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## Catch composition and relative biomass of fishes caught by danish seine in Lingayen gulf

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### Abstract

The Lingayen Gulf is one of the major fishing grounds in the Philippines. The main clients of the fishing ground are the fishermen in the province of Pangasinan. The bulk of the catch of these fishermen are caught mainly using Danish Seine. Though there have been study conducted, related or succeeding studies were not undertaken so far. In the absence of updated studies, we undertaken a study to assess the catch composition and relative biomass of fishes caught by Danish seine. Two Sampling sites were selected, namely, Sector I (western Coast) and Sector III (eastern Coast). Two 45 HP commercial fishing vessels were utilized in the study in two sectors of the Gulf. Each vessel utilized modified Danish seine net and sampling was done every 15 days for a period of two months. The landed catch volume of every species were obtained from the fishing vessel's logbook. Results showed that there were 38 species of finfishes belonging to 22 families identified in the two sectors (25 species in Sector I and 29 species in Sector III). *Decapterus macrosoma* yielded the highest catch for the whole sampling periods and the most dominant catch in Sector I, while *Saurida tumbil* in Sector III. Catch landings were higher in Sector I with 6,448.6 kg as compared to Sector III has 2,525.8 kg. Out of the 22 families identified, 14 of these were demersal while the remaining were pelagic. Two new families were identified in this study which not mentioned in the early studies. Due to the limitations of this study, further studies related on the growth by sexes and other important growth parameters of different species is recommended for better management of the Lingayen Gulf.

**Keywords:** Sectors one and three, global positioning system, fishing vessel and danish seine

### Introduction

Lingayen Gulf is one of the primary sources of livelihood of the people particularly those living in the coastal areas. There are about 1.2 million people as of 2010 census residing in the 15 towns and three cities located along the gulf translating about 34% of the total population in the province of Pangasinan and La Union <sup>[1]</sup>. The gulf also serves as the major fishing ground for both the commercial and municipal fishermen. However, data on the catch volume in Lingayen Gulf, is scarce and very limited. Earlier reports disclosed that the total catch of local fishermen (16,000 municipal fishermen and 80 commercial fishermen) in the gulf was about 6,500 MT in 2001 <sup>[2]</sup>. The distribution of municipal fishermen by sector varied, where Sector I has the highest percentage with 47%, Sector II with 30% and Sector III with 23%. In addition, most of the commercial fishermen are based in Dagupan City, Sual and Mangaldan <sup>[3]</sup>.

Based on the various reports, there are 32 different types of fishing gears used in the gulf <sup>[4-10]</sup>. In the commercial fisheries sector, Danish seines and Trawls are the commonly operated fishing gears with a total catch of 9,653.52 metric tons (MT) from 1998-2002, and which 65% are accounted in Danish seines <sup>[11]</sup>.

In April 1988, Danish seine fishing was introduced in the gulf from Samar Sea and started its operation with three boats <sup>[12]</sup>. On the latest inventory conducted by BFAR in 2002 it shows that there are 41 registered Danish seine fishing boats operating and it also have a catch per unit of effort (CPUE) measured at kg/boat/day range from 91.78 kg/b/d to 116.11 kg/b/d <sup>[11]</sup>. However, it was found out that it contributes to the destruction of marine habitats and fishery resources which violates section 92 of Republic Act 8550, also known as the Fisheries Code of the Philippines <sup>[13]</sup>.

Though the study of <sup>[11]</sup> was conducted for five years (1997-2002) covering all the fishing gears in the area including Danish seine, related or succeeding studies were not undertaken so

far and there is still limited researches and publications on the catch composition of Danish seine operating in the gulf.

It is indispensable to have an inventory on the catch composition of fishes caught by Danish seine in the Sectors I and III of Lingayen Gulf and it is timely as it provides updates and information of Danish seine fisheries in the Gulf. Furthermore, the outcome of this study may also use in support on the banning of the gear (Danish seine and modified Danish seine) in the Philippine Waters under the Fisheries Administrative Order (FAO) No. 246 for the better fisheries management of the gulf particularly on integrated coastal resource management program of the government.

