

EXECUTIVE SUMMARY

LARGE PELAGIC RESOURCES SURVEY

IN SOUTHEAST ASIA WATERS

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Table of Contents

	Page
INTRODUCTION	1
1) Objectives of the Project	2
2) Survey Period and Area	2
3) Exploratory Fishing by Pelagic Longline	2
4) Results of the Survey	4
4.1) Species Composition and CPUEs by Survey Area	4
4.2) Distribution and Abundance	7
5) Dominant and Commercial Species for Consideration	9
5.1) Swordfish : <i>Xiphias gladius</i>	9
5.2) Indo-Pacific Sailfish : <i>Istiophorus platypterus</i>	10
5.3) Sickle Pomfret : <i>Taractichthys steindachneri</i>	10
5.4) Snake mackerel : <i>Gempylus serpens</i>	11
5.5) Thresher sharks : <i>Alopiidae spp.</i>	11
5.6) Lancetfishes : <i>Alepisaurus spp.</i>	12
6) Conclusions and Suggestions	12
Acknowledgements	13



INTRODUCTION

This paper is developed under the ASEAN-SEAFDEC program on the “Harvesting of Under-Exploited Resources” from 2003-5 and “Information Collection of Highly Migratory Species in the Southeast Asia Waters” from 2006-7 with the funding support from the Government of Japan through the Japanese Trust fund of Fishery Agency.

Due to fisheries resources in the Southeast Asian Region are currently heavily exploited in the coastal fisheries in comparison with the offshore ones, by a reason of difference in geographical areas. Increased production from those fisheries can only be derived from greater utilization of existing resources. However an increasing of human population and associated demand for fish and fishery products means there is a need to increase fisheries production even further. To achieve this, exploration of new potential fisheries resources which currently are under-exploited resources are needed.

Take into account on the geo-topographic features in the Southeast Asia waters, about 60% of the sea water areas are identify as deep sea where the sea is deeper than 200m, for examples, in the Andaman Sea, South China Sea, Sulu Sea, Celebes Sea, Eastern Indian Ocean, Banda Sea, Sulawesi Sea., etc. Many large pelagic species such as tunas, tuna like species, billfishes and others are classified as highly migratory species. It is expected that those large pelagic species existed in the region are still under exploited resources, however due to lack of information and unclear on the status of those resources. SEAFDEC therefore proposed to conduct the fishing experiment based information collection in many sea areas namely Andaman Sea, the South China Sea and Sulu Sea of the member countries’ EEZ. A series of field surveys has been carried out accordingly in collaboration with the SEAFDEC member countries using SEAFDEC Research and Training Vessels; MV SEAFDEC and MV SEAFDEC2 .

The progress and results of the survey are reported herein. The report provides an update of large pelagic fisheries resources based on fishing survey using drifting longline in the Southeast Asia Waters in particular the south china sea and the Andaman sea. The report also provides an insight of potential resources of commercial pelagic species in the particular sea areas such as in the Andaman Sea and Sulu sea that will need to be addressed for future fisheries management to ensure to contribute significantly to sustainable utilization of the large pelagic resources.



1) Objectives of the Project

The main objectives of this project was to collect basic data/information of the large pelagic species or highly migratory species as well as to investigate the existing potential pelagic fishery resources in the Southeast Asia Waters.

2) Survey Period and Area

Field surveys were carried out from 2004-2006, The survey areas covered in the EEZ of member countries namely 1) Andaman sea in EEZ of Indonesia, Myanmar and Thailand, 2) Gulf of Thailand, 3) west coast of Borneo in the EEZ of Brunei Darussalam, and Sabah of Malaysia, 4) west coast of Luzon and Sulu Sea of the Philippines, and 5) east coast of Vietnam (see **Fig. 1**). However, this analysis was included the past surveys mostly conducted by MV SEAFDEC since 1995 to 2002. A total of 109 fishing stations were carried out on board SEAFDEC Research Vessels namely MV SEAFDEC and MV SEAFDEC2 (see Fig. 2).

3) Exploratory Fishing by Pelagic Longline

The pelagic longline gear was deployed for obtaining knowledge of the distribution and abundance of the large pelagic species in the area. Fishing depths were set between 70m to 250m. Operation time were mostly started in the evening and hauled in the morning of next day. Number of hooks used per basket were varied from 10 to 15 hooks. Two types of hook were used namely J-hook and Circle hook with 10 degree offset. The diagram of pelagic longline gear and its compositions are shown in Fig. 3. Baits used in the survey were selected as available in the local such as Indo-Pacific mackerel and milkfishes sized from 4-6 individuals per kilogram (see Fig. 4).

