MINDORO STRAIT AND LAGONOY GULF TUNA FISHERIES: AN ASSESSMENT FROM 2013 TO 2019

(A Report Submitted to World Wildlife Fund – Philippines, January 2021)

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Acronyms

BFAR	Bureau of Fisheries and Aquatic Resources
CPUE	Catch Per Unit Effort
EU	European Union
FAO	Food and Agriculture Organization
FSP	Fishery Sector Program
Ha	Hectare
HCR	Harvest Control Rules
IUUF	Illegal Unreported Unregulated Fishing
Kg	Kilogram
Km^2	Square Kilometer
MPA	Marine Protected Area
MPAN	Marine Protected Area Network
MSY	Maximum Sustainable Yield
MT	Metric Ton
NFARMC	National Fisheries and Aquatic Resources Management Council
NFRDI	National Fisheries Research and Development Institute
NSAP	National Stock Assessment Program
PPTST	Partnership Program Towards Sustainable Tuna
RA	Republic Act
RP	Reference Points
SPR	Spawning Potential Ration
STP	Sustainable Tuna Partnership
TFA	Tuna Fishers Association
WCPFC	Western and Central Pacific Fisheries Commission
WWF	World-Wide Fund for Nature

EXECUTIVE SUMMARY

The determination of fishing capacity is critical in fisheries management. Under Philippine laws, capture fisheries are assessed and monitored using indicators or reference points such as catch per unit of effort (CPUE). Mindoro Strait and Lagonoy Gulf have significant tuna fisheries. This is the subject of WWF-Philippines' Sustainable Tuna Partnership (STP) Project, which aims to sustainably manage this important resource. To assess the tuna fisheries in the project sites, the STP Project conducted a landed catch and effort monitoring of selected landing sites in Mindoro Strait and Lagonoy Gulf from 2013 to 2019. Data collection was guided by the standard method of the Bureau of Fisheries and Aquatic Resources-National Fisheries Research and Development Institute National Stock Assessment Program (BFAR-NFRDI NSAP) and data collectors were trained accordingly. For Mindoro Strait, the specific hook and line fishery was targeted while for Lagonoy Gulf, the multi-gear fishery was sampled. Results revealed that for both areas, tunas dominated the catch: yellowfin tuna for the Mindoro Strait hook and line fishery while yellowfin tuna, albacore tuna and skipjack tuna for Lagonoy Gulf. CPUEs for both fisheries were stable over time indicating a sustainable level of tuna fisheries. To ensure that sustainability of this fishery continues, it is recommended that the existing number of fishing effort should not be increased and that other fisheries management interventions such as continuous monitoring and the establishment of Marine Protected Areas (MPAs), MPA networks (MPANs), fish sanctuaries and refugias need to be pursued.

Keywords: *Sustainable fishing, conservation, certification, fisherfolk communities*

I. INTRODUCTION

Fishing capacity is defined by the Food and Agriculture Organization (FAO) as "the ability of a vessel or fleet of vessels to catch fish and can be expressed more specifically as the maximum amount of fish over a period of time (year, season) that can be produced by a fishing fleet if fully utilized, given the biomass and age structure of the fish stock and the present state of the technology" (Pascoe and Greboval, 2003). In other words, it is the ability of the fishing fleet to catch fish measured by indicators such as the number of boats in a fishing fleet, kinds and size of boats that make up the fleet, engine horsepower, days or years of operation, the kind of fishing gear used, among others.

In the Philippines, under Section 8 of Republic Act (RA) 8550 otherwise known as the Philippine Fisheries Code of 1998, as amended by R.A. 10654, determination of the status of fish stocks could be made through reference points (RPs) including target, trigger and limit RPs and that harvest control rules (HCRs) are set when limit RPs are breached.

The World Wide Fund for Nature (WWF)-Philippines has been working to improve the National Tuna Management plan together with other agencies and aims to have a sustainable tuna fisheries in the region. It builds on the achievements of the Partnership Program towards Sustainable Tuna (PPTST) in Mindoro Strait and Lagonoy Gulf and aims to contribute particularly on ending poverty, on achieving gender equality, and on conserving and sustainably using oceans, seas, and marine resources for sustainable development.

Mindoro Strait, a body of water between the provinces of Occidental Mindoro and Palawan, is one of the narrow channels connecting the West Philippine Sea with Sulu Sea. It has an average depth of 420 meters where waterways serve as gateway or alternate route for cargo ships between the Indian and Pacific Oceans. The Bureau of Fisheries and

Aquatic Resources (BFAR) considered Mindoro Strait as the ‘‘Philippines new tuna highway” and as ‘‘one of the most prosperous new yellowfin tuna fishing sites in the Philippines”. Starting in 2010, yellowfin tuna from Mamburao, Occidental Mindoro has been exported to the European and Asian countries because it conformed to international standards (Urlanda, 2019 and Evora, 2016). The Mindoro Strait Municipal Ordinance 2012-160 otherwise known as the “Fishery Code” of the municipality was passed for the management, conservation, development and utilization of the fisheries and aquatic resources in the area.