## Materials and Methods

### Research Method and Design

This study employed a descriptive-survey method of research. Every 15 days, catch landings of Danish seines from Sectors I and III in Lingayen Gulf were monitored and recorded. The species composition and volume of catches were determined for every landing.

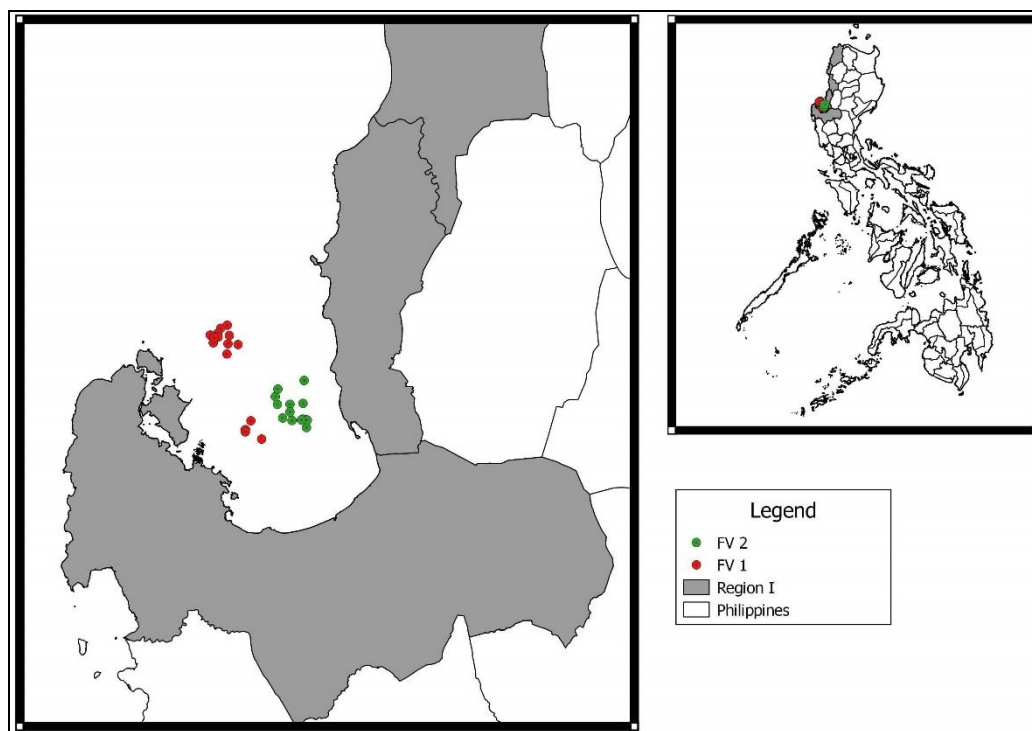
### Location of the Study

Lingayen Gulf is one of the major fishing grounds of the

Philippines located in the northwestern part of Luzon. It lies within 16° 00' N and 16° 40' N latitudes and 119° 55' E and 120° 25' E longitudes. It is bounded on the west and south of Pangasinan province and northeast by La Union province. The gulf covers a total area of 2,085 km<sup>2</sup> with a 160 km coastline from Cape Bolinao to Poro Point and generally shallow with depths of less than 90 m [14].

The Gulf has been classified into three sectors according to dominant coastal features [15]. Based on the bottom types of the gulf, Mines (1986) subdivided it into three sectors, namely; Sector I- (western coast) - which extends from Cape Bolinao to Sual and characterizes by coral reefs and seagrass beds; Sector II- (inner coast)- extends from Sual to Damortis and have a muddy substrate, mangroves and nipa swamps where aquaculture activities are concentrated and Sector III - (eastern coast)-characterized by sandy bottom with scattered rocky substrate.