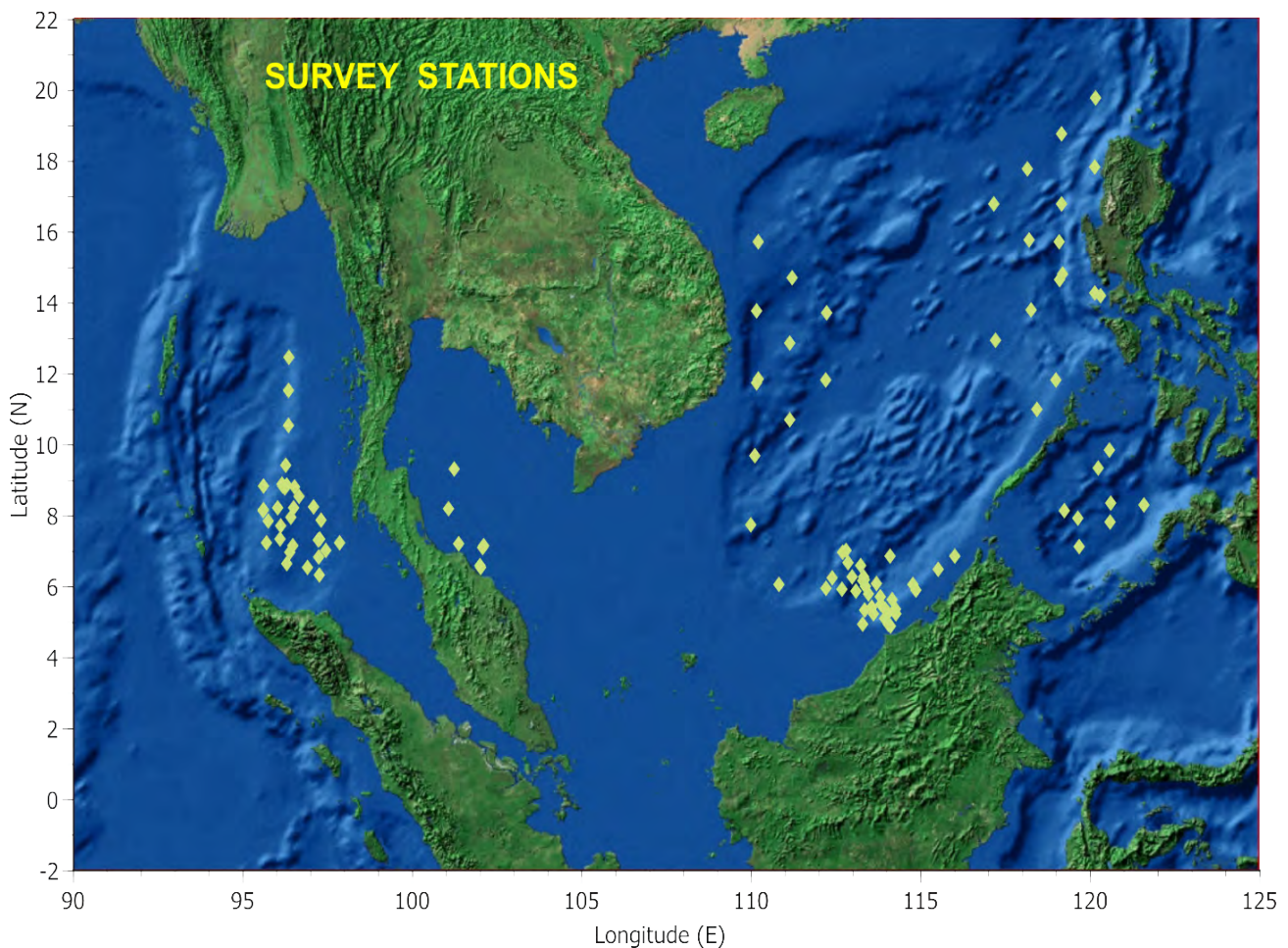


Fig. 1 Pelagic longline fishing stations in the survey area in 2004-6





Fig. 2 SEAFDEC Research Vessel namely MV SEAFDEC2 was used in the survey

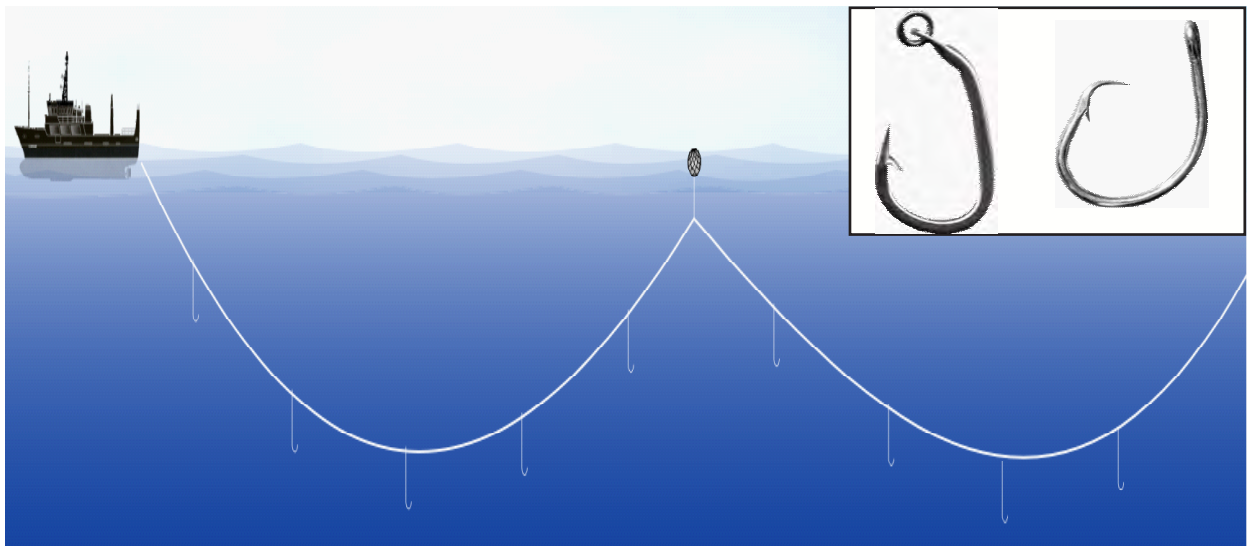


Fig. 3 Diagram of longline gear and type of J-hook and circle hook used in the survey



Fig. 4 Types of bait used in the survey



4) Results of the Survey

A total of five survey areas were conducted as follows:

- i) Cruise 04-1: in off shore of Brunei Darussalam from 18 September – 4 October 2004, 13 operations by MV SEAFDEC2
- ii) Cruise 04-2: in Andaman Sea (Indonesia, Myanmar and Thai waters) from 16-22 November 2004, 7 operations by MV SEAFDEC
- iii) Cruise 05-1: in off shore of Brunei Darussalam, and west coast of Luzon, the Philippines from 10-29 March 2005, 6 operations by MV SEAFDEC2
- iv) Cruise 05-2: in off shore of Sabah, Malaysia from 14-17 July 2005, 4 operations by MV SEAFDEC2
- v) Cruise 06-1: in Andaman Sea (Thai waters) from 20 January 13 February 2006, 11 operations by MV SEAFDEC2
- vi) Cruise 06-2: in off shore of Brunei Darussalam from 19-24 June 2006, 6 operations by MV SEAFDEC2
- vii) Cruise 06-3: in Sulu sea of the Philippines from 5-16 October 2006, 8 operations by MV SEAFDEC2
- viii) Past data from the South China Sea and Andaman Sea since 1995 to 2002, 54 operations by MV SEAFDEC

4.1) Species Composition and CPUEs by Survey Area

Fig. 5 shows the hook rate in percentage in each fishing stations. The results showed that highest hook rate of pelagic longline was 15% found in the Sulu Sea. The species composition in percentage from each survey areas namely Andaman Sea (a), West coast of Borneo (b), West coast of Luzon (c), East coast of Vietnam (d) and Sulu sea (e) as shown in **Fig. 6** indicates low diversity of species in the Sulu sea comparison to other survey areas. In addition, 75% of total catch was dominant by snake mackerel, *Gempylus serpens*. The snake mackerel is minor commercial species and occasionally used as bait. They

