

**PART I**  
**DESCRIPTION OF SMALL-SCALE FISHERIES**  
**OF NIAS ISLAND, INDONESIA**

*(Based on a report prepared in 1988  
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**1. INTRODUCTION**

Nias is an island situated in the Indian Ocean about sixty nautical miles west of the west coast of North Sumatera province. It has a land area of approximately 4800 km<sup>2</sup> and a population of 528,000. The geographical location of the island is shown in Figure 1 (facing page) and some socio-economic data are given in Appendix I.

Nias District is one of the districts (*kapupaten*) of the province of North Sumatera. It has 13 subdistricts (*kecamatan*), of which twelve are coastal. The subdistricts of Nias Island are shown in Figure 2 (alongside). The subdistrict of Pulau Batutello comprises a group of small islands lying some 40 nautical miles south of Nias Island. Due to its geographical location, this subdistrict is economically attached to West Sumatera Province and a description of its small-scale fisheries is not included in this report.

There are about seventy fishing villages scattered along the Nias coastline, of which 26 are located in Gunung Sitoli and Tuhemberua subdistricts. The road network is largely underdeveloped and restricts access to many fishing villages.

Of the total population of Nias Island, some 4000 people are directly involved in fishing, as well as in the handling, processing, and marketing of fish and other ancillary activities. Knowledge of the marine resources in the coastal and offshore zones is limited.

Fishing in Nias Island consists of small-scale fishing activities, except for the fishing operations based at Sibolga and Padang. The private sector plays a major role in all sectors of the fishery. All fishing craft are privately owned. The construction of craft, supply of fishing gear, engines and other requisites are handled by the private sector. The public sector is involved only in the supply of fuel at major fishing centres and in institutional credit at Gunung Sitoli.

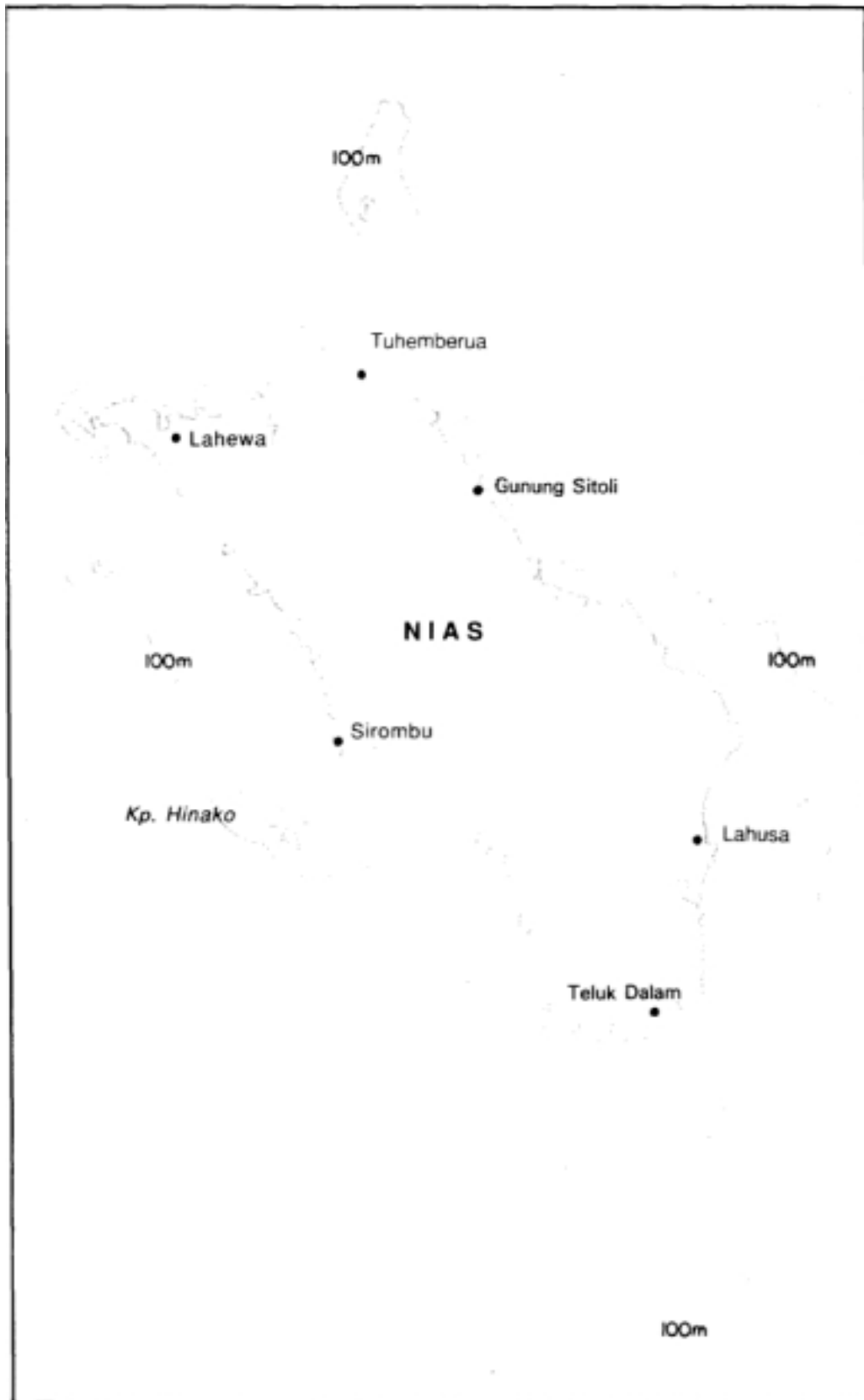
There are about 2500 fishing craft operating, mostly in the coastal zone, of which about 96 per cent are very small, non-motorized craft. The effort to motorize the traditional craft and introduce new fishing craft commenced in the early 1980s. The fishing gear are traditional and hook-and-lines predominate.

