

**Impacts of the Tsunami on Fisheries, Aquaculture and  
Coastal Livelihoods**  
(10 January 2005)

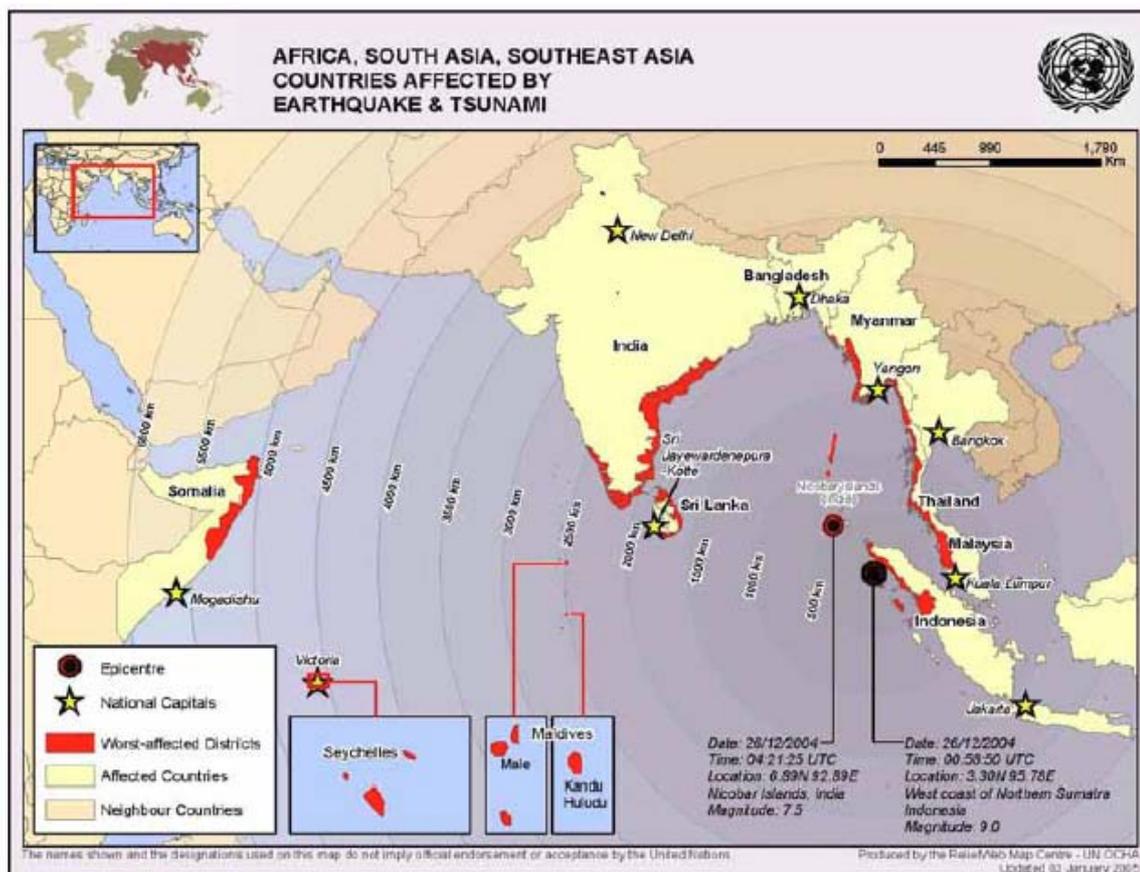
**NACA/FAO/SEAFDEC/BOBP-IGO**

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# Impacts of the Tsunami on Fisheries, Aquaculture and Coastal Livelihoods

- Update on the situation of the affected areas-  
(As of 18:30, 10 January 2005)

NACA/FAO/SEAFDEC/BOBP-IGO



This is a summary report of the impacts on coastal livelihoods of the Indian Ocean tsunami compiled collaboratively by the Food and Agriculture Organization of the UN/Asia Pacific Fishery Commission (FAO/APFIC), Network of Aquaculture Centers in Asia Pacific (NACA), South East Asia Fisheries Development Centers (SEAFDEC) and the Bay of Bengal Programme – Intergovernmental Organizations (BOBP-IGO)<sup>1</sup>. More detailed country reports are available on the collaborating partner's web sites. This assessment will be updated regularly as more information comes to hand. The overall purpose of the assessment effort is to determine the needed resources and efforts to quickly restore shattered livelihoods in the stricken communities.

<sup>1</sup> [www.fao.org](http://www.fao.org) [www.apfic.org](http://www.apfic.org) [www.enaca.org](http://www.enaca.org) [www.seafdec.org](http://www.seafdec.org) [www.bobpigo.org](http://www.bobpigo.org)

The assessment, in consultation with other like-minded organizations, governments, communities, and other stakeholders, will be translated into priority needs, along with reports on partner's responses and activities. These needs will be addressed by projects designed to provide the best possible impact on restoring shattered livelihoods and rehabilitating affected communities as well as the sources or bases for their livelihoods that may also have been seriously damaged.