Lagonoy Gulf is the major fishing ground in the northeastern side of the Philippines. It is bordered by the provinces of Albay, Camarines Sur, and Catanduanes, composed of 15 coastal municipalities. In 1992, Lagonoy Gulf was a priority fishing ground for a number of projects like the Fishery Sector Program (FSP) of BFAR (Silvestre et al., 1995). Among the interventions made during this project were the establishment of artificial reefs, fish sanctuaries and marine reserves and mangrove reforestation. The Gulf is considered a highly productive fishing ground particularly for large tuna, tuna-like, mackerels, sailfish, blue marlin, wahoo, dolphinfish, sharks and rays, reef dwelling fishes among others (Olaño et al. 2002 and Soliman et al., 1998). Lagonoy Gulf is a multi-gear fishery where handlines and gillnets comprised 75 percent of the total number of gear units in the area (Garces et al., 1995a and Garces et al., 1995b). In 1995, the estimated annual production in the Gulf is at 33,380 MT or about 11 MT/km2/yr (Soliman et al. 1995). In 2011, it was at 40,332.73 MT (Olaño et al., 2017). However, Lagonoy Gulf have been reported to suffer heavy exploitation often closely related with the capture of undersized and immature fishes (Olaño et al., 2002). In 1987, mangroves in the area were estimated at 251.44 ha or 26 % of their original cover from 1956 (Vega et al., 1995). Sea

grass beds were either disturbed or altered at varying rates due to anthropogenic activities (Nieves et al., 2010).

To assess the status of fish stocks and fishing capacity, certain RPs or indicators are monitored such as catch, Catch per Unit of Effort (CPUE), Exploitation (E) values, spawning potential ration (SPR), maximum sustainable yield (MSY) among others for effective fisheries policies and management (Lae et al., 2004). CPUE is one of the most useful indicators for long term monitoring of a fishery (FAO, 1999).

This report provides the assessment results and analysis of the fisheries of Mindoro Strait and Lagonoy Gulf from 2013-2019, particularly the tuna fisheries using CPUE as indicator and in relation to fishing capacity and activities of WWF-Philippines in the area.

II. MATERIALS AND METHODS

Landed Catch and Effort Data Collection

In 2013, the WWF-PPTST team received training on data collection using the NSAP standard method (Santos et al., 2017). Monitoring of fish catch data in tuna handline fisheries including bait species with the tuna fisher leaders commenced on the same year. In February 2015, a "Trainers Training on Fisheries Data Collection" was conducted for selected tuna fisher leaders from six tuna fishing municipalities of Mindoro and 15 municipal-wide Tuna Fishers Association in Lagonoy Gulf. Specifically, fish catch data collection was conducted in six (6) municipalities of Occidental Mindoro and later on focused in the two major tuna landing municipalities: Sablayan and Mamburao. In Lagonoy Gulf, catch and effort reporting both for municipal and commercial tuna fishing

vessels was limited to the members of the respective Tuna Fishers Association (TFA) and willing tuna handline fishers from 14 municipalities/city of Albay, Camarines Sur and Catanduanes.

Hired enumerators recorded the data. Catch recording was done in every fishing trip including Saturdays, Sundays and holidays on both project sites. Catch by species and effort of every fishing trip and length measurements for the target species were recorded in the prescribed fish catch report form (for EU Simplified Catch Certificate) or the FRQD Form No. EU-4 EU-IUUF Catch Report developed by BFAR.

Data Analysis

Catch and effort profile for Mindoro Strait and Lagonoy Gulf were computed using basic total and mean averages represented in line and bar graphs. For indicator of stock status, only CPUEs (kg/boat/year and kg/boat/day) for the dominant catches (e.g. tunas) by hook and line were computed as these represented majority of the data collected across abovementioned timelines.

Limitations and Assumptions

This report was solely based on the raw landed catch and effort data provided by WWF-Philippines. It is assumed that the data came from a sampling regime and followed the abovementioned methodology consistently during the duration of the study period. In addition, it is assumed that accurate species identification was made by the trained data collectors.

III. RESULTS

Mindoro Strait

A total landed catch of 311 MT from various established fish landing sites in Mindoro Strait (covering the provinces of Occidental Mindoro and Palawan) was recorded from 2014-2015 and 2017-2019. The highest catch was recorded in 2018 with 133 MT (43%), followed by 2019 with 72 MT (23%), 2017 with 52 MT (17%), 2015 with 36 MT (12%) and 2014 with only 6% (19 MT) (Fig. 1). In terms of landed catch per fish landing site, Mamburao had the highest landed catch at about 49% (154 MT) followed by Sablayan at 124 MT (40%) and Puerto Princesa in Palawan at 26 MT (8%). The least catch was observed in Calintaan and Rizal in Occidental Mindoro with 1.0%, (4 MT) and 1.0% (3 MT), respectively (Fig. 2).

By design, only hook and line fishery was recorded for Mindoro Strait (Fig. 3). A high percentage of boats about 43% in operation was recorded in 2018, followed by the year 2019 with 23%, 2017 (17%), and 2015 (12%). A total of 34 species were recorded in the landed catch dominated by large pelagic fishes (Fig. 4). Yellowfin tuna was the most dominant species (97% of the total landed catch) followed by blue marlin, swordfish and mahi-mahi, which equally contributed about 0.7%.

Total recorded hook and line boats for the duration of the study was 8,299 with annual average of about 1,660 or five fishing boats per day. Hook and line was analysed for CPUE - (total catch kilograms (kg) divided by total number of boats landed (effort) per year. The average CPUE is 39.01 kg/boat/year ranging from 33.55 kg/boat to 44.13 kg/boat. The CPUE for this gear show a slight decreasing trend from 2014 to 2019 (Fig. 5).

