rigorous way to arrive at a more accurate statistical picture of the fishing fleet of Aceh Province is to perform a new census (focusing on a few key variables).

The main characteristics of the fleet is that there are 13 360 fishing vessels in Aceh Province with an average size of 3.2 GT and 91 percent of these vessels are active (Table 18). The fleet is made up of, in general, relatively newly built wooden vessels (most were built about 2002), with highly motorized (inboard engines) with an average engine size of 16 Hp. The fleet is largely privately owned and the vessels acquired by private funding, although in 2005 and 2006 a large proportion of boats was donated. The typical vessel, on average, carries 1.5 gears and 3.2 crew members and they mainly perform their fishing nearshore (0 to 3 nm offshore). The main gear used comprises different types of hook and line but also gill nets are used by a large proportion of the fleet. The vessel is usually not equipped with navigation or communication equipment, although a high proportion of the larger vessels carry both.

The main differences between the west and east coast are that there are fewer and smaller vessels on the west coast than on the east coast, but a higher degree of the vessels are active on the west coast. Furthermore, the vessels on the west coast carry more gear and more crew members than the east coast vessels.

Table 18 Average data for Aceh Province fleet characteristics (based on the 2006 census data) divided by coast

	East coast	West coast	Total
GT	3.2	3.1	3.2
Active fishing vessels (%)	88	97	91
Number of crew members	3.1	3.3	3.2
Average Hp	18.1	11.5	16
Number of gears	1.4	1.7	1.5
Number of vessels	8 258	5 102	13 360

The data collected by the census was generally in agreement with the other data sources available (Table 19). However, there are also some significant differences between the different data sources. Comparing the census and the local statistics, there is a large difference in the small vessels group (0 to 5 GT). Possibly a large proportion of these fishing vessels are non-powered small vessels that were not caught by the enumerators during the census. This observation is also supported by comparing the engine of the vessels, where the census recorded a significantly lower number of vessels with outboard engines or with no engine than the local statistics. The local statistics show higher values for the number of boats above 10 GT than the number registered in 2009.

Table 19 Summary of fishing fleet (number of fishing vessels) grouped by size (GT and motor) from different sources of data

	Census (2006)		Local statistics (2006)		Registered (2009)
By Size (GT)	**number**	**percent**	**number**	**percent**	**number**
0 to 5	11 602	87	13 007	80	
5 to 10	948	7	1 939	12	
10 to 30	635	5	1 171	7	530
Above 30	175	1	191	1	
By Motor					
No motor	1 912	14	3 845	24	
Outboard	1 214	9	3 717	23	
Inboard	10 234	77	8 746	54	

Also, the estimated figure for vessels above 10 GT differs between the census and the registration component[37] (Table 20). Specifically, there is a large difference depending on the coast, with only 33 percent of the vessels enumerated in the 2006 census being registered in 2009.

Table 20 Number of boats above 10 GT

District	Registered (2009)	Census 2006 data
East coast	428	496
West Coast	102	313
Total	**530**	**809**

For the east coast, the coverage is higher with 89 percent. The main differences in the west coast can be found in the districts of Aceh Barat, Aceh Barat Daya with only 25 percent of the boats registered and in Aceh Selatan where only 55 percent are registered. For the other districts on the west coast, no vessels are registered as above 10 GT although all districts have boats above 10 GT in the census. On the east coast the main difference is found in Aceh Besar with 87 registered boats above 10 GT in 2009 but only one boat in the 2006 census. It should also be noted that the registration project focused on major ports, therefore any ships operating outside of these would not be enumerated in the registration scheme, but would still be in the census. As a result of this, the higher numbers obtained in the census could be explained by the exclusion of vessels outside major ports.

Evolution of fleet tonnage and engine size (1994 to 2007)

If the average values from the census are used and applied to the time series from the local statistics, the picture shown in Figure 14 emerges. Although the real values might not be exact, there is a clear trend in increasing tonnage, especially during the last few years. The increase is mainly in the groups 10 to 30 GT and above 30 GT. Hence, this is an indication that the fleet is getting larger. The increase in engine size and the total fleet power (kW)[38] has been steady increasing since 1994 with major increases in 2003 and again in 2006 (Figure 15). Hence, not only is the fleet getting bigger but it is also using more power.

[37] It should be noted that the census data also include inactive vessels.