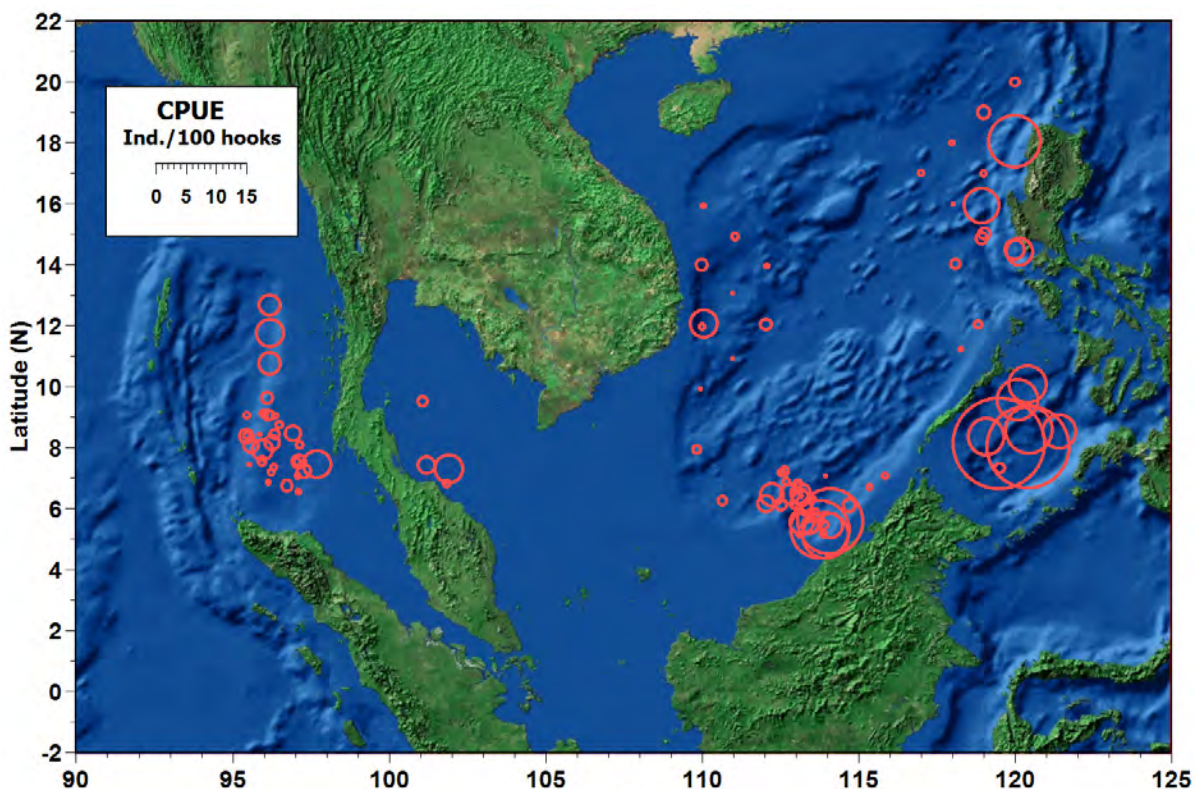


Fig. 5 Hook rate of pelagic longline in different sea areas



found abundance in not only Sulu sea, but also in off shore of Brunei Darussalam and west coast of Luzon, the Philippines. **Fig. 6** also shows the average CPUEs (individual per 100 hooks) in each areas were ranged between 1.21 and 7.78.

In Andaman Sea, the hook rates of pelagic longline were varied from 0.3 to 4.5 ind/100hooks, it is lower than that of other sea areas however the catch composition showed many commercial species such as tuna and tuna like species namely bigeye tuna, swordfish, sailfish and marline. Almost 38% of a total catch was represented by the group. In addition, another 41% was represented by ray and shark group.

In east coast of Borneo of Brunei Darussalam and Sabah, Malaysia waters, hook rates of pelagic longline were rather varied between 0.2 and 10.9 ind/100hooks, however mainly of catch were non valued commercial fishes. About 77% of total catch were Snake mackerel and Lancet fishes and less than 10% was tuna and tuna like species.

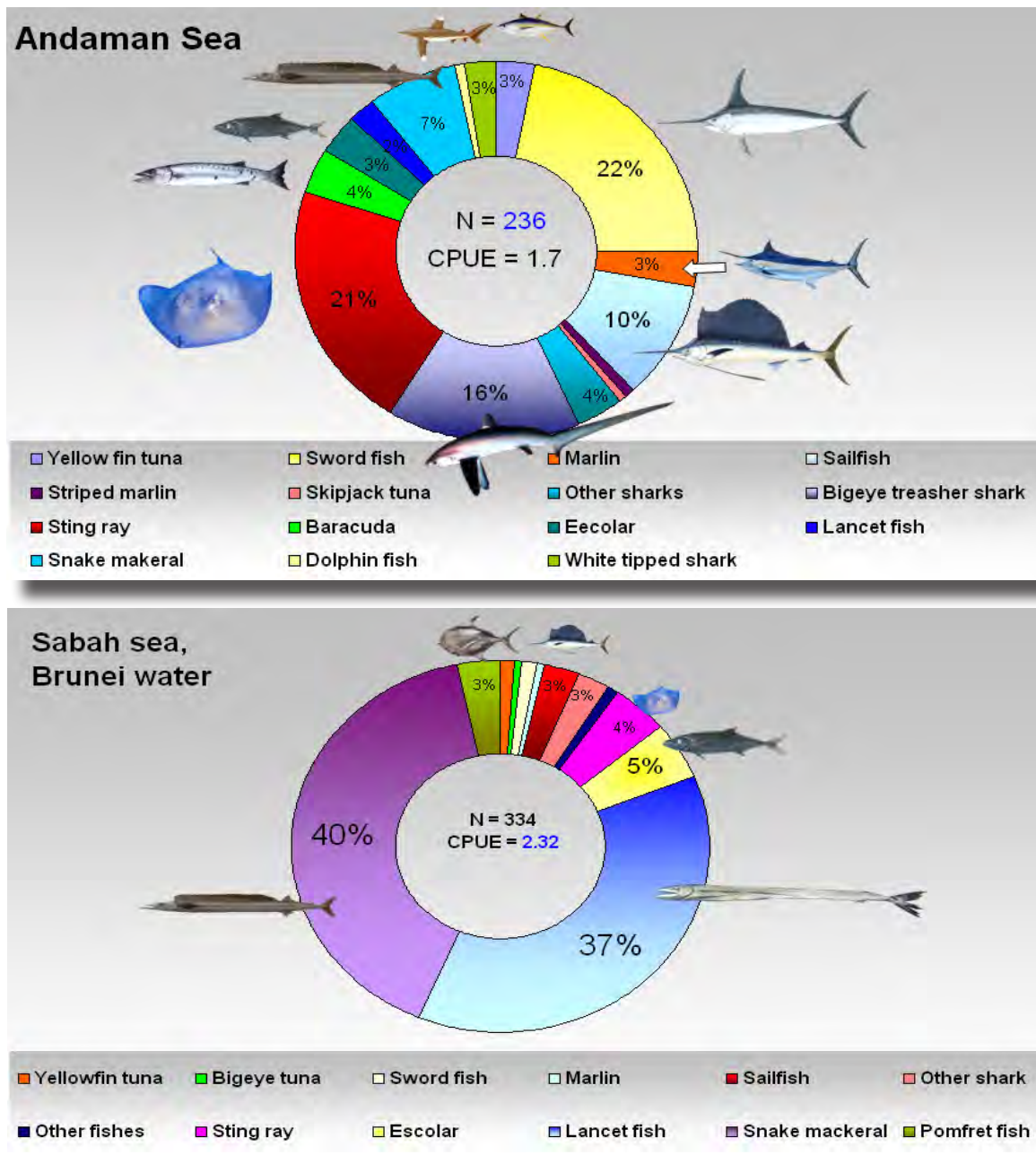
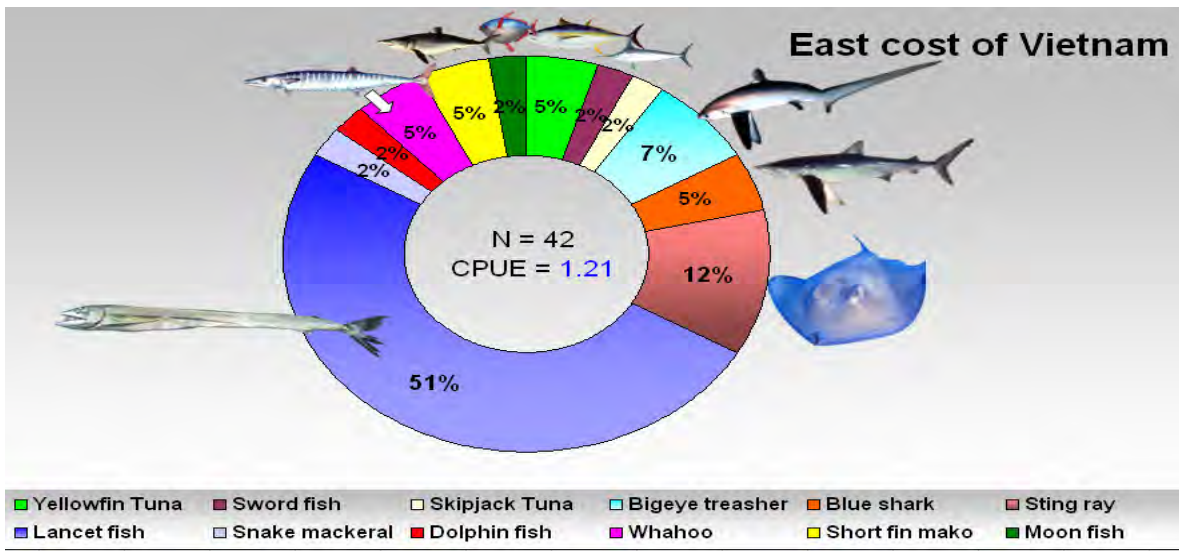
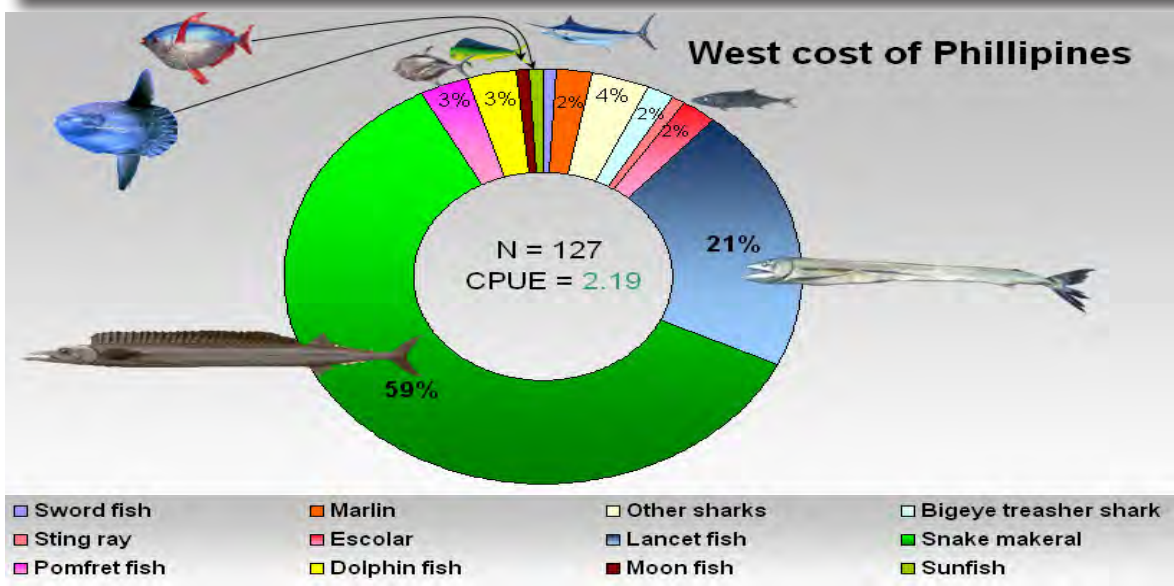