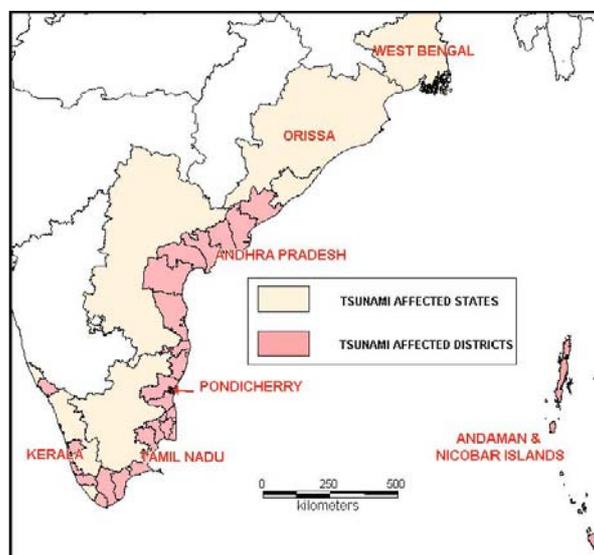
The information in here is from India, Indonesia, Malaysia, Myanmar, Sri Lanka Thailand, and the Maldives.

# IMPACT OF THE TSUNAMI

## INDIA

### General

The Tsunamis caused extensive damage in Southern regions of India and Andaman & Nicobar Islands affecting a total of 2,260 km of coastline. The waves were reported to be as high as 3 -10 meters in southern India and penetrated 300 m to 3 km inland. The worst-affected regions were the Andaman and Nicobar Islands, the States of Tamil Nadu, Pondicherry, Andhra Pradesh and Kerala.



### Fisheries

The fisheries sector in Tamil Nadu, Andhra Pradesh and Andaman & Nicobar Islands has suffered major damages - some firm estimates would be available only in the next 7-10 days, when the areas become accessible. Worst hit places like Nagapattinam have been closed (both entry and exit) fearing epidemics. BOBP-IGO is closely monitoring the situation through its NGO network.

### Impact on fishing by districts

State/ Province	District	Village			Landing centers (damaged)	No. of fishers	Human losses (missing)	Fishing vessel			
		Total	Fishing village	Village affected				Mechanised		Non-mechanised	
								Total	Lost /damag ed	Total	Lost /damaged
Andaman & Nicobar Is.	2	38 inhabited Islands.		30 Islands		900 (6,010)					
Tamil Nadu	13	13,182	591	362	362	698,268	7,921 (383)	10,000		49,000	
Pondicherry	2			33			579 (86)				
Andhra Pradesh	7			301			105 (11)		2,000		
Kerala	3			187			170				
<b>Total</b>	27			883 30 Is.			9,675 (6,490)				

**Tamil Nadu:** There are 591 fishing villages and 362 Fish landing Centres, which are mostly small and cater to the needs of small mechanized fishing crafts and traditional boats. The total number of 698 268 fishers were engaged in fisheries (2000) with some 10 000 mechanized fishing vessels, 21 000 vallams and 28 000 catamarans.

The fisheries sector in Tamil Nadu has suffered major damages. Besides loss of lives and assets such as houses and personal belongings, fishing boats and nets, the fisheries infrastructure (Fishing Harbours and fish Landing Centres) has also suffered heavy damages.

**Andhra Pradesh:** Fishers along 1,000 km coastline here were the worst hit by tsunamis. Fishers lost some 2,000 fishing boats and 47,370 nets. The trawlers, fishing equipment and fish stored for exports were all damaged at Visakhapatnam. Nearly 300,000 fishers were rendered jobless and they are estimated to be losing Rs. 50 million a day. Fishing is a major trade activity in coastal Andhra. The state produces 200,000 tonnes of marine fish every year.

### **Aquaculture**

Many hatchery facilities in the southern India regions were severely affected with damages; in Kovalam, Marakanam and Pondy belt, most of the shrimp hatcheries have lost their pump houses, fencing etc; shrimp farms at Cuddalore, Chidambaram, Sirkali were severely affected with collapsed bunds and damaged pumps; shrimp farms in Vellar estuaries (Chidambaram, sirkali) were heavily damaged from seawater inundation; sea based farms in Tharangampadi, Vedaranyam, Nagapattinam, Velankanni were severely hit by tsunami with their bunds obliterated and their equipment including motors and pumps destroyed.

Catches from wild fisheries will decline because of damages to fishing boats/vessels and will impact on shrimp broodstock and also impacting adversely on the likelihood of having a crop in the next season.

**Kerala:** total loss is estimated around Rs. 149 lakh, at least 14 shrimp hatcheries affected covering 4 districts (Kollam, Alleppey, Ernakulam, and Kannur). Most of these are small-scale hatcheries, but some may have employed a few local workers who are now livelihood being affected

**Tamil Nadu:** total loss is estimated at around Rs. 627 lakh, which including a 120 ha of small-scale shrimp farms in Nagapattinam and Karaikal (Pondicherry) districts, and 11 hatcheries. The compound wall of the lobster fattening centre in Chennai was totally damaged.