The study was conducted in the Magsaysay Market, Dagupan City, Pangasinan where the Danish seines operators landed their catch. Danish seine operators served as cooperators and the sources of samples. Two Danish seine vessels were operated in the two sectors; one each in Sector I and Sector III.



**Fig 1:** Map showing the fishing areas of Danish seine fishing vessels in Lingayen Gulf.

### Fishing Vessel and Fishing Operation

Sampling was undertaken using two Danish seine fishing vessels. The fishing vessels had an overall length of 14.02 m, 3 m breadth and 3 m a depth. Both fishing vessels were also powered with 45 hp engine and equipped with navigational instruments such as Global Positioning System (GPS) receivers, magnetic compass, Fish Finder and VHF radio receiver. Each fishing vessel carried an AM/FM band radio to monitor the weather condition through listening to programs that broadcasting weather reports. Each vessel utilized modified Danish seine net measuring 180 m. It also had a scare line (*tingga* and cut of sacks) of 120 m on each side, a wing of 60 m on each side and a pouch bag of 25 m with a mesh size (#12, #9 and #6) towards the cod end.

The whole operation takes about 1-1 1/2 hours. The catch is iced down quickly to ensure a quality product.

### Sampling and Data Gathering

Sampling was done every 15 days from December 2015 to January 2016. The volume (kg) of catch landed by species were obtained from the fishing vessel's logbook. To determine the species composition, a specimen for each species was collected from the master fisherman in the Magsaysay Market, Dagupan City. The species were identified through their morphological features based on the books of [16, 17] and verified using Fish Base for proper identification. Unidentified species were preserved using ethanol in a glass container and brought to Pangasinan State

University, Binmaley Campus (PSU-BC) Wet Laboratory for further identification.

In terms of the relative biomass (RB) by species, the following formula was used:

$$RB = (V/TV) \times 100$$

where:

V= volume of catch of each species

TV= total volume of catch

## Results

### Species Composition

A total of 38 species of finfishes belonged to 22 families were captured by Danish seine operated in the Sectors I and III of Lingayen Gulf from December 2015 to January 2016 (Table 1). Based on the landed catch, Sector I had 25 species while Sector III recorded 29 species.

In Sector I, Family Carangidae obtained the highest number of species, with 7 out of 25 species which made up 28% (Table 2). This was followed by Family Leiognathidae that comprised 12% and the Family Scombridae and Serranidae both consisted 8%. The rest of the families caught include Lethrinidae, Lutjanidae, Malacanthidae, Menidae, Monacanthidae, Mullidae, Nemipteridae, Priacanthidae, Sphyraenidae, Synodontidae, and Trichiuridae which were accounted 4% of landed catch.

In Sector III, Family Carangidae also dominated the catch with a 20.7%. Species under families Paralichthyidae and Scombridae had an 6.89% each, while the families Nemipteridae, Sphyraenidae, Mullidae, Synodontidae, Malacanthidae, Trichiuridae, Lethrinidae, Menidae, Lutjanidae, Gerreidae, Terapontidae, Leiognathidae, Ambassidae, Congridae, Serranidae and Chirocentridae had 3.45% each.

**Table 1:** Species composition of finfishes caught by Danish Seine in Sectors I and III of Lingayen Gulf from December 2015 to January 2016. (Note: positive (+) sign means present in the catch; negative (-) sign means absent in the catch).