Fig. 6 Species Composition from pelagic longline in different sea areas

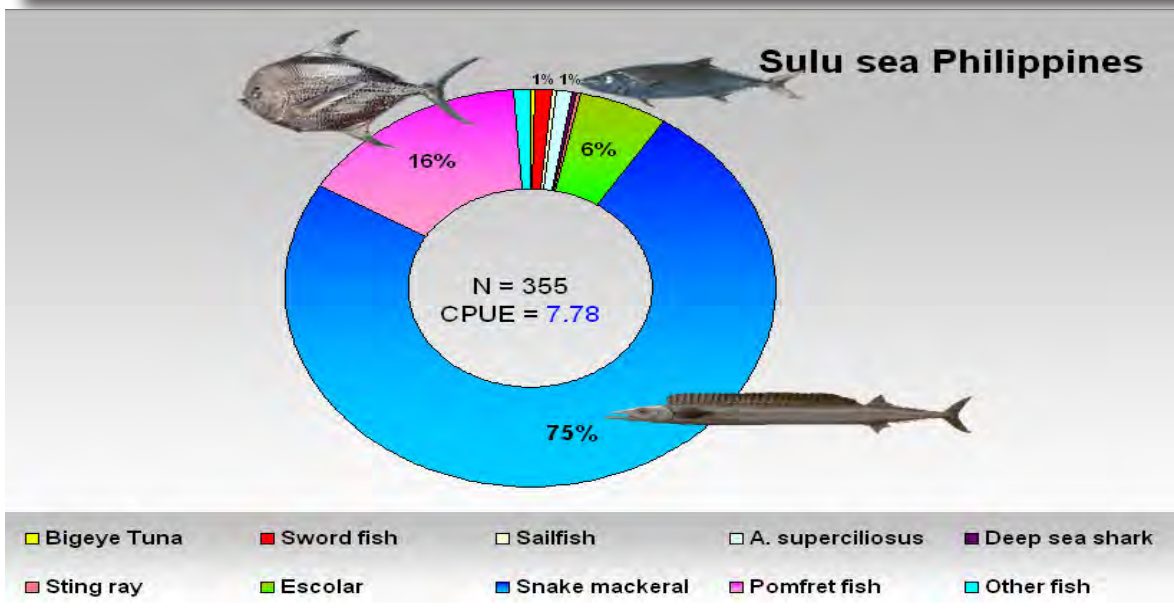




- Yellowfin Tuna
- Sword fish
- Skipjack Tuna
- Bigeye treasher
- Blue shark
- Sting ray
- Lancelet fish
- Snake mackerel
- Dolphin fish
- Whahoo
- Short fin mako
- Moon fish



- Sword fish
- Marlin
- Other sharks
- Bigeye treasher shark
- Sting ray
- Escolar
- Lancelet fish
- Snake mackerel
- Pomfret fish
- Dolphin fish
- Moon fish
- Sunfish



- Bigeye Tuna
- Sword fish
- Sailfish
- A. superciliosus
- Deep sea shark
- Sting ray
- Escolar
- Snake mackerel
- Pomfret fish
- Other fish

Fig. 6 continued Species Composition from pelagic longline in different sea areas



In east coast of Vietnam, 51% of total catch was lancet fish, and about 30% were ray and sharks remaining about 20% were commercial species in tuna and tuna like species.

In west coast of Luzon, the Philippines, about 80% of total catch were snake mackerel and lancet fish. The catch composition was similar to those found in the waters of Brunei Darussalam and Sabah, Malaysia.

4.2) Distribution and Abundance

Three groups of fishes found by pelagic longline namely tunas and billfishes called as target group, ray and sharks group and others by-catch group from different sea areas were investigated for potential resources. **Fig. 7** showed distribution and abundance of tuna and billfishes from pelagic longline survey.

Sword fish, *Xiphias gladius* (Linnaeus, 1758) is found in oceanic but sometimes in coastal waters, generally above the thermocline preferring temperatures of 18°C to 22°C. Adults are opportunistic feeders, known to forage for their food from the surface to the bottom over a wide depth range. From the survey, sword fishes were found high abundance in the Andaman sea in comparison to other survey areas. The total catch per haul was ranged from 0-14 individuals/haul in the Andaman sea. They also found in the east coast of Borneo in Brunei Darussalam waters, Sulu Sea and west coast of Luzon, the Philippines.

Indo-Pacific sailfish, *Istiophorus platypterus* (Shaw, 1792) is classified as oceanic and epipelagic species usually found above the thermocline. Most densely distributed in waters close to coasts and islands. From the survey, the sailfish were also found abundance in the Andaman Sea in comparison with others survey areas. The total catch per haul was ranged from 0-7 individuals/haul in the Andaman sea. They also found in the east coast of Borneo in Brunei Darussalam waters and Sulu Sea the Philippines.