[38] [average kW per group (census data)] X [number of vessels per group (local statistics)]

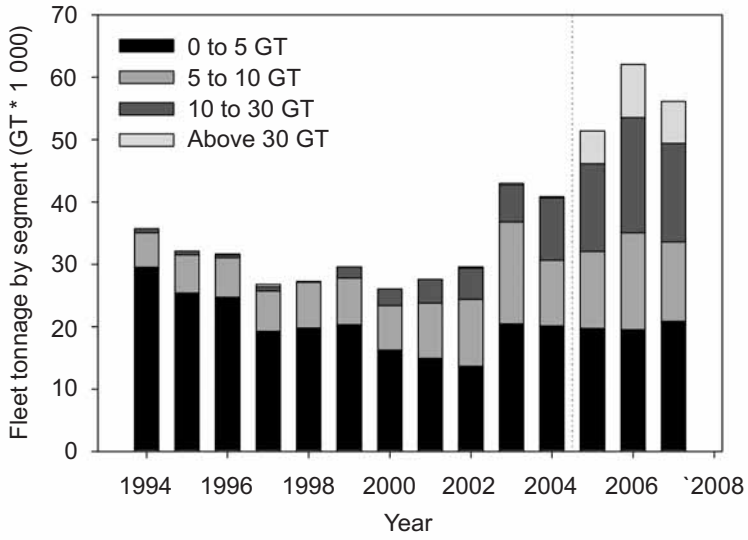

Figure 14 Extrapolation of the evolution in tonnage of fishing fleet[39]

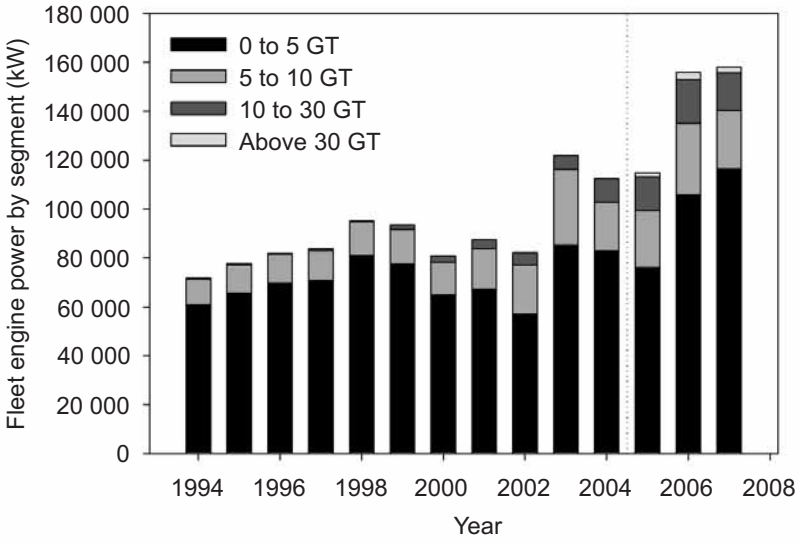

Figure 15 Extrapolation of the evolution in engine power (kW) of the fishing fleet in Aceh Province[40]

If the local statistics are representative (i.e. a relatively stable catch (total volume) during the last 25 years) we can summarize and say that the average catch per tonnage (GT) or fleet power (kW) has gone down. This is a first indication that the Aceh Province fishing fleet might have reached the maximum catch per effort and hence any further increase in fleet tonnage would result in even less catch per fleet tonnage.

[39] Calculated as average group data (from table census average tonnage) and multiplied by local stats time series

[40] Calculated as average group data (from table census engine size (Hp)) transferred into kW (1 Hp = 0.7456 kW) and then multiplied by local statistics time series.

SOURCES OF ERROR AND DATA DISCREPANCIES

The discrepancy between the local statistics and the census data could be explained by three possible scenarios:

(1) The census data are mis-estimated[41] whereas local statistics are correct.
(2) The local statistics are mis-estimated whereas the census data are correct.
(3) Both the local statistics and the census data are mis-estimated.

An earlier comparison[42] of the above sources led to the following observations:

- The DKP 2004, 2005 statistics and the 2006 census display respectively 63.3 percent, 67.6 percent and 55.6 percent of the FAO estimate for 2005. This may signify either an under enumeration of boats by DKP and the 2006 census or an overestimation by FAO in 2005.
- The total number of boats established by the 2006 census is 82.2 percent of the 2005 DKP figure. This significant difference was entirely because of a different number of boats recorded on the west coast, notably in the districts of Aceh Selatan, Aceh Barat, Simeulue and Aceh Barat Daya.
- Despite a comparable total on the east coast in the 2006 census and the DKP statistics of 2005, there are rather big differences between the districts.

The conclusion of this review is that scenario (3) above is the most likely for the following reasons:

- The accuracy of the local statistics is probably hampered by the fact that collecting them is a routine exercise and hence there may be a tendency to fail to detect changes in the fleet because routine collection of local statistics often suffers from over-usage of projections between years (and/or estimates, and a tendency not to change an estimate between years) and the tendency for small sample size when actual data collection takes place.
- The census data suffers from the fact that perhaps not all vessels were covered because of the sampling design (thus the number of small boats was underestimated) and the fact that the coverage for the variables was low in some cases (i.e. there is some uncertainty about the estimate figures produced by the census). Also, the fact that enumerators were paid by the number of forms they returned, increases the risk of overestimation of boats and copying of data.