Family	Scientific Name	Sector I	Sector III
Ambassidae	<i>Ambassis miops</i>	-	+
Carangidae	<i>Alectis ciliaris</i>	+	+
	<i>Alectis indica</i>	-	+
	<i>Atule mate</i>	+	+
	<i>Carangoides coeruleopinnatus</i>	-	+
	<i>Caranx ignobilis</i>	+	+
	<i>Decapterus kurroides</i>	+	-
	<i>Decapterus macrosoma</i>	+	-
	<i>Selar crumenophthalmus</i>	+	+
	<i>Selaroides leptolepis</i>	-	+
<i>Uraspis uraspis</i>	+	-	
Chirocentridae	<i>Chirocentrus nudus</i>	-	+
Congridae	<i>Conger cinereus</i>	-	+
Gerreidae	<i>Gerres filamentosus</i>	-	+
Leiognathidae	<i>Photopectoralis aureus</i>	+	-
	<i>Leiognathus equulus</i>	+	+
	<i>Aurigequula fasciata</i>	+	-
Lethrinidae	<i>Gymnocranius griseus</i>	+	+
Lutjanidae	<i>Lutjanus russellii</i>	+	+
Malacanthidae	<i>Branchiostegus japonicus</i>	+	+
Menidae	<i>Mene maculata</i>	+	+
Monacanthidae	<i>Aluterus monoceros</i>	+	-
Mullidae	<i>Upeneus moluccensis</i>	-	+
	<i>Mulloidichthys pfluegeri</i>	+	-
Nemipteridae	<i>Nemipterus bathybius</i>	+	+
Paralichthyidae	<i>Pseudorhombus dupliciocellatus</i>	-	+
	<i>Pseudorhombus cinnamomeus</i>	-	+
Priacanthidae	<i>Priacanthus tayenus</i>	+	+
	<i>Pristigenys nipponia</i>	-	+
Scombridae	<i>Scomberomorus commerson</i>	+	-
	<i>Rastrelliger kanagurta</i>	+	+
	<i>Rastrelliger brachysoma</i>	-	+
Serranidae	<i>Epinephelus sexfasciatus</i>	+	+
	<i>Epinephelus coioides</i>	+	-
Sphyraenidae	<i>Sphyraena barracuda</i>	+	+
Synodontidae	<i>Saurida tumbil</i>	+	+
Terapontidae	<i>Terapon jarbua</i>	-	+
Trichiuridae	<i>Trichiurus lepturus</i>	+	+
	Total	25	29

### Relative Biomass

The total landed catch by Danish seine from Sectors I and III of Lingayen Gulf from December 2015 to January 2016 was

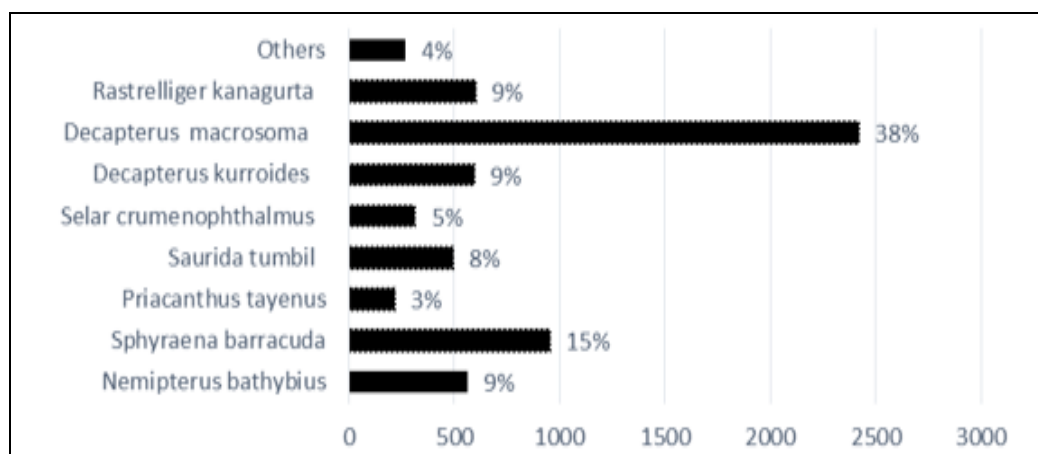
8,974.4 kg (Table 2). Sector I as the higher catch landings of 6,448.6 kg (71.9%) as compared to Sector III with 2,525.8 kg (28.1%).