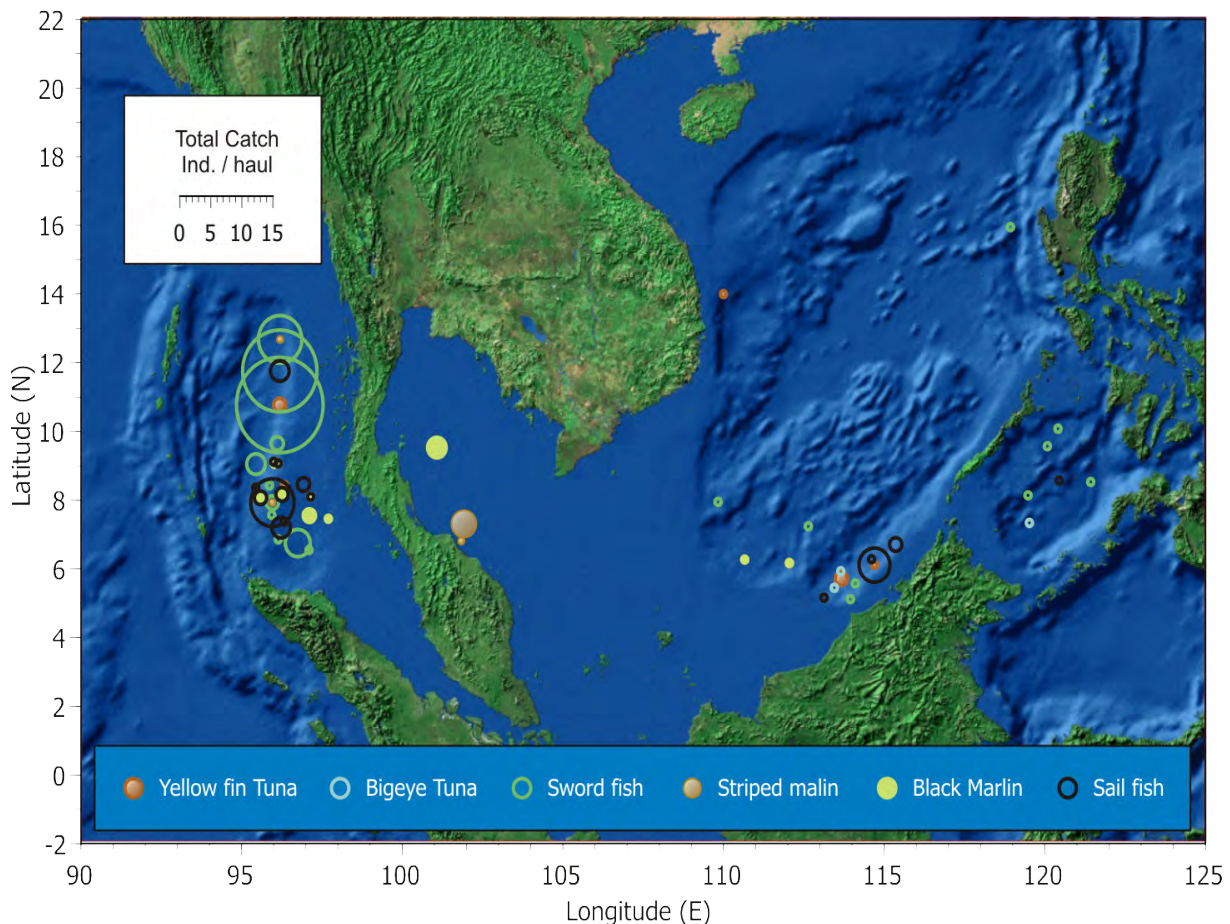


Fig. 7 Distribution and abundance of tunas and billfishes from pelagic longline survey



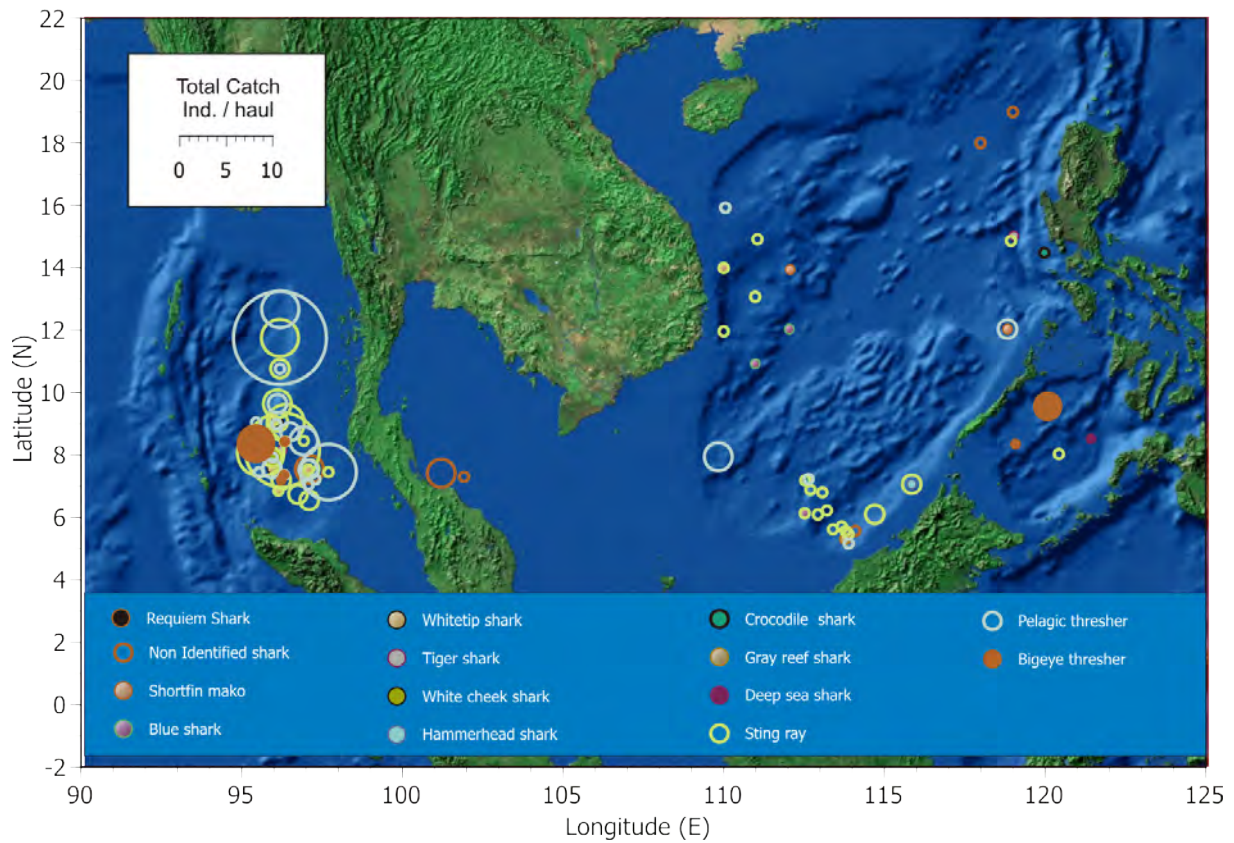


Fig. 8 Distribution and abundance of sharks and rays from pelagic longline survey