CPUE of hook and line targeting yellowfin tuna is shown in Fig. 6. Total recorded fishing effort was 7,129 fishing boats with annual average effort of 1,426 or 4 boats per day. The average CPUE is 42.71 kg/boat/year ranging from 37.66 kg/boat/year to 44.78 kg/boat/year. CPUE observed was steady from 2014 to 2018 but with slight decrease in 2019.

Lagonoy Gulf

A total estimated annual landed catch of 299 MT from 14 fish landing sites in Lagonoy gulf (covering the provinces of Catanduanes, Camarines Sur, Albay, and Tabaco City) was recorded from 2013 to 2019 (Fig. 7). The highest catch was recorded in 2014 at about 68 MT (23%) followed by 2015 at 63 MT (21%) and 2013 at 2.0 MT (1%). Comparing the landed catch by fish landing site/municipality, Tabaco City in Albay showed the highest landed catch at about 139 MT (47%), followed by Tiwi, Albay at 95 MT (32%), Sagñay Camarines Sur at 16 MT (5%) and Presentacion and San Jose, Camarines Sur each recorded 3.0 MT (10%) (Fig. 8).

Percentage of fishing boats operating annually in Lagonoy Gulf from 2013-2019 is shown in Fig. 9. The highest recorded boat operation in 2014 and 2015 is at 25% and 26%, respectively. Majority of the catch was from tuna handline fisheries, which contributed 283 MT or about 95% to the total catch of the Gulf for the duration of the study (Fig. 10). Other gears recorded were troll line (2%), scoop net, hook and line and multiple hook and line (at 1% each), jigger (0.4%), and scoop net with kulapo (0.01%).

A total of 71 species were recorded in the landed catch dominated by large pelagic fishes (Fig. 11). Yellowfin tuna (*Thunnus albacares*) was the most dominant species in

terms of total landed catch at 58%, followed by albacore tuna (*Thunnus alalunga*) (22%), and skipjack (*Katsuwonus pelamis*) (6%).

For tuna handlines, the total effort recorded was 25,707 boats with an annual average of 3,672 boats or 10 fishing boats per day (Fig. 12). For troll line, it was 528 fishing boats with annual average of 88 fishing boats (Figure 13). While for multiple hook and line, it was a total of 755 boats or an annual average effort of 151 boats (Fig. 14).

The CPUE of three (3) fishing gears, namely: tuna handline, multiple hook and line, and troll line were computed. The average CPUE for tuna handline was 10.80 kg/boat/year ranging from 8.85 kg/boat/year to 18.11 kg/boat/year (Fig. 12). For multiple hook and line, the average CPUE was 6.82 kg/boat/year ranging from 2.07 kg/boat/year to 21.23 kg/boat/year (Fig. 13). While for multiple hook and line, the average CPUE was 9.26 kg/boat/year ranging from 6.79 kg/boat/year to 15.24 kg/boat/year (Fig. 14).

Specific CPUE for yellowfin tuna (*Thunnus albacares*) shows a stable trend from 2014 to 2019 with an average of 29.05 kg/boat/year ranging from 23.66 kg/boat/year to 35.43 kg/boat/year (Fig. 15). The total recorded fishing effort was 5,751 boats with an annual average effort of 822 boats. On the other hand, CPUE for albacore tuna (*Thunnus alalunga*) showed stable to increasing from 2015 to 2019, averaging at 14.32 kg/boat/year, with a range from 12.57 kg/boat/year to 16.29 kg/boat/year. Total recorded fishing effort was 4,568 boats with an annual average effort of 653 boats. CPUE for skipjack (*Katsuwonus pelamis*) showed a more erratic trend. Total recorded fishing effort was 905 boats with an annual average effort of 129 boats.

IV. DISCUSSION

In the Western Pacific, where the Philippines is situated, the stock status and management advise of October, 2019 for the migratory yellowfin tuna, albacore tuna and skipjack tuna as reported by the Western and Central Pacific Fisheries Commission (WCPFC) is not overfished and not showing signs of overfishing (https://www.wcpfc.int/current-stock-status-and-advice). In the Philippines, tuna production was at 142,341 tons and 388, 412 tons from municipal and commercial sectors, respectively in 2019 and remains to be one of the top fishes in terms of export (Philippine Statistics Authority, 2020).

Mindoro Strait

The discovery of Mindoro Strait as the "new tuna highway" is new; hence, the tuna fishery, at a scale similar to General Santos, is recent. This could explain why the CPUE trend for the yellowfin tuna in Mindoro Strait is generally stable, in addition to the latest information from WCPC that the stock of this highly migratory fish in the region is neither overfished nor is experiencing overfishing.

In March 2020, the National Fisheries and Aquatic Resources Management Council (NFARMC) has endorsed the Mindoro Strait Local Tuna Management Plan to be included in the National Tuna Management Plan of BFAR. Such plan needs to be put in place and implemented to ensure the sustainability of the tuna not only in Mindoro but in the entire Philippines as well.

Lagonoy Gulf

The top three dominant tuna species recorded in this study were yellowfin, followed by albacore and skipjack. Compared with a 1994 survey where the top tuna species recorded was skipjack followed by yellowfin and no albacore (Soliman et al., 1995), it is evident that the tuna composition in the Gulf has changed.

CPUE results show that the tunas (yellowfin, albacore and skipjack) in Lagonoy Gulf are generally stable. Tuna and tuna-like species usually occur in the Gulf throughout the year and shows abundance during the northeast monsoon or "Amihan" (Olaño et al., 2017). A management plan similar to Mindoro Strait needs to be pursued and implemented in the Gulf.