**Andhra Pradesh:** According to officials 400 fish tanks were damaged. Unofficial estimated loss at Rs. 500 million. Aquaculture farms over 400 acres were also damaged. The state's seafood industry accounts for 25-30 percent of India total seafood exports. Most of the hatcheries were not much affected except Thupilipalem in Nellore District. Seabass hatcheries in Thirumullaivasal were badly affected with one farm totally submerged.

### **Sources:**

- B.Vishnu Bhat. JD (Aqua) MPEDA;
- Contacts in the Aquaculture sectors
- BOBP-IGO

- Website: (<http://www.newkerala.com/news-daily/news/features.php?action=fullnews&id=51744>)
  - Y.C. Thampi Samraj, Project Director, RGCA
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## INDONESIA

### General

Information on estimated damages to fisheries, aquaculture and coastal livelihood in Northern Sumatra is still very limited due to poor accessibility to the area by fisheries officials. However, we know that the province of Aceh and Nias Islands in North Sumatra has been severely impacted.

Early status report prior to January 5, 2005 by various senior officers from the DGA Indonesia (Mr Agus Budhiman, Director of Seed Production and Ms Maya Sudjarwo, Director for International Cooperation) provided a very brief inside into the potential damaged caused and pledged for help in assisting creating jobs for the victims for those who are in Northern Sumatra particularly Aceh province.

Mr Andy Pradjaputra (ASEAN Foundation, Jakarta) also ascertains that ASEAN Foundation will contribute to the rehabilitation of tsunami-hit areas in whatever efforts and ways it can.

### Fisheries

Early reports suggest that in Aceh Province about 70% of the small-scale fishing fleet was destroyed (980 canoes, 50% of which were motorized). In Nias Islands, preliminary reports indicate that 800 fishing canoes were destroyed.

### Impact on fishing by districts

State /Province	District	Village			Landing centers (damaged)	Number Of fishers <sup>2</sup>	Human losses (missing)	Fishing vessel			
		Total	Fishing village	Village Affected				Mechanised		Non-mechanised	
								Total	Lost /damaged	Total	Lost /damaged
Aceh	172			1,550		42,149	94,081 (1,341)	700	490	700	490
Nias Is.											800
<b>Total</b>				1,550			94,081				1,290

### Aquaculture

The area available for marine fish farming was almost 400 ha, mostly in Central Tapanuli and Sibolga districts (Tapien Nauli Bay). It is very likely that the number of grouper farms in North Sumatra, by the date of the tsunami, was in excess of 1,000 farms, with each farm having usually 4 but up to 20 cage units.

The earthquake and Tsunami affected vast aquaculture areas especially those located near the coast. These included brackishwater ponds for fish and shrimp culture, shrimp and fish hatcheries and the Regional Centre for Brackishwater Culture

<sup>2</sup> Number of fishers recorded in Nanggroe Aceh Darussalam  
Capture Fisheries Statistics of Indonesia, 2002, Department of Marine Affairs and Fisheries,  
Directorate General of Capture Fisheries, Jakarta 2004

Development (BBAP Ujung Batee). Below is the estimate of aquaculture losses caused by the disaster.

*a. Brackishwater Aquaculture (Pond) culture in NAD Province*

The natural disaster affected 11 district areas of brackishwater activities in the province as follows :

1. Total area 36,597 ha (2003) with annual average total production of 24,603 tons valued at US\$ 80,821,782)
2. Standing crop: 8,261.4 ton of shrimp, 5,113.9 ton of milkfish and 11,227 tons of other species (Table 1).
3. Support structures including water channels were rehabilitated through a Fisheries Support Service Project (FSSP), funded by World Bank in 1995; SPL-JBIC INP 23 Project funded by Japan government in 1999/2000 and Indonesian government 's APBN), with a total cost of US \$ 9,322,667 (Table 2).

**Table 1: Brackishwater pond culture by area and production in NAD province, 2003**

No.	District	Area (ha)	Production (t)				Production Value (x Rp. 1000)	Production Value (US\$)
			Shrimp	Milkfish	Others	Total		
1	South Aceh	25.0	5.3	3.6	7.3	16.2	517,400	57,488.9
2	West Aceh	289.0	55.5	36.1	74.2	165.8	2,800,650	311,183.3
3	Aceh Besar	1,006.0	716.9	220.5	895.6	1,833.0	30,534,400	3,392,711.1
4	Kota Banda Aceh	724.3	667.6	424.6	809.5	1,901.7	59,969,300	6,663,255.6
5	Kota Sabang	28.0	-	514.0	-	514.0	4,549,000	505,444.4
6	Pidie	5,056.0	788.4	648.6	928.2	2,365.2	59,798,740	6,644,304.4
7	Bireuen	5,146.7	2,254.2	1,127.3	2,723.6	6,105.1	200,926,020	22,325,113.3
8	North Aceh	10,520.0	1,485.5	1,058.2	3,055.6	5,599.3	149,187,032	16,576,336.9
9	East Aceh	7,822.0	2,288.0	1,081.0	2,733.0	6,102.0	219,113,500	24,345,944.4
10	Kota Langsa	2,122.0						
11	Aceh Tamiang	3,858.0						
	<b>Total</b>	<b>36,597.0</b>	<b>8,261.4</b>	<b>5,113.9</b>	<b>11,227.0</b>	<b>24,602.3</b>	<b>727,396,042</b>	<b>80,821,782</b>