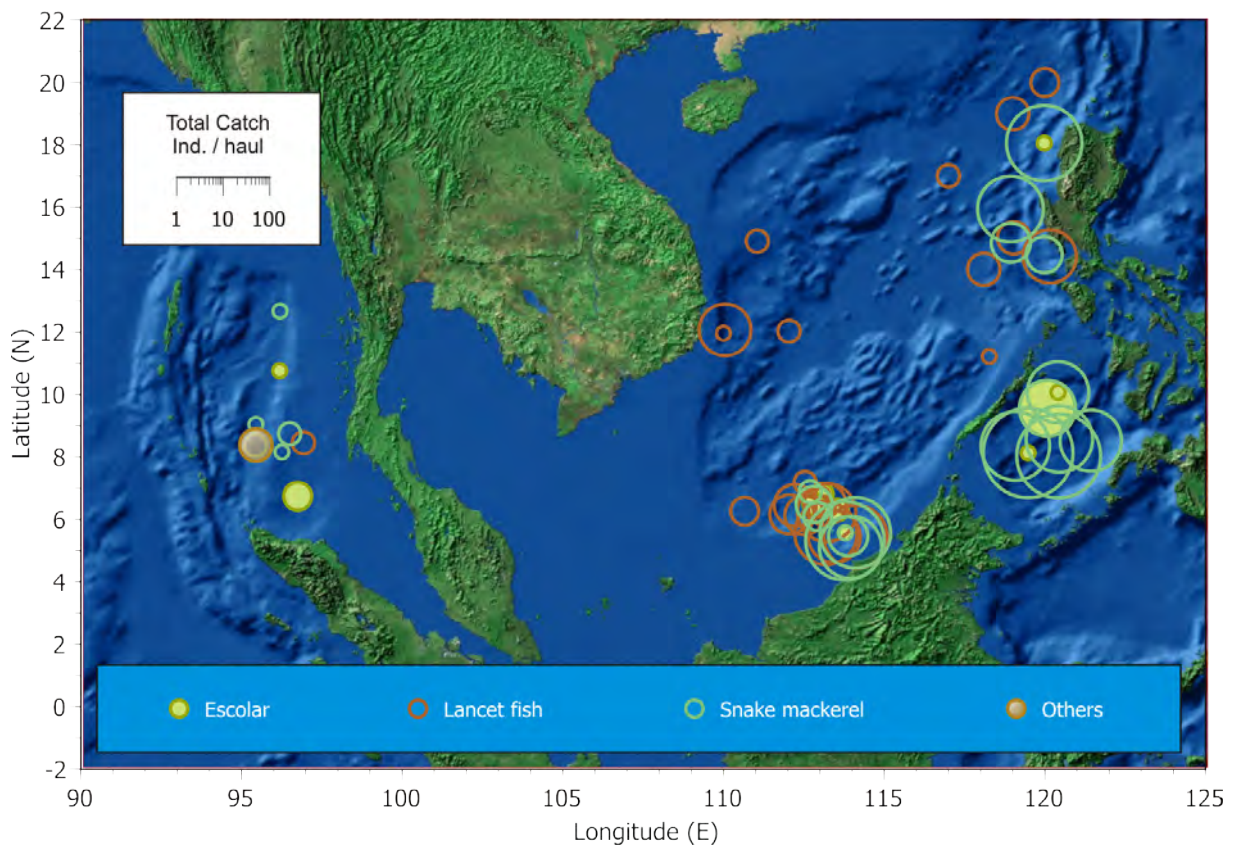


Fig. 9 Distribution and abundance of other By-catches from pelagic longline survey



Fig. 8 showed distribution and abundance of sharks and rays from pelagic longline survey. One of the dominant shark species found in the Andaman Sea was Pelagic thresher, *Alopias pelagicus*. Pelagic Thresher, is primarily an oceanic species but sometimes close inshore; Mesopelagic in the tropics; may enter atoll lagoons. Stuns its prey with its tail, presumably feeding on small fishes and cephalopods. Utilized for *human consumption, liver oil for vitamin extraction, hides for leather, and fins for shark-fin soup*. From the survey found that they widely distributed not only in the Andaman Sea but also in the South China Sea. This species is Not in IUCN Red List.

Fig. 9 shows the distribution and abundance others By-catch in particular the Escolar, Lancet fish and Snake mackerel. Escolar, *Lepidocybium flavobrunneum* (Smith, 1843) is bathypelagic; oceanodromous species normally found at depth ranged from 200 – 885 m. This fish is minor commercial, flesh meat is oily and may have purgative properties. Marketed frozen and as fish cakes in Japan. From the results found abundance in Sulu sea in comparison with other survey areas. Not in IUCN Red List.

5 Dominant and Commercial Species for Consideration

5.1) Swordfish : *Xiphias gladius* (Linnaeus, 1758)

Swordfish is classified in the in the Actinopterygii Class (ray-finned fishes), Perciformes Order (perch-likes), Xiphiidae Family. Swordfish is also classified as pelagic, oceanodromous and Highly migratory species normally living at depth range 0 – 800 m, where sea temperature is wide ranged from 5-27 °C. Generally found in the oceanic above the thermocline but sometimes found in coastal waters, preferring temperatures of 18°C to 22°C. Larvae are frequently encountered at temperatures above 24 °C. Migrate toward temperate or cold waters in the summer and back to warm waters in the fall. Adults are opportunistic feeders, known to forage for their food from the surface to the bottom over a wide depth range. Use their sword to kill their prey. Feed mainly on fishes but also on crustaceans and squids. Good food fish, marketed fresh or frozen, and can be made into sashimi, teriyaki or fillets. Large individuals may accumulate large percentages of mercury in its flesh.

Swordfish is one of commercial species found abundance in the Andaman Sea especially tranboundary area between Thailand and Myamar (**Fig. 10**). They also found in the east coast of Borneo in Brunei Darussalam waters, Sulu Sea and west coast of Luzon, the Philippines. This species is Not in IUCN Red List. (Ref. FishBase)

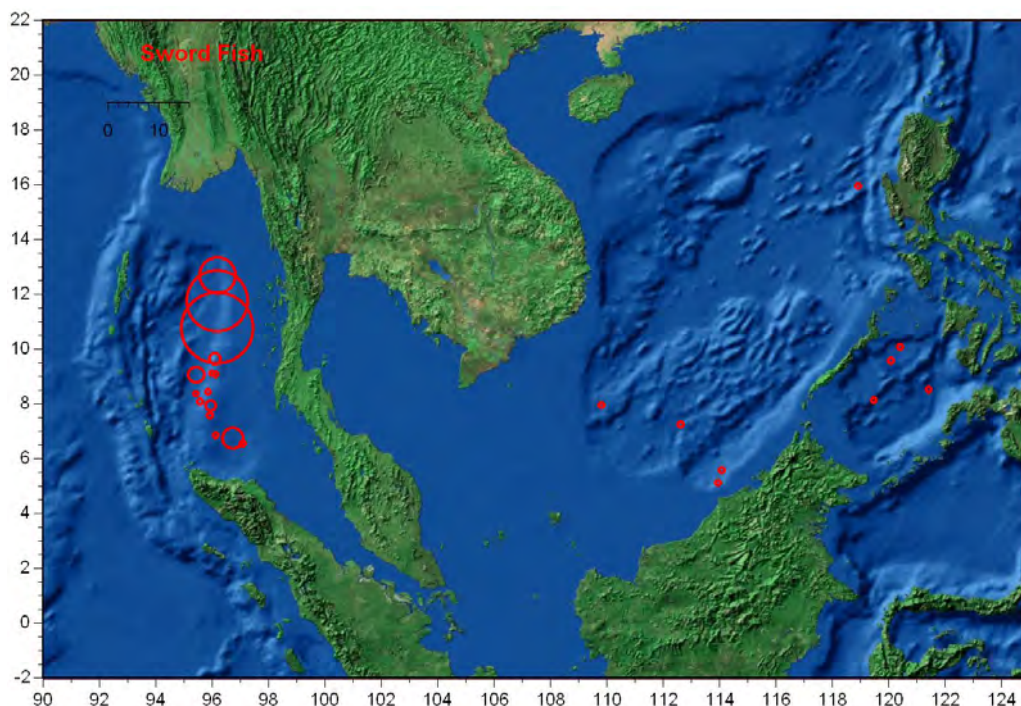


Fig. 10 Distribution and abundance of swordfish from pelagic longline survey



5.2) Indo-Pacific Sailfish : *Istiophorus platypterus* (Shaw, 1792)

Indo-Pacific sailfish is classified in the Actinopterygii Class (ray-finned fishes), Perciformes Order (perch-likes), Istiophoridae Family (Billfishes). Indo-Pacific sailfish is also classified as oceanic and epipelagic and Highly migratory species normally living at depth range 0-200 m., usually found above the thermocline. Most densely distributed in waters close to coasts and islands. Most likely schools by size. Undergoes spawning migrations in the Pacific. Feeds mainly on fishes, crustaceans and cephalopods. Utilized fresh, smoked and frozen; also used for sashimi and sushi; eaten broiled and baked (Ref. FishBase). **Fig. 11** shows the relative distribution and abundance of the sailfish found during the survey.