According to the Provincial Fisheries Service statistics of 1986, the total production of marine products was in the order of 3400 t. This figure, however, does not include the catch of the fishing fleet based at Sibolga and Padang and which operates around Nias Island. Most of the marine catch is consumed in the fresh form. Only a fraction of the total catch is iced or processed into salted, dried fish. A small quantity of high market value shrimps and lobsters is exported to Sibolga. Import of fish from Sumatera Island is in salted, dried form.

**Fig. 2 The subdistrict of Nias Island**



Fig. 3 Map of the continental shelf



The personnel of the District Fisheries Service come under the authority of the Director General of Fisheries and the provincial government institutions. The policy of the Government is to concentrate on development for more intensive exploitation of coastal, deep water and offshore resources by introducing larger motorized craft, improving fishing techniques and providing better processing and marketing infrastructure, leading to self-sufficiency in marine food products and an improved standard of living for the fisherfolk.

## 2. *MARINE ENVIRONMENT*

The continental shelf extends from one nautical mile in Gunung Sitoli to about ten nautical miles in most other parts of the coastline. In the north and south, however, it extends in a narrow, tongue-like shape upto thirty nautical miles. The slope shows an abrupt drop in most areas. The shelf area is approximately 5,000 km<sup>2</sup>. The configuration of the shelf is shown in Figure 3. Coraline outcrops and coarse coraline sandy bottom areas are found in most parts of the continental shelf. Sandy and muddy trawlable areas are scattered along the east and west coasts. Removal of coral outcrops for road and house construction during the past has contributed to erosion of the shoreline in many areas. Coastal erosion is illustrated alongside.



Coastal erosion



The tidal range is very moderate (0.30 - 0.70 m) and the level of water in most small water outlets is almost stagnant. This results in the formation of sand banks, which often prevent or limit access to rivers by fishing craft other man small outrigger canoes ana open planked boats.

The sea condition is generally fair, with a predominance of a gentle breeze which strengthens from September to December.

The climate is affected by insularity and the island's proximity to the equator. The rainy season is from September to December.

## 3. *RESOURCES*

### 3.1 *The coastal zone*

3.1.1 Sardine, anchovy, scad, mackerel (rastrelliger), barracuda and flyingfish are the most common small pelagic species found in the near shore area of the coastal zone. These species are

mainly caught by monofilament gillnetting and beach seining. These methods are used within a few nautical miles from the shore.

Considering the level of production of these species and the spatial employment of these fishing methods, there is potential for further increase of production without adversely affecting either the catch rate or the viability of the fisheries.

3.1.2 Snapper, bream, grouper and emperorfish are the most common demersal species caught in the area upto the outer limit of the coastal zone. Reliable data are not available to evaluate the effect of the fishing effort on these resources. The lack of uniformity in the area-wise production, however, suggests that expansion of this fishery is possible without adversely affecting its viability.