**Table 2: Rehabilitation of brackishwater pond irrigation in NAD province**

No.	District	Brackishwater Area (ha)	Brackishwater Area Irrigated (ha)			Production Value (x Rp. 1000)	Production Value (US\$)
			FSSP	SPL	APBN		
1	South Aceh	25	-	-	-	-	-
2	West Aceh	289	-	-	-	-	-
3	Aceh Besar	1,006	-	-	-	-	-
4	Kota Banda Aceh	724	-	-	-	-	-
5	Kota Sabang	28	-	-	-	-	-
6	Pidie	5,056	-	950	100	11,846,000	1,316,222
7	Bireuen	5,147	-	-	50	200,000	22,222
8	North Aceh	10,520	3,000	900	700	49,544,000	5,504,889
9	East Aceh	7,822	1,000	400	750	21,314,000	2,368,222
10	Kota Langsa	2,122	-	-	-	-	-

11	Aceh Tamiang	3,858	-	-	100	1,000,000	111,111
	<b>Total</b>	<b>36,597</b>	<b>4,000</b>	<b>2,250</b>	<b>1,700</b>	<b>83,904,000</b>	<b>9,322,667</b>

Note: FSSP: Fisheries Support Services Program  
SPL: Sub Program Loan  
APBN: National Allocated Budget for Development

c. *Private Shrimp Hatchery*

There were 17 private shrimp hatcheries with varying scales of production, from small- to medium. They were producing some 200 million PL a year. They have all been heavily damaged.

2. *Losses estimation*

a. *Material losses*

Almost all of the brackishwater pond areas were destroyed as well as the support infrastructure such shrimp hatcheries and the Regional centre in Ujung Batee. These losses consist of fish and shrimp pond structures, water channels, irrigation canals, building, housing and training facilities, equipment, library collections, and others.

Estimate of loss based on the establishment costs of the facilities and structures destroyed is about **US\$ 210,835,555**, which consist of:

1)	Brackishwater ponds in NAD Province	=	US\$ 202,811,782
2)	Private Shrimp hatcheries	=	US\$ 6,233,33
3)	BBAP, Ujung Batee	=	<u>US\$ 1,790,444</u>
	<b>Total</b>	=	<b>US\$ 210,835,555</b>

**UNOSAT Satellite Images for Aquaculture Site in Aceh**

Satellite images obtained from UNOSAT provide a comparison of before and after tsunami in Aceh on aquaculture sites. These aquaculture sites may culture a range of marine finfish (milkfish, seabass, mullet etc.) and crustaceans (crabs, shrimps, etc.). The severity of the damages is apparent. Figure 1 shows the aquaculture areas have been totally destroyed. The aquaculture sites in Figure 2 is slightly inland compare to the area in Figure 1, the severity of the damaged is also the same.



## MALAYSIA

### General

The northern states of west coast peninsular Malaysia are badly affected. About 5,200 fishers with estimated loss of RM 29.3 million; 155 fish farmers with estimated loss of RM23.9 million are affected.

### Fisheries

#### Impact on fishing by districts

State	District	Village			Landing centers (damaged)	Number of fishers <sup>3</sup>	Human losses (missing)	Fishing vessel <sup>4</sup>			
		Total	Fishing village	Village affected				Mechanised		Non-mechanised	
								Total	Lost /damaged	Total	Lost /damaged
Penang	5					2,162		1,237	360	4	
Kedah	3					5,645		1,341		0	
Perlis	1					5,279 (2,000 fishers affected)		587		0	
Perak	4				(1)	7,511		4,068	164 <sup>5</sup>	43	
<b>Total</b>	14					20,597		7,233		47	

Some 3,500 people were evacuated in Kedah and 800 in Penang. The tsunami reportedly caused losses estimated at around RM30 million (US\$8 million) in the four affected northern states of Penang, Kedah, Perlis and Perak.

About 1,000 fishermen have been affected, and the fishing industry is likely to take a jolt. Prices of seafood could rise. Before the tsunami, Penang recorded fishing hauls valued at some RM150 million a year.