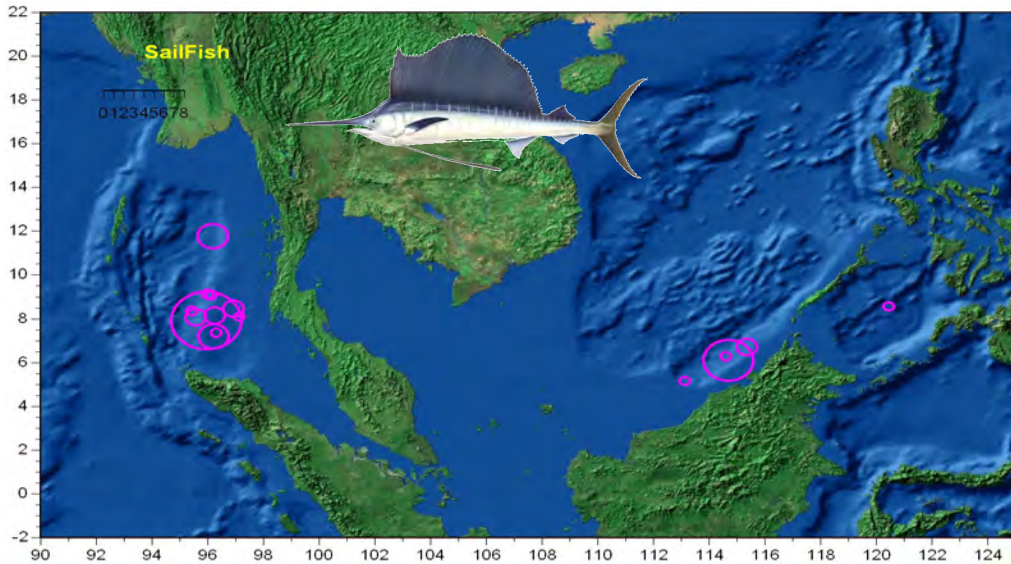


Fig. 11 Distribution and abundance of Indo-Pacific Sailfish from pelagic longline survey

5.3) Sickie Pomfret : *Taractichthys steindachneri* (Döderlein, 1883)

Sickle pomfret is classified in the Actinopterygii Class (ray-finned fishes), Perciformes Order (perch-likes) and Bramidae Family (Pomfrets). Sickle pomfret is also classified as benthopelagic oceanodromous and Highly migratory species normally living at depth range 50 – 360 m. **Fig. 10** shows the relative distribution and abundance of sickie pomfret found during the survey. This species is one of commercial species found often in the Sulu sea of the Philippines and West coast of Borneo in particular Brunie Darussalam waters. This species is Not in IUCN Red List (Ref. FishBase).

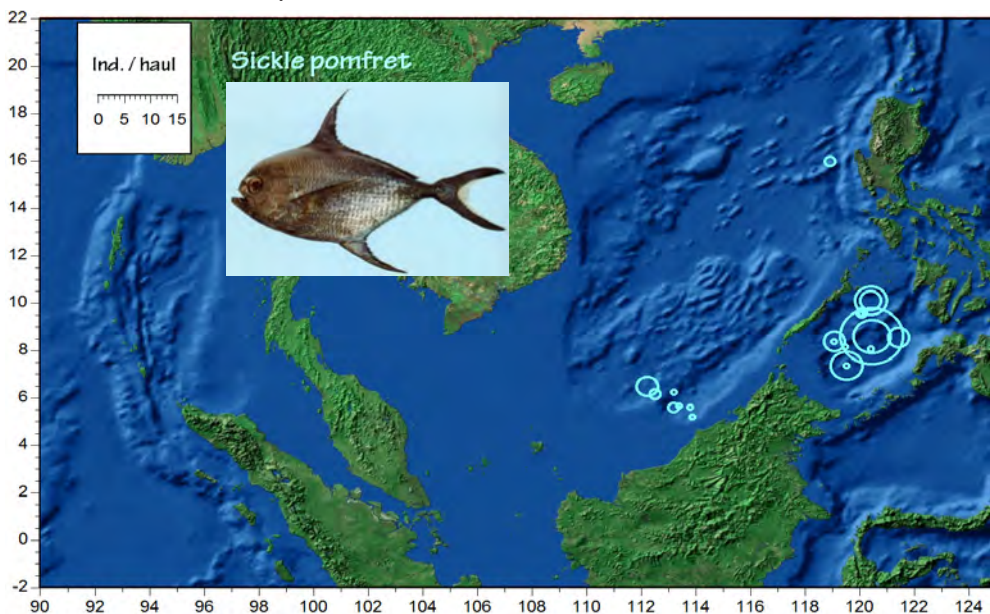


Fig. 12 Distribution and abundance of Sickie pomfret from pelagic longline survey

5.4) Snake mackerel : *Gempylus serpens* (Cuvier, 1829)

Snake mackerel is classified in the Actinopterygii Class (ray-finned fishes), Perciformes Order (perch-likes), Gempylidae (Snake mackerels) Family. Snake mackerel is also classified as bathypelagic; oceanodromous living at depth range 0 – 600 m. Adults migrate to the surface at night while larvae and juveniles are found near the surface during the day. Feeds on fishes, cephalopods and crustaceans. Sold frozen, as sausages or fish cake. Not eaten raw, but cooked in any way, also dried. The fish are low important commercial, sometimes used as bait. Males mature at 43 cm SL, females at 50 cm. **Fig. 13** shows the relative distribution and abundance of the snake mackerel found during the survey.

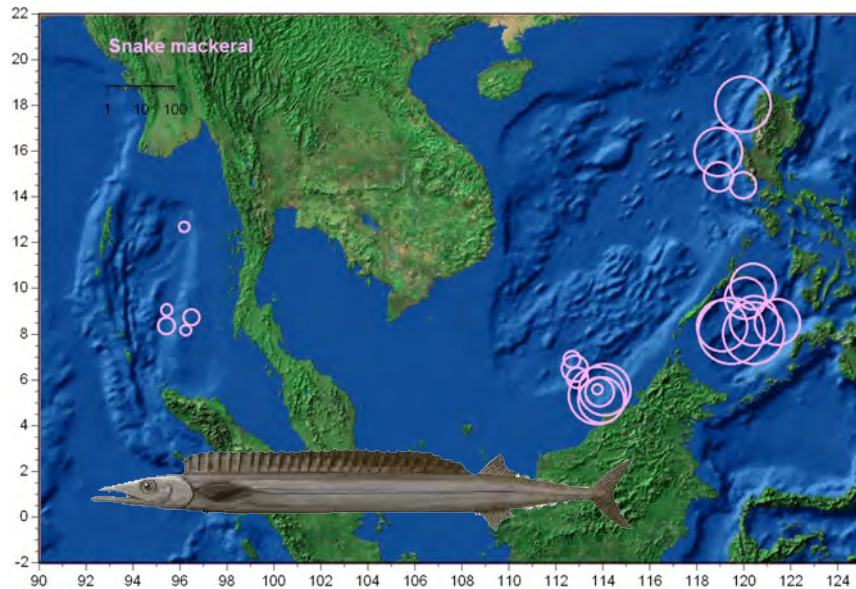


Fig. 13 Distribution and abundance of Snake mackerel from pelagic longline survey

5.5) Thresher sharks : *Alopiidae* spp.