3.1.3 Penaeid shrimp species make the biggest contribution to the shellfish fisheries. The main shrimp fishing methods are trawling and, to a much lesser extent, trammel gillnetting. As trawling has reduced considerably since the trawl ban in 1980 – with only some illicit trawling by boats based on Sibolga – it is believed that the potential for increased catches of shrimp by small-scale trammel gillnetting is good.

3.1.4 Lobster are mostly found near reefs and in rocky shallow water in the southern areas. Lobster fishing is mainly carried out in the south by diving and by using bottomset gillnets from small outrigger canoes. This resource is reported as being extensively exploited, even overfished. The lobster are directly exported to Sibolga by private traders. As no catch statistics are available, there is a need to assess the status of the lobster stock in the different areas.

3.1.5 Green mudcrab are found in the mangrove areas of Lahewa and Tuhemberua. Hoopnets are used for their capture. There is no information on the present production and the potential yield, but it is believed that the present level of production can be maintained, if not increased.

3.1.6 Bullet tuna, frigate tuna, king mackerel and dolphin fish are concentrated in the coastal zone, while skipjack, yellowfin, bilifish and shark are less abundant and more widely distributed in the offshore zone. The coastal fishery for large pelagic species is mainly carried out with small, non-motorized and motorized outrigger canoes using trolling lines, droplines and handlines. With the introduction of larger motorized boats, however, large mesh driftnets are also being used for taking these species.

The production of large pelagic species is increasing, without there being any evidence of a reduction in the catch rate. Considering the estimated potential of the resources, and the quantitative and spatial use of fishing craft and gear, it is believed that a significant expansion of this fishery is feasible.

### 3.2 *The deep water zone*

Large shark are caught in deep waters by the Sibolga based trawler *cum* longliners using bottomset longlines, but there is no information on the production and the potential yield.

Gulper oil shark and finfish, such as grouper and snapper, are known to be available in the deep water zone, but the information available on the potential of these resources and the feasibility of their exploitation is limited.

### 3.3 *The offshore zone*

Skipjack, yellowfin, bilifish and shark have been identified as the main species available in the offshore zone. These species are currently taken by the trollers based on Padang on the west coast and by the recently introduced motorized driftnetters based on Gunung Sitoli, off the east coast. The production of these species is increasing without any evidence of a reduction in the catch rate. Due to the wide distribution of large pelagic species in the offshore zone, there is obvious scope for expansion of the small-scale large pelagic fisheries around Nias Island.

The most common marine species are given in Appendix II.

## 4. FISHING CRAFT AND GEAR

### 4.1 Fishing craft

The fisheries sector of Nias Island comprises small-scale fishing operations which are responsible for the bulk of the indigenous marine production. There is no medium or large-scale fishing operations in the island. The Sibolga based trawler *cum* longliners, which carry out illicit trawling in the coastal zone, and the Padang based trollers, which operate seasonally in the offshore zone of the west coast of Nias Island, land their catches at their home bases.

With the ban on trawling in Sumatera waters in early 1980, it is believed that the number of trawlers operating in the coastal zone, which was earlier estimated to be 80, decreased to about 20. The latter still carry out illicit trawling together with shark longlining.

The period from the trawl ban, of 1980 to 1988 has been one of new development. Some small indigenous outrigger canoes were motorized in order to extend their range of operation. New plankbuilt outboard and inboard motorized craft were introduced in the coastal and offshore zone.

In 1987, the total production was in the order of 3400 t. Most of the catch was made by small indigenous non-motorized craft using mainly hook-and-lines and, to a small extent, gillnets. The motorized indigenous and newly introduced craft were, however, responsible for only a fraction of the total catch.

The fishing fleet comprises about 2300 fishing craft operating year-round mainly in the coastal zone and, to a much less extent, in the offshore zone. The present composition of the fishing fleet of Nias Island is given in Table I.

**Table I**  
**Composition of fishing fleet\***

<i>Craft type</i>	<i>Non-motorized</i>	<i>Motorized OBM</i>	<i>Motorised IBM</i>
<b>1. Indigenous craft</b>			
(a) Small outrigger dugout canoes (4-6m)	2121	67	—
(b) Dugout canoes (6-7m) with or without outrigger	20	4	5
<b>2. Introduced craft</b>			
(a) Planked open boats (7-10m)	—	32	—
(b) Planked half decked boats (8-12m)	—	—	28
<b>TOTAL</b>	<b>2141</b>	<b>103</b>	<b>33</b>

\* PFS Statistics, 1986

The different types of indigenous and newly introduced fishing craft are

- non-motorized indigenous fishing craft of traditional design propelled by sail, oars and paddles;
- indigenous fishing craft of traditional design modified for outboard (OBM) and inboard (IBM) motorization; and
- newly introduced motorized fishing craft of new design fitted with outboard and inboard engines.