(Source: [http://www.atimes.com/atimes/Southeast\\_Asia/GA04Ae05.html](http://www.atimes.com/atimes/Southeast_Asia/GA04Ae05.html))

The coastal fishing communities suffered the most in Malaysia. Fishing livelihoods lost in various areas in Malaysia are listed below:

- Teluk Kumbar, Penang – 128 fishing boats damaged with losses totaling RM 500,000.
- Gertak Sanggul, Penang – 32 boats damaged.
- About 4,696 people in Kedah and 1,600 villagers in Penang were evacuated from their homes to relief centers. There was 1,146 people affected in Balik Pulau, Penang, and the estimated cost (in terms of losses) was RM 2.3 million.
- Pulau Betong, Penang - villagers estimate that about 200 boats were damaged (media reports 40) and quite a number of houses. The damage per boat is estimated between RM 10,000 to 30,000.

<sup>3</sup> No of fishers working on licensed fishers

Annual Fisheries Statistics 2000 Vol.1, Department of Fisheries Malaysia

<sup>4</sup> No. of licensed fishing vessels

<sup>5</sup> This figure my include non-mechanized vessels

- Kuala Sungai Burung, Penang – fishers cooperative house damaged – losses estimated at RM 100,000.
- Tanjung Piandang, Perak – about 50 large boats and 67 small boats damaged.
- Bagan Datoh, Perak – one fishing jetty collapsed, 7 big and 40 small boats damaged.
- Kuala Perlis – most of the 2,000 inshore fishers reported poor daily catches since the tsunami catching below 5 kg vs 10 kg before (Star, 6 Jan.).

*(Dr. Wing-Keong Ng, School of Biological Sciences Universiti Sains Malaysia, Penang)*

### **Aquaculture**

Floating cage farms at Tanjung Dawai (Penang) were very severely damaged, farmers lost everything, their cages smashed by the tsunami. Floating cage farms at the south of Bukit Tambun area were wracked, and estimated loss of around RM 10 million. At Pulau Aman, some cages were damaged with loss of fish (*Dr. Leong Tak Seng, Penang*).

Many wooden village houses facing the open sea along the Kuala Muda coast near the National Marine Prawn Fry Production and Research Centre, Pulau Sayak were damaged and 10 lives lost. In Penang the death toll was higher with more than 35 people reported killed. Most the cages in Tanjong Tokong in Penang were broken all fish including 1 m giant groupers were found dead along the beach due to oxygen depletion as the gills were clogged up with mud during the tsunamis. No report on other places except damaged fishing boats in the affected areas. Deep sea cages in Langkawi ok (*Mr Chuah Toh Thye, Pulau Sayak, Kedah*).

Some 110 fish farmers living along coastal Sungai Aceh in Penang farming groupers, seabass and snappers covering a total water surface area of 120 ha. The estimated losses from tsunami in this area alone is greater than RM 10 million. The investment cost for each cage farms (usually more than 20 cages) are expected to be around RM 300,000 – 400,000. The annual production in this area alone accounted for a total of 600 t of marine finfish. Thousands of dead fish (around 100 t) were found dead at Pasir Pandak beach near Teluk Bahang, Penang (ref CNN photo). Small-scale oyster farmers in Penang also suffered losses. One oyster farmer losses about RM 20,000 when 40 of his 140 oyster cages were destroyed (*Dr. Wing-Keong Ng, School of Biological Sciences Universiti Sains Malaysia, Penang*)

### **Currently Unknown Impacts on Aquaculture and Fisheries**

- About 6,900 hectares of mudflats on the west coast of Peninsular Malaysia are used for the extensive culture of blood cockles, *Anadara granosa*. Major culture states are Perak, Selangor and Penang. Malaysia is the largest producer of cockles with about 70,754 tons in 2001. Huge quantities of dark mud were spewed by the tsunami onto land. The effects on Malaysia's premier cockle breeding mud flats, especially in the coastal areas of Penang, remains to be seen.
- About 24,000 tons of tiger shrimp, *Penaeus monodon*, was produced in Malaysia in 2002. Many of the shrimp hatcheries are still dependent on wild broodstock for their supply of larvae. The impact of the tsunami on the surrounding seas where these adult shrimp are caught remains unknown.

- Malaysia is one of the top 5 Asian producers of marine finfish, producing about 8,691 tons in 2002. For some species such as groupers, many cage farmers are still dependent on wild-caught seed to stock their cages. Wild-caught adult fish are also used in hatcheries for spawning. The impact of the tsunami on this supply line for the marine finfish aquaculture, if any, is not known.
- Immediate destruction to mangrove swamps and forests along the coasts is currently not known. Slow destruction of the mangrove forest could result from changes in the soil topography compromising water run-offs, changes in soil salinity, etc., as a result of the tsunami. Compromised health of the mangrove ecosystem may compromise fishing returns in the coastal areas of northern Malaysia.

*(Dr. Wing-Keong Ng, School of Biological Sciences Universiti Sains Malaysia, Penang)*

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## **MALDIVES**

### **General**

The tsunami inundated the entire country. Because of the low elevation of the country there was nowhere to run and at least one third of the entire population of some 100,000 people were severely affected. The initial damage assessment is daunting: more than one third of all inhabited islands are completely or severely destroyed and hundreds of boats, jetties and harbours were destroyed or damaged.