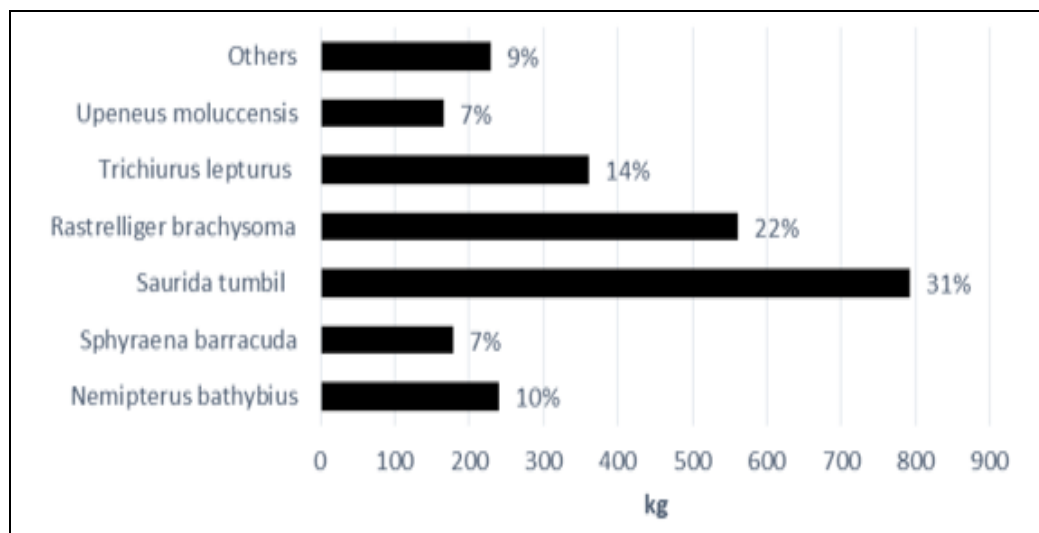
**Table 2:** Biomass (kg) of species caught by Danish Seine in Sectors I and III of Lingayen Gulf, Pangasinan from December 2015 to January 2016.

Family	Scientific Name	Sector I (kg)	Sector III (kg)	Total (kg)
Ambassidae	<i>Ambassis miops</i>	-	0.3	0.3
Carangidae	<i>Alectis ciliaris</i>	0.1	0.15	0.25
	<i>Alectis indica</i>	-	0.1	0.1
	<i>Atule mate</i>	99.9	16.5	116.4
	<i>Carangoides coeruleopinnatus</i>	-	0.3	0.3
	<i>Caranx ignobilis</i>	0.7	0.4	1.1
	<i>Decapterus kurroides</i>	594.0	-	594
	<i>Decapterus macrosoma</i>	2,416.2	-	2416.2
	<i>Selar crumenophthalmus</i>	314.0	8.5	322.5
	<i>Selaroides leptolepis</i>	-	1.3	1.3
	<i>Uraspis uraspis</i>	0.3	-	0.3
Chirocentridae	<i>Chirocentrus nudus</i>	-	46.5	46.5
Congridae	<i>Conger cinereus</i>	-	15.5	15.5
Gerreidae	<i>Gerres filamentosus</i>	-	0.9	0.9
Leiognathidae	<i>Photopectoralis aureus</i>	0.15	-	0.15
	<i>Leiognathus equulus</i>	34.8	1.3	36.1
	<i>Aurigequula fasciata</i>	0.1	-	0.1
Lethrinidae	<i>Gymnocranius griseus</i>	0.5	0.5	1.0
Lutjanidae	<i>Lutjanus russellii</i>	0.6	0.8	1.4
Malacanthidae	<i>Branchiostegus japonicus</i>	18.5	2	20.5
Menidae	<i>Mene maculata</i>	0.25	0.7	0.95
Monacanthidae	<i>Aluterus monoceros</i>	1.1	-	1.1
Mullidae	<i>Upeneus moluccensis</i>	-	165	165
	<i>Mulloidichthys pfluegeri</i>	38.6	-	38.6
Nemipteridae	<i>Nemipterus bathybius</i>	561.0	240.5	801.5
Paralichthyidae	<i>Pseudorhombus dupliciocellatus</i>	-	0.5	0.5
	<i>Pseudorhombus cinnamoneus</i>	-	0.1	0.1
Priacanthidae	<i>Priacanthus tayenus</i>	215.0	69.3	284.3
	<i>Pristigenys nipponia</i>	-	0.15	0.15
Scombridae	<i>Scomberomorus commerson</i>	32.0	-	32
	<i>Rastrelliger kanagurta</i>	599.0	59	658
	<i>Rastrelliger brachysoma</i>	-	561	561
Serranidae	<i>Epinephelus sexfasciatus</i>	0.3	1.8	2.1
	<i>Epinephelus coioides</i>	30.5	-	30.5
Sphyraenidae	<i>Sphyraena barracuda</i>	956.0	178	1134.0
Synodontidae	<i>Saurida tumbil</i>	494.5	792	1286.5
Terapontidae	<i>Terapon jarbua</i>	-	1.7	1.7
Trichiuridae	<i>Trichiurus lepturus</i>	40.5	361	401.5
	Total	6,448.6	2,525.8	8,974.4