V. SUMMARY AND RECOMMENDATION

The CPUEs of tunas both in Mindoro Strait and Lagonoy Gulf appear to be stable over the 7-year period of the study. Using this as an indicator, the tuna fishing capacity appear to be sustainable as of this time. This is reflective of the overall status of the tuna stocks in the Western Pacific, where the population of these highly migratory species were assessed as stable and not experiencing overfishing.

However, due to the slight decreasing tendency of the CPUE values in recent years, it is recommended that the existing fishing capacity should not be increased. Instead, to ensure the sustainability of the tuna fisheries in the area, management interventions such establishment of continuous monitoring and evaluation programs of fisheries indicators needs to be hastened. Moreover, continuous implementation of the provisions of RA 8550 as amended by RA 10654 particularly on Illegal, Unreported and Unregulated (IUU) Fishing should be strengthened.

Of particular interest is the benefit that large pelagic species could get from spatial protection (Boerder et al., 2019) especially if their biology and ecology such as migration routes, aggregation behavior, philopatry or homing (if any), spawning grounds among others are known. MPAs, MPANs, fish sanctuaries, refugia or any other spatial protection can be designed around these critical habitats in the life cycle of migratory tunas. For example, Mindoro Strait has been identified by the South China Sea Fisheries Refugia Initiative as one of the known areas of critical significance to the life cycle of fishes specifically as spawning ground (https://fisheries-refugia.org/93-refugia-country-activities/philippines/background-philippines/161-known-areas-philippines). Hence future research on possible tuna spawning and feeding aggregations in Mindoro Strait and Lagonoy Gulf and there after protecting these areas would further ensure sustainability of the population of this commercially important fish species.

ACKNOWLEDGEMENT

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FIGURES

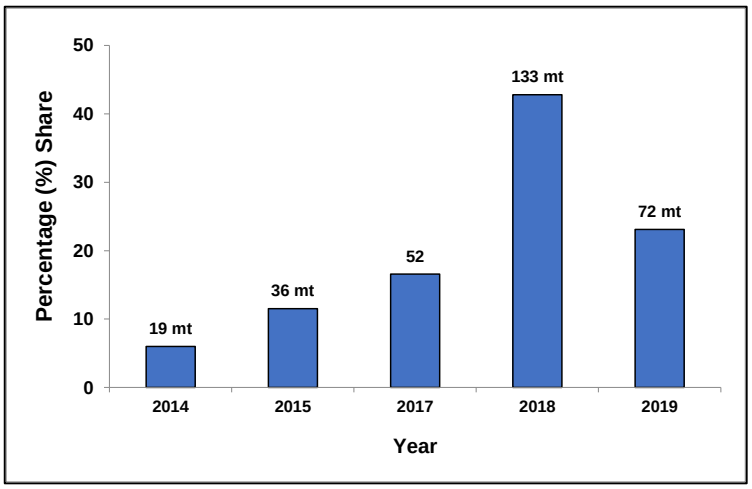

Figure 1. Estimated annual landed catch (in % of total) in Mindoro Strait, 2014-2015 and 2017-2019.

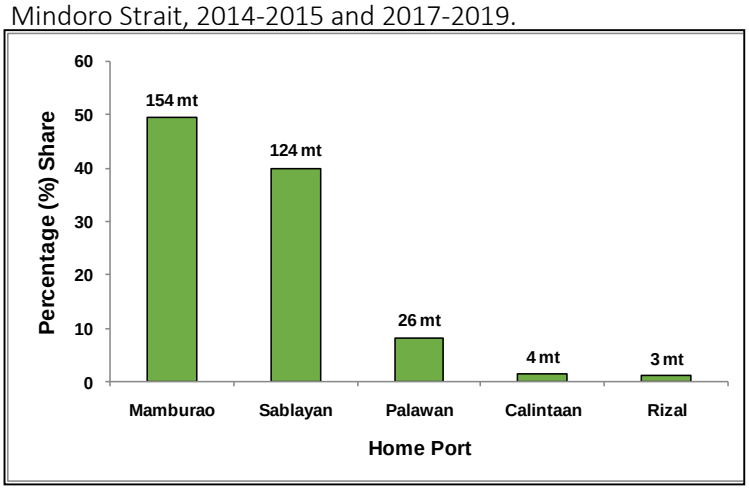

Figure 2. Actual landed catch by fish landing site/ municipality in Mindoro Strait, 2014-2015 and 2017-2019.

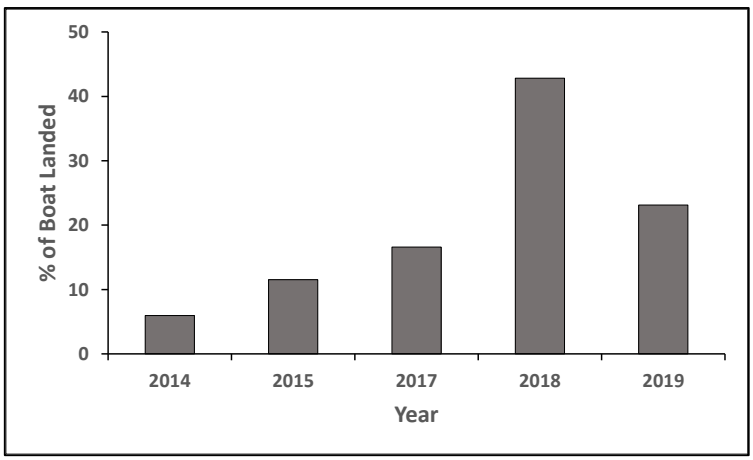

Figure 3. Percentage distribution of hook and line operation per year in Mindoro Strait on 2014-2015 and 2017-2019.