These fishing craft are used in the waters off the entire coastline, but their geographical distribution is uneven. The subdistrictwise distribution of the main types of fishing craft is given in Table II.

**Table ft**  
**Subdistrictwise distribution of fishing craft (1986)**

<i>Subdistrict</i>	<i>4-7m Outrigger Canoes</i>			<i>7-/0m Open</i>	<i>8-12m</i>
	<i>Non-motorized</i>	<i>Motorized</i>		<i>planked OBM boats</i>	<i>planked IBM boats</i>
		<i>OBM</i>	<i>IBM</i>		
Gunung Sitoli	399	—	—	17	10
Tuhemberua	398	4	1	13	2
Gido	90	7	—	—	—
Idano Gawo	104	12	—	—	—
Alasa	30	6	—	—	—
Lahewa	401	—	—	—	—
Teluk Dalam	342	5	—	2	13
Lahusa	124	—	—	—	—
Sirombu	202	37	4	—	3
Lolowau	51	—	—	—	—
TOTAL	2141	71	5	32	28

## **Indigenous Craft**

### **I. DUGOUT OUTRIGGER CANOES**

These craft have small, narrow, dugout hulls with slightly raised hull ends and double wooden outriggers attached to a pair of wooden arms. The sizes range from 4 to 5 m. They are mostly propelled by oars, paddles and/or sail. Some are motorized with 2 hp Suzuki or Yamaha OBM. They are mostly used for hook-and-line fishing and, to a small extent, for net fishing within the coastal zone.

### **ii. DUGOUT CANOES**

These are larger dugout canoes with an overall length of 5 to 7m with or without raised side strakes and outriggers attached to the hull. They are propelled by oars, paddles, sail and/or petrol OBM of 2 to 5 hp or Diesel IBM of 5 hp. Those without outriggers are used for beach seining and transport while the others are used for hook-and-line fishing, beach seining and gillnetting in the coastal zone.

## **Newly introduced craft**

### **i. PLANKED OPEN BOATS**

These are undecked, open, planked boats with wooden frames. Their overall length is from 7 to 10 m. They are mainly used for driftnetting for large pelagic species in the outer limits of the coastal zone and in the offshore zone.

They have a planing hull adapted to fishing and are propelled by kerosene and petrol outboard motors of 15 to 25 hp. An attempt is being made to modify them for motorization with diesel inboard engines.

### **ii. PLANKED HALF-DECKED BOATS**

These are planked boats with wooden frames, a displacement ranging from 2 to 3 t and an overall length of 8 to 12 m. They are powered by diesel inboard engines of 10 to 40 hp of various makes (Yanmar, Dong Feng, Kubota, Deutz, Daihatsu). They are owned by small entrepreneurs who use them for driftnetting for large pelagic species in the offshore zone off Gunung Sitoli and Teluk Dalam.

The various types of craft may be seen in the photographs on the following pages.



*Non-motorized dugout outrigger canoe (4-5 m)*



*Non-motorized dugout canoe (5-7 m) used for beach seining*

(7)



*Sail rig of traditional outrigger canoe*



*Outboard motorized dugout outrigger canoe (4-5 m)*





*Outboard motorized dugout outrigger canoe (5-7 m)*



*Inboard motorized dugout outrigger canoe (5-7 m)*



*Outboard motorized dugout outrigger canoe (6-7 m) used for beach-seining*



*Outboard motorized planked open boat (7-10 m)*



*A small inboard motorized half-deck driftnetter (8 m)*



*A larger inboard motorized half-deck driftnetter (10-12 m)*



*Padang-based inboard motorized trollers fishing off the west coast of Nias Island*



*Sibolga inboard motorized trawler--cum-longliner fishing in the coastal zone of Nias Island*

## 4.2 Fishing gear

Hook-and-lines comprise the most important category of fishing gear used by the small-scale fishing sector, and are followed by gillnets and beach seines. While hook-and-lines (handlines, droplines, trolling lines) have been traditional fishing gear used for decades, bottomset longlines, small mesh gillnets, trammelnets and large mesh driftnets were introduced in the early 1980s after the trawl ban.

Seventeen types of fishing gear, belonging to seven different categories, are identified. The identified fishing gear is listed in the Table III.