Looking at the relative biomass of species in Sector I (Figure 2), *Decapterus macrosoma* was the most captured species with 37.5% of the total landed catch from December 2015 to January 2016. This was followed by *Sphyraena barracuda* (14.8%), *Rastrelliger kanagurta* (9.3%), *Decapterus*

*kurroides* (9.2%), *Nemipterus bathybius* (8.7%), *Saurida tumbil* (7.7%), *Selar crumenophthalmus* (4.9%), *Atule mate* (1.5%), *Trichiurus lepturus* (0.6%), *Mulloidichthys pfluegeri* (0.6%) and the other landed catch accumulated 5.2%.

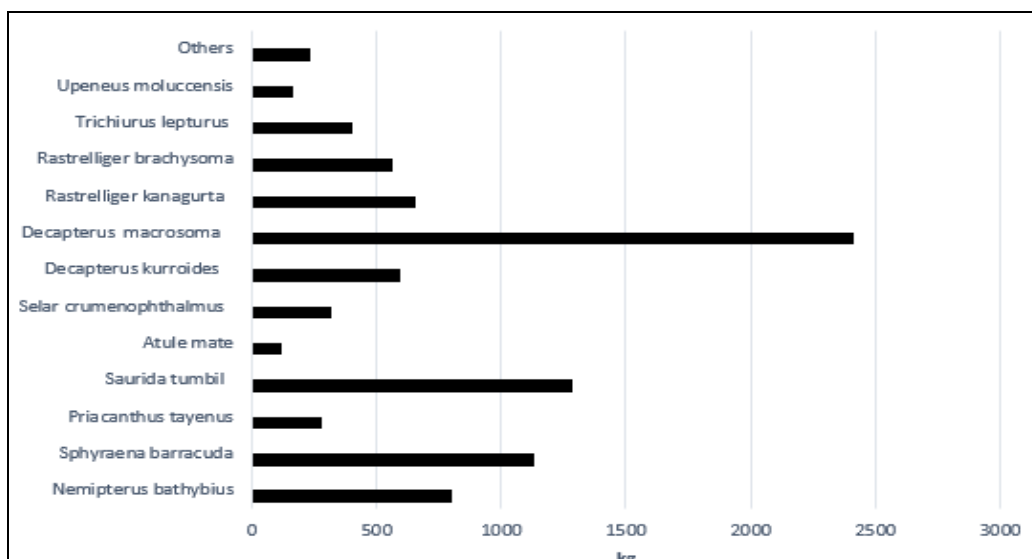




**Fig 2:** Relative biomass (%) of species caught by Danish Seine in Sector I (top) and Sector III (bottom) of Lingayen Gulf, Pangasinan from December 2015 to January 2016.