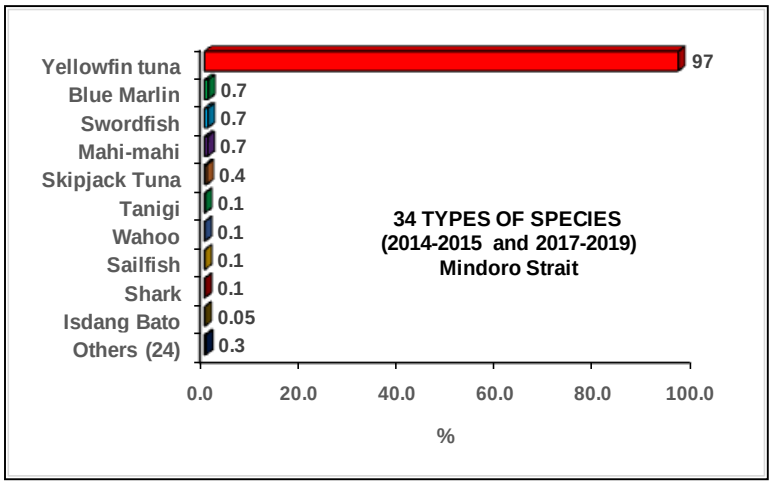

Figure 4. Relative abundance of major species in Mindoro Strait 2014-2015 and 2017-2019.

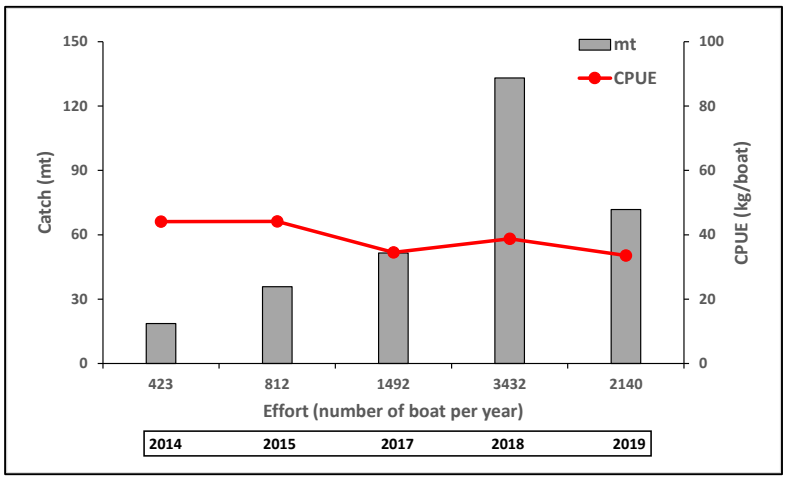

Figure 5. Catch per unit effort (CPUE) (kg/boat/year) of hook and line in Mindoro Strait, 2014-2015 and 2017-2019.

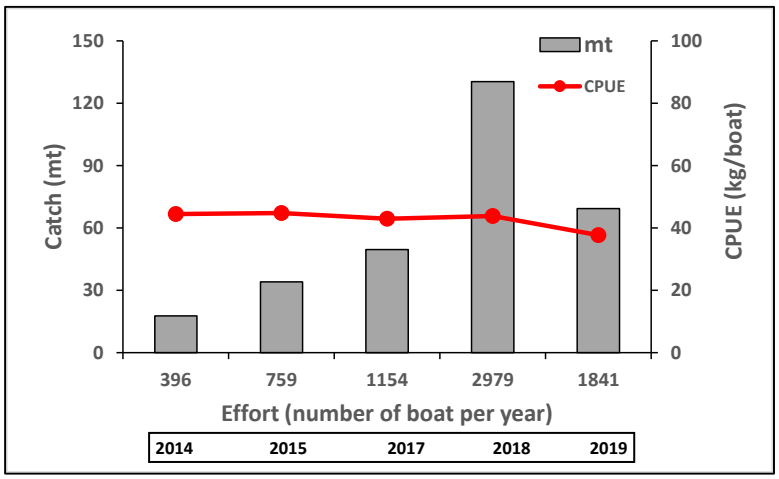

Figure 6. Catch per unit effort (CPUE) (kg/boat/year) of hook and line targeting yellowfin tuna in Mindoro Strait, 2014-2015 and

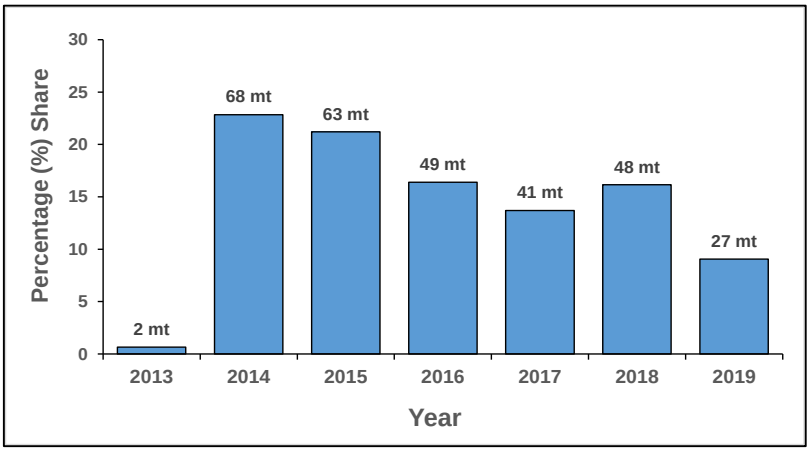

Figure 7. Estimated annual catch production (in % of total) in Lagonoy Gulf 2013-2019.