**Table III**  
**Types of fishing gear used in Nias island**

<i>Category and Type</i>	<i>Target species</i>
<i>Surrounding nets</i>	
Beach-seine	Small pelagic.
2. <i>Gillnets and entangling nets</i>	
(a) Drift gillnet (small mesh)	Sardine, flying fish, Indian mackerel.
(b) Bottom drift gillnet	Shrimp and mixed miscellaneous demersal species.
(c) Trammel gillnet	Shrimp and mixed miscellaneous demersal species.
(d) Drift gillnet (large mesh)	Tuna, billfish, shark and dolphin fish.
(e) Bottom set gillnet	Lobster and demersal species.
3. <i>Hook-and-lines</i>	
(a) Handline (single and multihook)	Snapper, grouper, bream and other miscellaneous demersal species.
(b) Handline (multihook with artificial lures)	Frigate mackerel, eastert little tuna and other small tuna species.
(c) Trolling line (single and multihook with artificial lures)	Frigate mackerel, seer, skipjack, yellowfin and other tuna species.
(d) Bottom set longline	Snapper, grouper, bream, and other demersal fish, including gulper oil shark.
(e) Angling line	Miscellaneous near shore and river species.
4. <i>Traps</i>	
Hoopnet	Mangrove green crab.
5. <i>Falling nets</i>	
Castnet	Mixed small pelagic and demersal species.
6. <i>Trawls</i>	
Bottom otter trawl	Shrimp and bottom dwelling species.
7. <i>Others</i>	
(a) Scoopnet	Small mixed species.
(b) Liftnet on stilts used with light attraction	Small mixed pelagic species.
(c) Harpoon	Small demersal species, lobster.

No accurate quantitative information on fishing management units is available. According to the 1986 census conducted by the PFS office of Gunung Sitoli, there are 3774 fishing management units in the small-scale fishing sector of Nias Island. The subdistrictwise fishing management units are given in Table IV.

**Table IV**  
**Subdistrictwise fishing management units**

<i>Subdistrict</i>	<i>Hook-and-lines</i>	<i>Gill-nets</i>	<i>Beach-seine.c</i>	<i>Others</i>	<i>Total</i>
Gunung Sitoli	479	37	3	111	630
Tuhemberua	467	27	6	136	646
Gido	135	16	5	25	181
Idano Gawo	153	10	5	32	200
Alasa	44	8	—	5	57
Lahewa	425	50	7	223	705
Teluk Dalam	432	65	—	123	620
Lahusa	140	10	—	43	193
Sirombu	276	—	—	79	355
Lolowau	117	—	—	70	187
<b>TOTAL</b>	<b>2668</b>	<b>223</b>	<b>36</b>	<b>847</b>	<b>3774</b>

### 4.3 *Fishing Areas*

#### 4.3.1 COASTAL FISHERIES

The coastal zone is delimited by the continental shelf, which extends from 1-10 nautical miles around the coastline of Nias Island, except in the north and south where the continental shelf extends in a narrow tongue-like area upto 30 nautical miles.

The nearshore belt of upto 5-6 nautical miles, in which most of the indigenous craft using hook-and-lines and small mesh gillnets, as well as the Sibolga based trawlers, operate is the most exploited. With the recent introduction of motorized craft, exploitation of the coastal zone upto its outer limits has been slowly intensified. Considering the size of the coastal fleet, the fishing gear used, the intensity of fishing, and spatial use of fishing craft, however, there is room for further development of the resources.

#### 4.3.2 DEEP WATER FISHERIES

The deep water zone is the area beyond 100 m depth in which bottom dwelling demersal resources are available. The continental shelf area beyond 100 m depth around Nias Island is limited.

The present level of exploitation of the deep water fishery is very low, and very few fishing craft are deployed therein.

The limited experience of this fishery has indicated the availability of large shark species, gulper oil shark and large fin fish, It is necessary to study the feasibility of exploiting these resources using small-scale fishing craft and gear.

#### 4.3.3 OFFSHORE FISHERIES

The offshore zone is the area extending from the edge of the continental shelf upto about 50 miles from the coastline all around the coast of Nias Island.

Before the recent motorization of indigenous craft and the introduction of new motorized craft, fishing for large pelagics within the coastal zone was carried out mainly by indigenous outrigger canoes propelled by sail, oars or paddles. Trolling lines, droplines and handlines were the main gear used for catching tuna and billfish species.