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## **MYANMAR**

### **General**

The southern coast of Myanmar was hit by the waves around four hours later. Unlike for the coasts of Thailand or Sri Lanka, the Myeik Archipelago reduced the Tsunami's force, before impacting the coast of Tanintharyi Division. On its way to the Ayeyarwaddy coast, the wave had also severely hit the Adaman Islands (India). This might partly explain the smaller scale of damage inflicted on the southern areas of Myanmar. The Myanmar coast is also characterized by its hilly geomorphology.

### **Fisheries**

Some 17 seaside fishing villages have been reported as destroyed and some 778 people homeless. Seasonal fishing villages are common at this time of the year. One known examples is a village, 220 miles (352 kilometres) southwest of the capital Yangon in Ayeyarwaddy division, that sprang up barely a month ago as families built bamboo and thatch huts for the post-monsoon fishing season. The fishing village of some 600 people was swept into the sea by killer tsunamis, leaving 17 dead and scores of families with nothing but shattered lives.

There was particular concern about fishing communities and the ethnic Salone and Moken, commonly referred to as sea gypsies, a UN official told AFP.

Fisherman Maung Maung, 36, told AFP he had been out to sea with seven other men on a trawler when they were caught by the wave and capsized.

"All our boats overturned but we managed to hold on and keep afloat until rescue arrived," he said.

Source:

[http://www.channelnewsasia.com/stories/afp\\_asiapacific/view/125398/1.html](http://www.channelnewsasia.com/stories/afp_asiapacific/view/125398/1.html)

### **Aquaculture**

Little aquaculture was being practiced along the impacted coast.

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## SRI LANKA

### General

The Sri Lankan coast was one of the heaviest impacted areas in the region. Fisheries communities in particular have been devastated. The initial broad assessment by the Director General of Fisheries Development was that their “fishery industry has been pushed back to its 1950 status”.

### Fisheries

Initial assessments indicate that 80% of the boats in the districts of Colombo, Negombo, Jaffna, Kilinochchi, Mullaitu, Tricomalee, Batticaloa, Ampara, Hambantota, Matar, Gale and Kaluthara have been destroyed or seriously damaged. To rebuild to re-tsunami conditions, approximately 50% of these would have to be replaced and 50% repaired. In Puttalam and Mannar, the overall damage is estimated as 25%.

The bulk of the boats destroyed or damaged are the small non-motorized boats owned and operated by the poorest of the community. Ten out twelve of the main fishing ports have been devastated with extensive loss of essential infrastructure such as ice plants, cold rooms, workshops, slipways and marine structures. The basins of the harbors are clogged with wrecked vessels and need to be cleared.

### Impact on fishing by districts

District	Village			Landing centers (damaged)	Number of fishers	Human losses (missing)	Fishing vessel			
	Total	Fishing village	Village affected				Mechanised		Traditional	
							Total	Lost /damaged	Total	Lost / damaged
<i>Colombo</i>				12 fishing ports (10 damaged)	7,600 fishers in 7 districts	76 (12)	MD 21 DF184	MD 17 DF 147	214	171
<i>Gampaha</i>						7	MD 216 DF1,338	MD 173 DF1,070	1,557	1,245
<i>Puttalam</i>				xx fishery anchorages	(5,686 fishers missing and 90,657 displaced)	4	MD 180 DF3,271	MD144 DF 818	3,122	780
<i>Mannar</i>						0	MD 1 DF1,164	MD 1 DF328	528	422
<i>Jaffna</i>				700 landing places		2,640 (540)	DF 1,221	MD 0 DF 976	2,446	1,957
<i>Kilinochchi</i>					560 (56)	DF381	MD 0 DF305	344	275	
<i>Mullaitu</i>					3,000 (1,300)	DF601	MD 0 DF480	214	171	
<i>Tricomalee</i>					957 (335)	MD 43 DF1,492	MD 35 DF1,194	1172	938	
<i>Batticaloa</i>					2,497 (1,097)	DF 490	MD 0 DF392	2,462	1,970	
<i>Ampar</i>					10,436	MD6 DF 653	MD 5 DF522	612	730	
<i>Hambantota</i>					4,500	MD184 DF834	MD 147 DF667	715	572	
<i>Matara</i>					1,205 (404)	MD472 DF545	MD 378 DF 436	472	378	
<i>Gale</i>					4,101	MD 182 DF 717	MD 145 DF574	314	251	
<i>Kaluthara</i>					213 (48)	MD 225 DF235	MD 180 DF188	568	455	
<b>Total</b>							MD 1,530 DF13,124	MD1,225 DF8,097	15,040	10,315

The latest assessment indicates that MD 750, DF 9,550, 640 of beach seine boats and 12,000 of traditional boats have been lost or damaged (details at district level not available)

MD=Multiday fishing boats, DF=Day fishing boats

## **Aquaculture**

Little aquaculture was being practiced along the impacted coast. Tsunami waves caused extensive damages to the National Aquatic Resources Research & Development Agency (NARA) of the Ministry of Fisheries and Aquatic Resources, which is located in the coast of Colombo. Some important equipment for its research activities such as HPLCs, GCs, spectrophotometers, ice making machines and autoclaves have been destroyed. The institute is responsible for research and development on fish quality, new fish products and post harvest losses as well as providing laboratory testing services for the fish exporting industry and hence, is expected to play a vital role in the rehabilitation process of the fishery sector.