NEXT STEPS

It is challenging to propose the best way to manage the fishing fleet in the province of Aceh, when we still know so little about the present situation.

Assuming that there is a willingness to improve the data collection system and the subsequent analysis of the data for information for management, the first overall project should focus at arriving at the “true” numbers for the fishing fleet (vessels, engine size, crew size, number of trips and catch volume and composition). As part of this activity, it would be important to establish the reasons behind the discrepancies between local statistics and census data. As identified in this report, there are indications that these differences are mainly to do with small fishing vessels and specifically non-powered fishing vessels.

[41] Mis-estimated here means overestimated or underestimated.
[42] Hoekstra (2007)

In order to assess fleet capacity usefully, a minimum requirement is availability of estimates of vessel numbers and the principal vessel characteristics:[43]

- If the fleet consists of only one type of vessel, the number of fishing vessels can be used to express the total fishing power or capacity of the fishing fleet.
- If the fleet consists of vessels of different designs (as in the province of Aceh), any survey to determine the capacity of a given fishing vessel would require information on a number of vessel characteristics.
- Gross tonnage (GT), length and engine power would be among the most important characteristics, and it is likely that gross tonnage would be the most important single variable influencing fishing capacity.

Further guidelines and technical advice can be found in (among others) several FAO technical papers.[44] Among the most important things to consider when setting up a census and sample-based survey system are:[45]

1. the need for basic fishery statistics;
2. human and financial resources;
3. system optimization; and
4. system sustainability.

Need for basic fishery statistics. Collection of basic data on fishers, catches, fishing effort, prices, values and other related information such as size at capture and length frequencies, is fundamental for most activities related to policy, planning and management of fisheries and aquaculture. Occasional censuses (frame surveys) and sample-based fishery surveys conducted on a regular basis should be viewed as an important source of fishery information for a wide range of activities such as:

a) estimated total production (or total catch);
b) estimated total value of fish production;
c) prices at landing;
d) fishing effort; and
e) numbers of fishers.

The quality of the data collected impacts directly on the quality of the analyses of the data including the indicators, stock assessments and forecasts elaborated using them. In addition, the quality of the national data collection system will influence the ultimate quality of the data collected and compiled in other statistical systems, at regional level (i.e. in Regional Fishery Management Organizations and Regional Fishery Bodies) or global level (e.g. at FAO) as these are largely based on national statistics. FAO can ground truth or validate other regular statistics that may be subject to high levels of estimation.

Human and financial resources. Availability of sufficient and adequate human resources is often one of the major constraints in the implementation of medium- and large-scale fishery surveys operated on a regular basis, particularly in cases of fishery administrations with limited budget allocated for data collection programmes. Another important feature of human and financial resources are appropriate incentives to enumerators that ensure they get out of the office, but also prevents the manufacturing of data and misreporting (e.g. payment by form referred to earlier). Mobility of data recorders – the ability to visit as many locations as possible during an allocated time – also affects the quantity of collected data as well as their representativeness.

[43] FAO (2009a)
[44] FAO (2001) and FAO (2002)
[45] Adapted from FAO (2009b)

Systems optimization. Once established, statistical systems should be optimized in order to efficiently use the scarce resources available. Optimization is a constant concern because, without special attention, performance of statistical systems tends to degrade with time.

Systems sustainability. One of the key concerns in data collection is the sustainability of the adopted system in terms of human, financial and computational resources, as well as the ability to adapt to changing needs. This can typically be related to the amount of budgetary allocation available to the activity. In situations where fishery information and statistics are collected without meaningful linkage to management action, there is a tendency to consider the activity an expensive research activity. This often results in a general decline in investment and funding. This underlines the importance of collecting the right data in a cost-effective manner that is of direct value to management decision-making.

Newly renovated and painted fishing vessel in Banda Aceh

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ANNEX 1. VESSEL TYPES

Below are some examples of the different size classes used in the report, for reference and easy comparison. The classes are:

- 0 to 5 GT
- 5 to 10 GT
- 10 to 30 GT
- Above 30 GT

Example of boats in the size range 0 to 5 GT

Non-powered

Inboard engine

Example of boats in the size range 5 to 10 GT

Outboard engine

Inboard engine

Example of boats in the size range 10 to 30 GT

Outboard engine

Inboard engine

Example of boats above 30 GT (all inboard engine)

ANNEX 2. FISHING GROUNDS

- Blue line shows the 12 nautical mile line around the province of Aceh
- Different coloured land areas correspond to different districts[46]

[46] The district *Pidie Jaya* was created after the making of the map and is hence not included. For reference, the newly created district is part of what on the map is the district *Pidie*.

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