Thresher sharks are classified in the Elasmobranchii (sharks and rays) Class, Lamniformes Order (mackerel sharks), Alopiidae Family. There are two species found during the survey; *Alopias pelagicus* or Pelagic thresher and *A. superciliosus* or Bigeye thresher. Feeds on pelagic and bottom fishes and squids. Stuns its prey with its long caudal fin. Utilized for human consumption, liver oil for vitamins, skin for leather, and fins for shark-fin soup. Marketed fresh and may be broiled, baked or grilled, but unsuitable for steaming, boiling or frying; meat may be salted and dried. Fig. 14 shows their abundance in the Andaman Sea

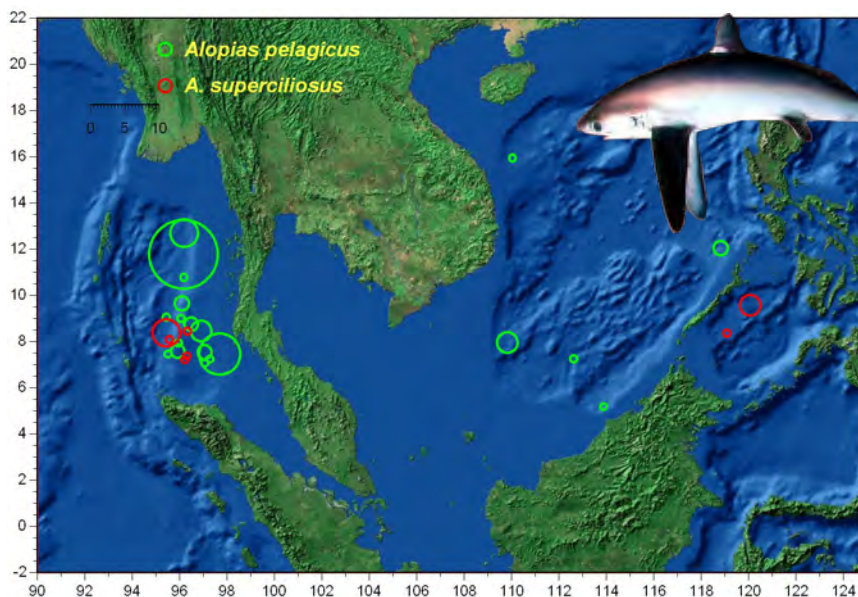


Fig. 14 Distribution and abundance of Thresher sharks from pelagic longline survey



5.6) Lancetfishes : *Alepisaurus spp.*

Lancetfishes are classified in the Actinopterygii (ray-finned fishes) Class, Aulopiformes (grinners) Order, Alepisauridae (Lancetfishes) Family. There are two species found in the survey areas; *Alepisaurus brevirostris* Gibbs, 1960 or shortnose lancetfish and *Alepisaurus ferox* Lowe, 1833 or longnose lancetfish. Lancetfishes are none value fishes, occasionally consumed but of little importance due to its soft flesh. Generally, they are mainly nocturnal, feed on fishes, cephalopods, tunicates, and crustaceans. Many lancetfishes found distributing in the South China Sea (Fig. 15), this will affected to commercial pelagic longline and reduced commercial catch.

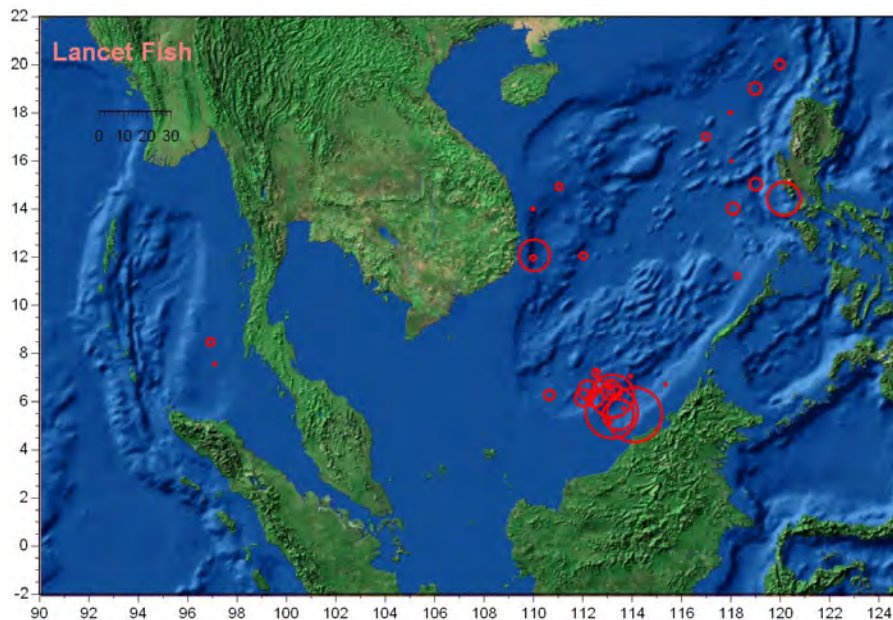


Fig. 15 Distribution and abundance of Lancetfishes from pelagic longline survey

6) Conclusions and Suggestions

Taking into account on the large pelagic species found from all survey areas indicated that the Andaman Sea especially in the offshore of Myanmar and border area with Thailand are still abundance of high commercial pelagic species especially swordfish, billfishes. In addition tunas; Yellowfin and Bigeye tuna are occasionally caught although not a dominant catch. At present, although there is no high sea areas in the Andaman Sea, but some Taiwanese longliners and few Thai longliners are operating. Concerning to International fisheries related issues, by-catch such as Thresher sharks is one of the issues. Since there are many thresher sharks also distributed in the Andaman sea, and most of them are adult size by weight about 100kg per individual.

In the South China Sea off Brunei Darussalam water, the catch rate from commercial species is quite low in comparison with the catch rate of non/less commercial fishes such as lancetfishes and snake makerel. The same results are also found in the Sulu sea, however in Sulu sea there are many Sickle pomfret. In case of reduction cost of longline for those dominant species in the Sulu sea, bait for pelagic longline may need to be considered. At present we used whole fish of some makerels, round scads and milk fishes for bait, therefore cut fishes could be used as baits replacing whole fishes. In addition, longline gears may need to modified using more hooks, but shorter hook lines and shorter distance between hooks.

Tunas are one of the target species in the Andaman Sea, enhancing of tuna resources in the Andaman Sea could be made in near future by deploying of the midwater-artificial reef on the continental slopes to deep bottom where as the bottom depth between 800-1,500m. Changing of fishing techniques from longlining to be handline for commercial species could be made in order to increase livelihood of local fishers along the coastline and decrease the traditional fishing gears and vessels such as bottom trawl by modifying to be handline for commercial large pelagic species such as tunas, swordfish and billfishes.



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