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## THAILAND

### General

Six provinces facing the Andaman Sea which were hit hard by the tsunamis are Ranong, Phang-gna, Krabi, Phuket, Trang and Satun. Phuket has been declared an emergency area, but indications are now that Phang-nga is the worst affected province. The damages on fisheries and aquaculture are estimated at 1.34 billion baht (USD 343 million).

### Fisheries

#### Impact on fishing by districts

Province	District	Village			Landing centers (damaged)	Fishers <sup>6</sup>	Human losses (missing)	Fishing vessel			
		Total	Fishing village	Village affected				Large (>10 ม.)		Small (<10 ม.)	
								Total	Lost / damaged	Total	Lost / damaged
Ranong	3			22	3,918	164 (16)	587	191	1,408	297	
Phangna	6			73	9,411	1583 (2376)	825	284	2,782	607	
Phuket	3			81	2,485	279 (1815)	574	476	676	636	
Krabi	5			123	10,338	367 (1913)	312	147	2,669	775	
Trang	5			51	10,252	5 (1)	626	0	2,365	594	
Satun	3			36	10,271	6 (0)	783	29	2172	493	
<b>Total</b>	<b>25</b>			<b>386</b>	<b>46,675</b>		<b>3,707</b>	<b>1,127</b>	<b>12,072</b>	<b>3,402</b>	

#### a) Damage or loss of fishing vessels

Some 3,500 fishing boats were either damaged or total wrecked, 93% are small-scale fishing boats. Estimates indicate that 2,923 fisheries households were affected<sup>7</sup>. Estimated damages on fisheries alone would amount to USD 16.6 million.

Loss of small-scale vessels were particularly significant, most of which were typically 4 meter long hardwood built traditional fishing vessels powered by the diesel long tail engine. (A crude estimate of cost of a vessel is in the region of \$1,000-2,000. The engine costs about \$800 upwards. The vessels use a range of small-scale gears.)

In some areas (i.e. those with very heavy concentrations of tourism such as Phuket) many of the fishing vessels are not used for fishery purposes, but are used for transporting tourists.

There will be a major distinction between damage to vessels and actual loss (i.e. irreparable damage that requires replacement). In the case of replacement of the

<sup>6</sup> The 2000 intercensal survey of Marine fishery  
National Statistical Office, Office of the Prime Minister and Department of Fisheries, Ministry of Agriculture and Cooperatives, 2001

<sup>7</sup> The primary source of figures regarding lost vessels is the Department of Fisheries.

vessel, it is a concern that the original wood that the vessels were constructed from may not be readily available and reconstruction of the original type of vessel may not be possible. Replacement with a fiberglass composite structure may not be useful (if the design is not appropriate and certainly would not be as strong as the original vessel. Engines that power this design are typically diesel long tail engines these may be more favoured in place of 'modern' outboard engine (which run on petrol and may not be as robust or flexible as the original).

*b) Damage or loss of fishing gears*

This is extremely difficult to assess unless the gear is assumed to have been associated with the vessel and lost together with vessels. Gear replacement is a lower cost intervention that can get fishers fishing again and assume that they are able to repair damaged vessels themselves. In this circumstance, the assistance of gear provision is probably significantly less than the costs of boat repair.

*b) Damage to shore-based property and services.*

Land based infrastructure has also been affected in some areas – this sort of structure would be landing sites, ice making and storage facilities. Some of these facilities would be state owned or operated or possibly through cooperative type ventures. Many ventures would also be privately owned by entrepreneurs (i.e. not directly involved in fishery production).

An assessment would have to at last get a breakdown of the number of harbour sites that were directly impacted by the wave. There has been a great deal of minor damage in areas not in the actual path of the wave and this can be readily rectified and should not be a focus of intensive rehabilitation.

## **Aquaculture**

*c) Damage to aquaculture operations*

The west coast of Thailand has significant amounts of coastal aquaculture based in and around mangrove areas, especially in the creeks and delta mouths. The scale of these operations is extremely varied but can crudely be broken into:

- i) very small scale artisanal shellfish operations – crab fattening, mussel strings and other low input structures, individual fish cage operations (grouper, sea bass etc.)
- ii) larger scale water based aquaculture operations – typically these are fish cage operations and involve multiple cages.
- iii) Land based aquaculture operations (lower investment) - this would typically be fish ponds (unusual) and small shrimp pond operations (more typical)
- iv) Larger scale land-based aquaculture operations – these involve greater investment and would be larger shrimp farms which have many ponds (more than three. Also included and particularly affected in Phuket and somewhat in Phang-nga are shrimp hatcheries since these are often located at the water since in the most exposed areas (to get clear seawater) they have been significantly damaged). However the owners of these cannot be

classified as small-scale or poor and invariably have other sources of income

The initial estimated aquaculture floating cage damaged and cost from DOF, Thailand dated December 28, 2004 were 27,409 cages with a total cost of Baht 1.28 billion. The updated (January 4, 2004) version is listed below and the losses may be less than Baht 1.28 billion since the damaged cages are less than the original estimated, with a total of 15,802 cages covering some 1,123,176 m<sup>2</sup> been damaged. Fish ponds and shrimp and fish hatcheries were also damaged.