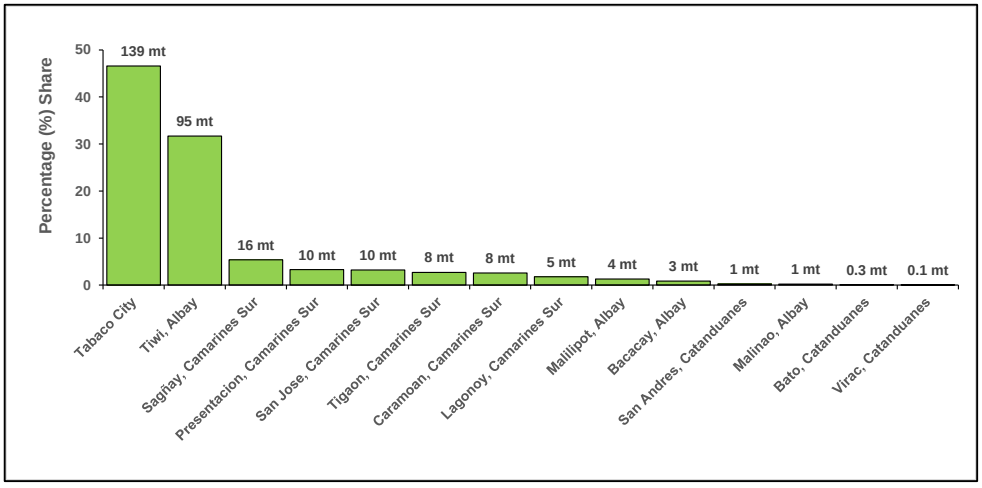

Figure 8. Actual landed catch by fish landing site/municipality in Lagonoy Gulf, 2013-2019.

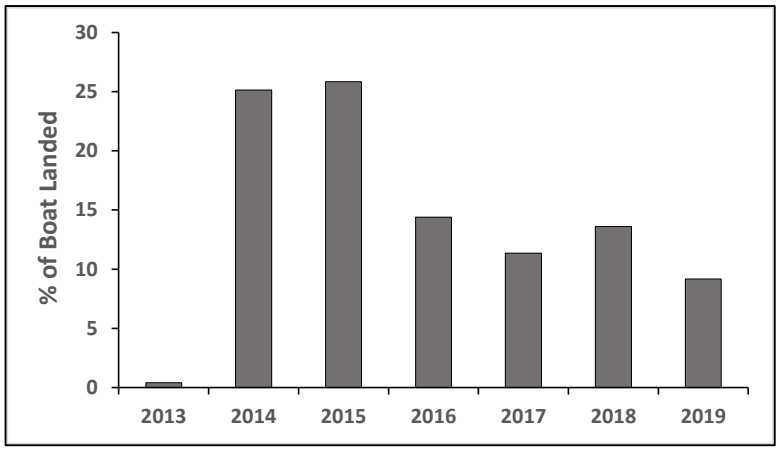

Figure 9. Percentage distribution of fishing boat operating in Lagonoy Gulf from 2013-2019.

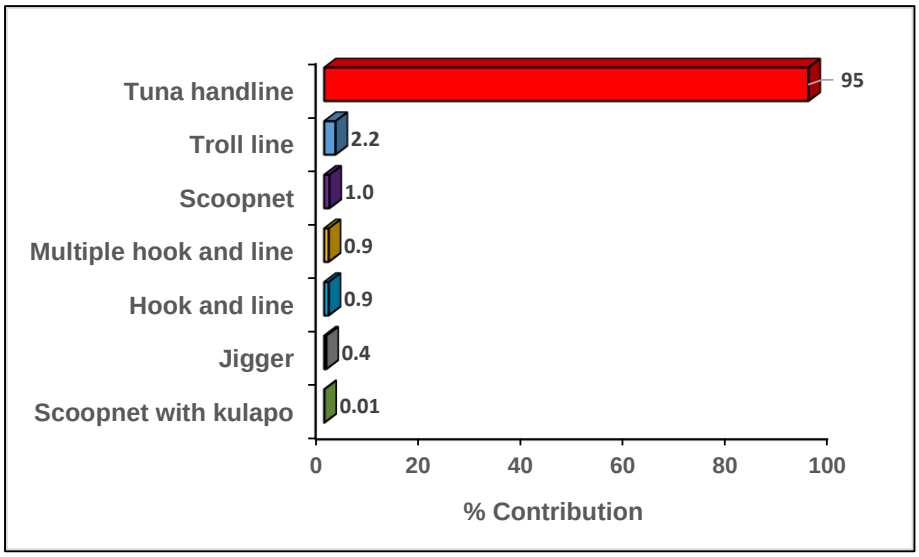

Figure 10. Percentage contribution of fishing gears in terms of catch in Lagonoy Gulf from 2013 to 2019.