In the early 1980s, with the introduction of motorized fishing craft and large mesh driftnets for large pelagic species in Gunung Sitoli and Tuhemberua subdistricts (in the northeast area) and trollers based in Padang on the west coast, the exploitation of offshore large pelagic species increased and the feasibility of fishing these resources in the offshore zone was established.

The limited fishing effort and spatial deployment of the craft suggest that the exploitation of large pelagic resources in the offshore zone could be substantially increased.

The narrow continental shelf and good weather conditions year round permit exploitation of the offshore zone with small-scale fishing craft and gear. Emphasis should be placed on introduction of improved craft and gear in order to obtain the best socio-economic benefit for the fisherfolk.

For better year-round feasibility, there should be greater diversification of the small-scale offshore fisheries by the use of drift gillnets, drift longlines and trolling lines according to availability of species and market demand.

## 5. **MARINE PRODUCTION**

Prior to 1980, coastal trawling for shrimp and food fish species by trawlers based on Nias Island and Sibolga made the major contribution to the marine fish production of the island.

After 1980, the trawl ban, the introduction of new motorized fishing craft, the motorization of countrycraft, and the introduction of gillnets have all influenced the marine fish production of Nias Island. Consequently, the trawling operations of the Sibolga based trawlers reduced, although they are still illicitly carried out by some 20 trawlers *cum* longliners. Small mesh monofilament gillnets for small pelagic species became more popular and led to a modest increase in the small pelagic catch. Limited use of trammel gillnets for shrimp resulted in a small increase in the shrimp catch of the small-scale sector.

Motorization of traditional dugout outrigger canoes using mainly hook-and-lines led to exploitation of resources at the outer edge of the continental shelf. Introduction of larger motorized fishing craft and of large mesh, drift gillnets led to increased exploitation of large pelagic species in the offshore zone of the east coast of the subdistrict of Gunung Sitoli.

According to the 1986 statistics of the PFS office of Gunung Sitoli, the estimated total production of the fishing fleet operating from Nias Island is 3406 t. The bulk of the landings are contributed by hook-and-lines, followed by gillnets and beach seines. The catch of the larger trawler *cuin* longliners based on Sibolga and the trollers based on Padang is not recorded and probably exceeds the total production of the Nias Island fishing fleet.

The subdistrictwise production, by category of fishing gear and by species groups, is shown in Tables V and VI.

**Table V**  
**Subdistrictwise production, by category of fishing gear**

<i>Subdistrict</i>	<i>FISHING GEAR</i>				<i>Total</i> (t)
	<i>Beach-seine</i> (t)	<i>Gill-net</i> (t)	<i>Hook-and-line</i> (t)	<i>Others</i> (t)	
Gunung Sitoli	28	264	456	20	768
Tuhemberua	225	123	243	18	606
Gido	46	39	45	5	135
Idano Gawo	44	85	128	4	261
Alasa	—	35	—	—	35
Lahewa	45	115	116	28	304
Teluk Dalani	—	280	281	18	579
Lahusa	—	30	46	10	86
Sirombu	—	—	547	18	565
Lowlowau	—	—	50	17	67
<b>TOTAL</b>	388	971	1912	135	3406

The catch is composed of a variety of species. The subdistrictwise production by groups of species is shown in Table VI.

**Table VI**  
**Subdistrictwise production, by species groups**

<i>Subdistrict</i>	<i>SPECIES GROUPS (catch in t)</i>								<i>Total</i>
	<i>Tuna</i>	<i>Seer</i>	<i>Shark</i>	<i>Queenfish</i>	<i>Skate</i>	<i>Rockfish</i>	<i>Small Pelagics</i>	<i>Others</i>	
Gunung Sitoli	351	64	35	79	20	54	80	85	768
Tuhemberua	93	52	33	118	17	64	63	166	606
Gido	18	10	19	14	9	14	32	19	135
Idano Gawo	29	38	30	30	19	52	22	41	261
<b>Alasa</b>	—	5	6	9	—	12	3	—	35
Lahewa	23	34	38	26	21	82	27	53	304
Teluk Dalam	210	45	14	42	11	76	53	128	579
Lahusa	6	14	20	3	10	13	6	14	86
Sirombu	316	31	19	21	3	59	52	64	565
Lolowau	—	5	1	25	2	11	5	18	67
<b>TOTAL</b>	1046	298	215	367	112	437	343	588	3406



*Outrigger canoes on the beach*



*Newly introduced inboard motorized craft moored in river*