### Impact on aquaculture by District

Province	Owners affected	Floating cages damaged and loss	Area of cages affected (m2)
Ranong	583	4,228	827,008
Phangna			87,194
Phuket	315	2,415	45,172
Krabi	359	1,150	74,108
Trang	393	842	19,554
Satun	960	7,167	70,140
<b>Total</b>	<b>2,610</b>		<b>1,123,176</b>

Province	Cage Culture area (m2)	Fish Pond area (rai)	Hatchery Area (m2)
Krabi	74,108	113	0
Phang-nga	87,194	60	1,548
Phuket	45,172	6.12	38,500
Ranong	827,008	0	0
Satun	70,140	0	0
Trang	19,554	0	0
<b>Total</b>	<b>1,123,176</b>	<b>179.12</b>	<b>40,048</b>

Note: 1 Rai = 2/5 acre = 1,600 m<sup>2</sup>

## Annex 1: Photographic record

### INDIA

#### Post-tsunami

*Photos from the BOBP-IGO Director (Dr Y.Yadava)*



## INDONESIA

### Pre-Tsunami



Fishing village at North Sumatra, close to Aceh. This photo was taken in 2000 during a field trip by DOF/NACA, they would have been destroyed. (S.Y. Sim, NACA)



Floating cage farms located at the river mouth at North Sumatra, several hundreds of these units are in the area, employing thousands directly and indirectly. (S.Y. Sim, NACA)

## MALAYSIA

### Pre-tsunami

The photos below show examples of facilities and structures that would have been washed away.



Floating cage farms in Kedah which grow various marine fish species located at the river mouth may already been destroyed by the tsunami. These big scale operations employed hundreds of people from the local community. (S.Y. Sim, NACA)



Small fishing village which is by the river mouth in Kedah. The tsunami would have destroyed the houses, fishing boats and the coastal fishery resources. (S.Y. Sim, NACA)



Fishing ground for bivalves and floating cage farms (behind), in Penang providing livelihoods and income for many would all have been destroyed by the tsunami. (S.Y. Sim, NACA)

### **Post-tsunami**



Dead groupers littering a Penang beach, most likely from aquaculture (because of their uniform size). *From a CNN website.*

## **THAILAND**

### **Pre-tsunami**

The following photos, taken at various times before the tsunami likely destroyed them, illustrate the source of immediate livelihoods, direct and indirect employment opportunities in these rural communities that have been lost.



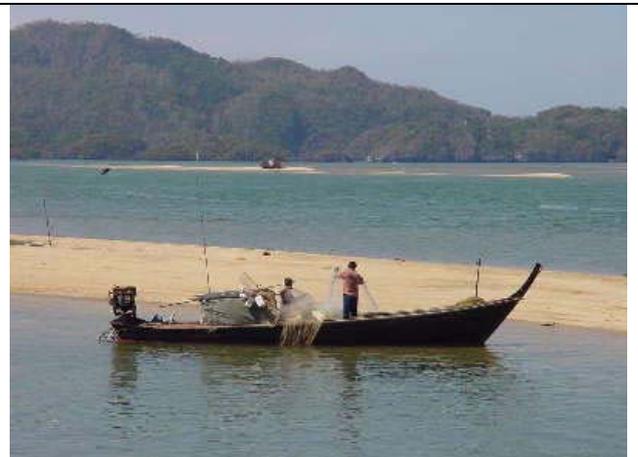
Small-scale floating cage farms in Krabi, this photo was taken in February 2004. This location is most likely to be one of the areas affected by tsunami, due to its proximity to the sea. (S.Y. Sim, NACA)



Happy fish farming lady in Krabi who liked to help small fishermen by buying their catches. Is she still capable of helping others? What kind of assistance does she need as well? (S.Y. Sim, NACA)



Floating cages in Satun close to the open sea, these small-scale farms would not have escaped the destructive force of the tsunami. (S.Y. Sim, NACA)



Small-scale fishermen in Satun area. Do they still have their boat? In the short and medium term would they have fish to catch? (S.Y. Sim, NACA)



This is one of the fishing village in Phang-nga bay area under TDH/DOF/NACA project, severely affected by the tidal wave. The community lost their fishing boats, and cages, and shelters have been damaged. (S.Y. Sim, NACA)



Small-scale floating cage farms in Phang-nga bay area which would surely be damaged by tsunamis. (S.Y. Sim, NACA)