The aggregated relative biomass of species caught by Danish seine in both Sectors I and III are presented in Figure 3. Of the total landed catch from December 2015 to January 2016,

*Decapterus macrosoma* dominated the catch with 27%, while the lowest species caught was the *Atule mate* with only 1% of overall catch in two Sectors.



**Fig 3:** Combined relative biomass (%) of species caught by Danish Seine in Sector I and Sector III in Lingayen Gulf, Pangasinan from December 2015 to January 2016.

**Discussion**

Danish seine fishery is one of the major fisheries in Lingayen Gulf that provides food supply, income and livelihood to several coastal communities. Round scads, which are locally known as “galunggong”, are among the important small pelagic fishes caught in municipal and commercial fisheries in large quantities in the Philippine water throughout the year [18, 19]. The results of this study indicates that there are two species of round scads present in Lingayen Gulf, and these were *D. macrosoma* and *D. kurroides*. Furthermore, *D. macrosoma* dominated the catch and was abundant in January which is contrary to the early findings of [11] which the peak months of *D. macrosoma* in their study were seen during the July to December. The different results may be attributed to the occurrence of typhoon “Nona” in December, 2015 that traversed through the Lingayen Gulf. However, there are several findings that indicate different spawning seasons of *D. macrosoma*. Based on the results of

[20] in Mozambique, the spawning seasons of this species is from December to February and June to September while the findings of [21] with the used of Gonadosomatic Index (GSI) in Romblon shows that the peaks of the spawning of *D. macrosoma* are in February, August and October. It was also reported in the study of [22] that the peak of spawning of this species was from February to April while [23] stated that the fish spawned between February and March. Presence of this species in these months maybe attributed to their spawning patterns. However, other parameters should still be considered to help support the findings and have baseline information for better management of the gulf. Of the 21 families identified, 14 (66.67%) of these are demersal namely; Mullidae, Monacanthidae, Malacanthidae, Teraponthidae, Menidae, Congridae, Chirocentridae, Nemipteridae, Synodontidae, Carangidae, Scombridae, Leiognathidae, and Paralichthyidae while the remaining 33.33% are pelagic species are the families of Trichiuridae,

Lethrinadae, Amblyssidae, Lutjanidae, Sphyraenidae, Serranidae, and Menidae. Based on the results found, most species caught by the Danish seine on Sectors I and III in the Lingayen Gulf are demersal.

This study also indicates that the operation of Danish Seine in some areas of the Gulf still continues even though that BFAR Central Office issued Fisheries Administrative Order (FAO) 246 in 2013, which ban the operation of Danish Seine and Modified Danish Seine in the Philippine waters. The rampant illegal fishing in the Lingayen Gulf might cause environment degradation. In addition, further studies related on the growth by sexes and other important growth parameters of different species is recommended for better management of the Lingayen Gulf.

### Conclusion

1. There are 25 fish species belonging to 15 families in the Danish Seine of Sector I and 29 species belonging to 20 families in the Danish seine of Sector III.
2. *Decapterus macrosoma*, has obtained the highest on the total catch biomass of the Sectors I and III of the Lingayen Gulf catch by the Danish seine.
3. The species caught are dominated by demersal species.

### Recommendations

1. Conduct another study covering the fish caught of all the major Fishing gear use in the Sectors I and III of Lingayen Gulf to ensure the better management of the Gulf particularly on integrated coastal resource management program of the government.
2. Link with other Municipal and City Government in the conduct of similar study to generate information on the present status of the Gulf.

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