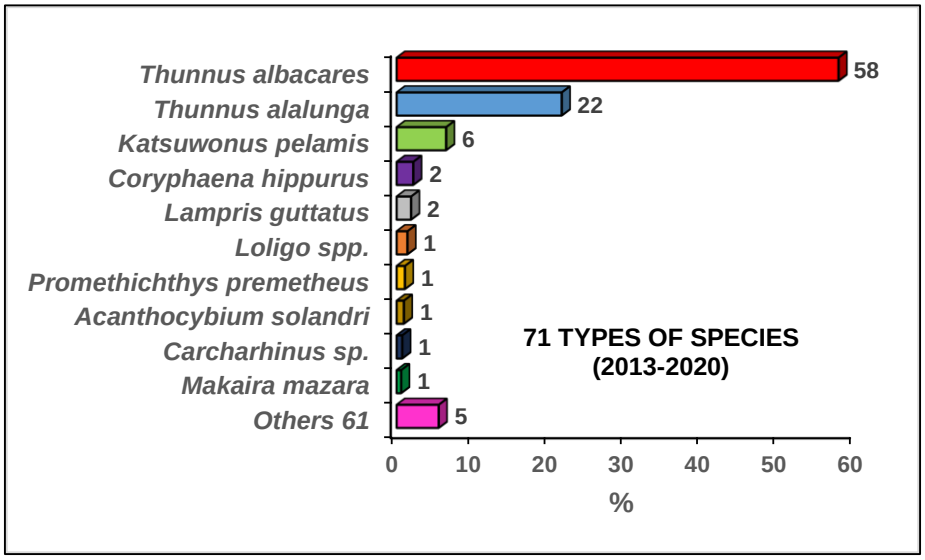

Figure 11. Relative abundance of major landed fish species in Lagonoy Gulf from 2013-2019.

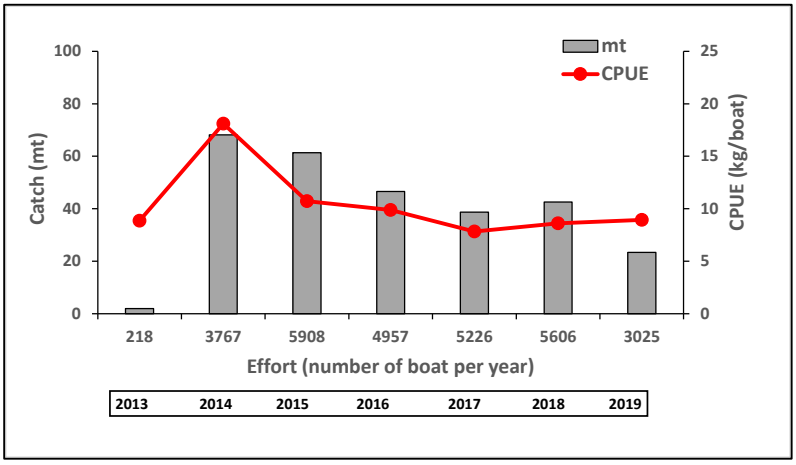

Figure 12. Catch per unit effort (CPUE) (kg/boat/year) of tuna handline in Lagonoy Gulf from 2013 to 2019.

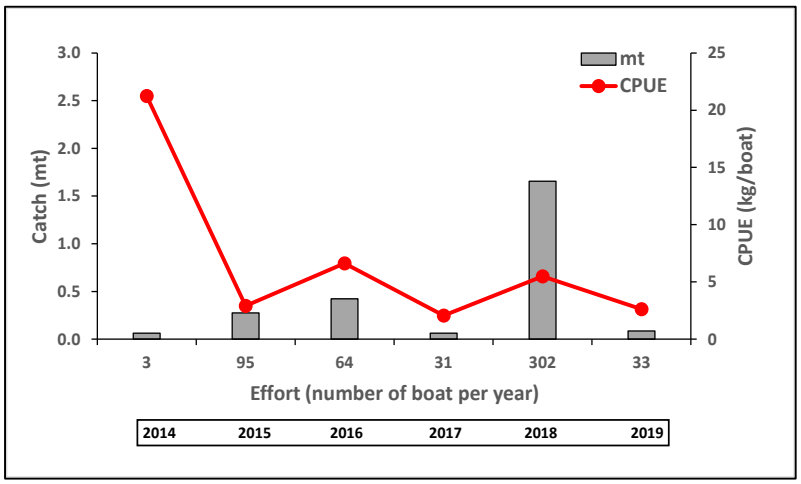

Figure 13. Catch per unit effort (CPUE) (kg/boat/year) of multiple hook and line in Lagonoy Gulf from 2014 to 2019.

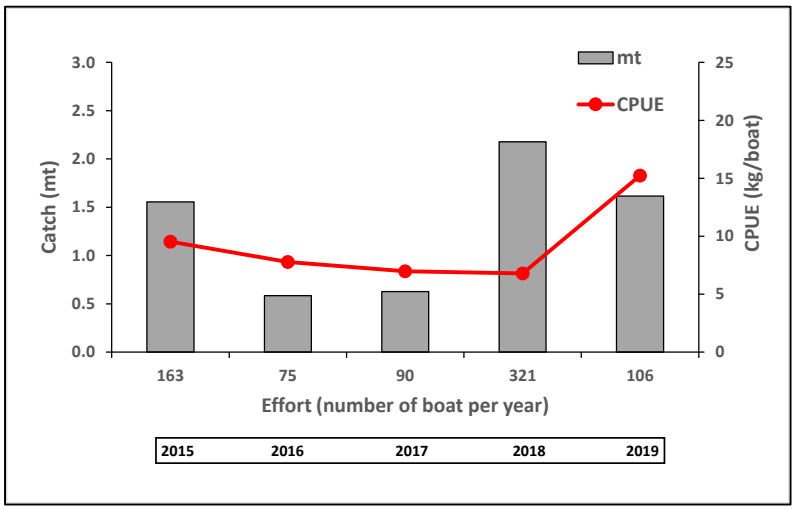

Figure 14. Catch per unit effort (CPUE) (kg/bopat/year) of troll line in Lagonoy Gulf from 2015 to 2019.

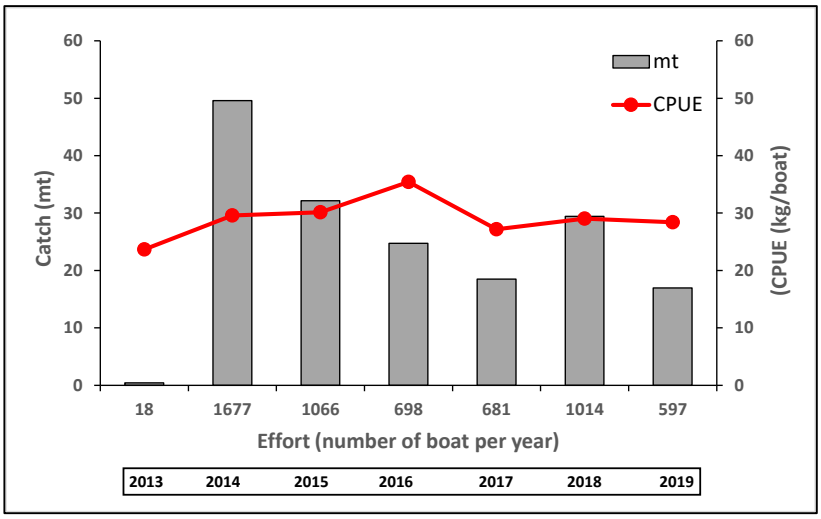

Figure 15. Catch per unit effort (CPUE) (kg/boat/year) of yellowfin tuna (*Thunnus albacares*) caught by tuna handline in Lagonoy Gulf from 2013 to 2019.

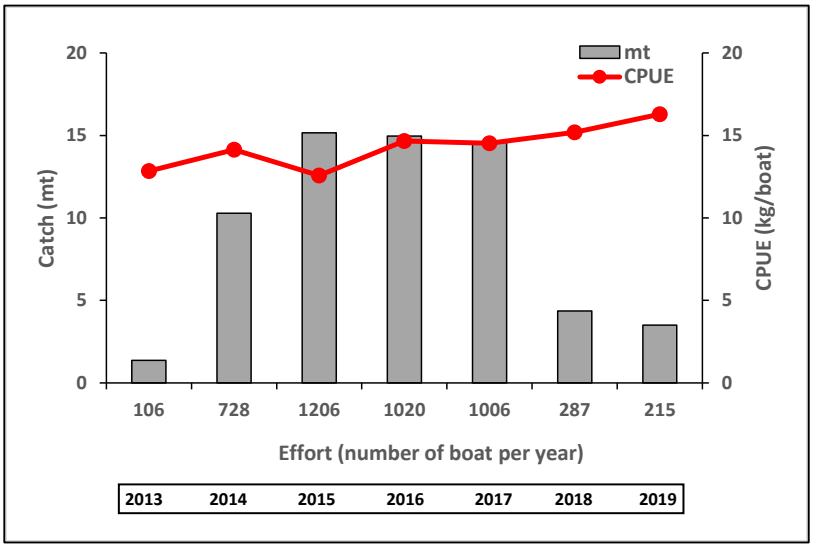

Figure 16. Catch per unit effort (CPUE) (kg/boat/year) of albacore tuna (*Thunnus alalunga*) caught by tuna handline in Lagonoy Gulf from 2013 to 2019.

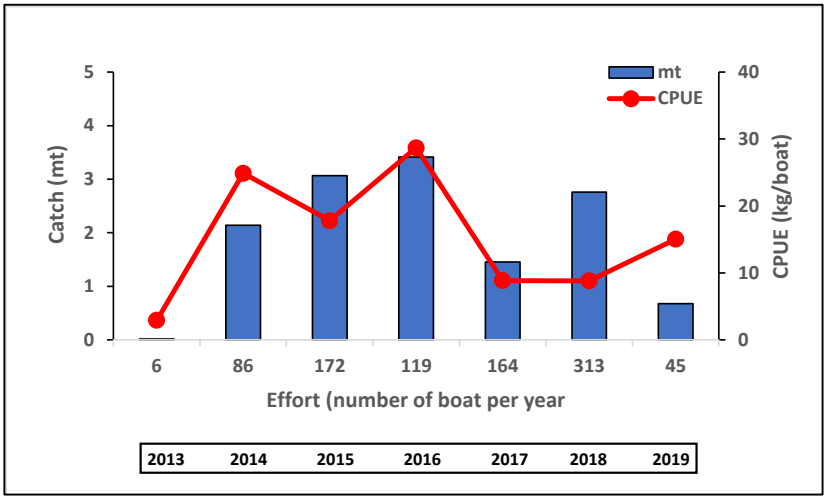

Figure 17. Catch per unit effort (CPUE) (kg/boat/year) of skipjack tuna (*Katsowunos pelamis*) caught by tuna handline in Lagonoy Gulf from 2013 to 2019.