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**Catch Rates and Relative Abundance of Species Caught by Philippine Purse Seine Fishing
Fleet in High Seas Pocket 1 (HSP1) and in Exclusive Economic Zone (EEZ)**

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Catch Rates and Relative Abundance of Species Caught by Philippine Purse Seine Fishing Fleet in High Seas Pocket 1 (HSP1) and in Exclusive Economic Zone (EEZ)

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ABSTRACT

This study examines the catch efficiency and species composition of Philippine-flagged purse seine vessels operating within the Philippine Exclusive Economic Zone (EEZ) and High Seas Pocket No. 1 (HSP1) from 2013 to 2023. Utilizing observer data, catch-per-unit-effort (CPUE) ratio between these two fishing zones were analyzed, focusing on the proportionate catch of tuna species. The average CPUE for vessels in the Philippine EEZ was 6.16 MT per set, compared to 9.98 MT per set in HSP1. In the Philippine EEZ, the catch was predominantly skipjack tuna (47%) and yellowfin (23%), followed by mackerel scad (23%) while in HSP1, it was similarly dominated by skipjack (65%) and yellowfin (26%), followed by bigeye tuna (5%). The findings support establishing fishing day limits for purse seine operations within the EEZ that are proportionate to the catch efficiency of larger and more efficient purse seine vessels operating in the convention area. This approach aims to ensure sustainable and equitable resource utilization, contributing to better fisheries management and conservation efforts within the Western and Central Pacific Fisheries Commission (WCPFC) convention area.

We invite SC20 to:

1. Note the differences in the catch efficiency and relative species composition of operation in High Seas Pocket No. 1 compared to Philippine EEZ.
2. Request the SPC to make a comparison of CPUE between Philippine EEZ and other EEZ in the convention area utilizing the submitted logsheet information in the TUFMAN2.
3. Request SPC to [conduct other similar scalar estimations to compare Philippine EEZ purse seine fishing days with purse seine fleets in other EEZ of the WCPFC Convention Area.](#)

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1. Introduction

The Western and Central Pacific Ocean (WCPO) is one of the world's most productive fishing regions, accounting for 80% of Pacific catch and 54% of global catch in 2022, primarily for tuna species. Within this region, the Philippine Exclusive Economic Zone (EEZ) and High Seas Pocket No. 1 (HSP1) are vital areas for the purse seine fishery targeting these valuable resources by Philippine-flagged fishing vessels. In 2023, HSP1 contributed 14% of the total Philippine production, with the remaining catch sourced from the EEZ, territorial seas, and archipelagic waters. Effective management of these fisheries is essential to ensure the sustainability of tuna stocks and the economic viability of the fishing industry.

Recognizing the importance of these fishing grounds for the Filipino fishing industry, the Philippine government must safeguard these resources for the benefit of its people. The Western and Central Pacific Fisheries Commission (WCPFC) Conservation and Management Measure (CMM) 2017-01 initiated a zone-based purse seine effort control requiring member states to notify the Commission of their EEZ purse seine limits. Initially, the Philippines submitted limits based on the number of vessels, which was unclear as the effort limit was required to be in terms of fishing vessel days. In 2019, following guidance at TCC15 and consultations with stakeholders, the Philippines set its purse seine limits at 42,000 fishing vessel days for its EEZ, reflecting the capacities and conditions of small purse seine vessels operating in the Philippine Pacific seaboard EEZ, including wooden-hulled ring net/purse seine vessels.

In 2021, during WCPFC18 discussions on developing a new tropical tuna measure, the Philippines was advised to recalibrate and separate the limits for its EEZ and adjacent high seas. Following stakeholder consultations, the Philippines submitted its purse seine limits in 2022, equivalent to 36,540 fishing days for the Philippine EEZ and 5,460 fishing days for the adjacent high seas. These limits are now part of Philippine national regulation under Fisheries Administrative Order (FAO) 269 Series of 2023 and 270 Series of 2023, respectively.

Consequently in 2023, during the development of the tropical tuna measure, the Secretariat of the Pacific Community established a scalar that adjusted the Philippine purse seine fleet's high seas days in HSP1 compared to other fleets fishing in the high seas over the past decade. The analysis indicated that the monthly CPUE for other purse seine fleets fishing on associated sets in the tropical high seas of the WCPFC was, on average, 5.6 times higher than the monthly CPUE for the Philippine fleet in HSP1 from 2012 to 2022.

A similar approach is intended to be applied to the purse seine fleet fishing in the Philippine EEZ, as the vessels operating in HSP1 are the same ones that originally operated in the EEZ before HSP1 opened in 2012 and vice versa. The only modification however is the net mesh size, which is larger in HSP1, as required by Fisheries Administrative Order 245, along with the target species in the Philippine EEZ, which include sardines, mackerels, scads (SMS), and other pelagic species.

This study aims to compare the catch efficiency and species composition of Philippine-flagged purse seine vessels operating within the Philippine EEZ and High Seas Pocket No. 1 (HSP1) using

Fisheries Observer data from 2013 to 2023. By analyzing the catch-per-unit-effort (CPUE) and species composition, the study seeks to provide insights into the fishing dynamics in these zones and support the development of management strategies within the Western and Central Pacific Fisheries Commission (WCPFC) convention area. These strategies would aim to balance species sustainability with the protection of traditional fishing grounds and the livelihoods of Filipino fishers.

2. Methods

2.1 Data Collection

Data for this study were collected from observer reports aboard Philippine-flagged purse seine vessels operating in the Philippine EEZ (areas facing the Pacific, specifically FMA 1 and FMA 2) and High Seas Pocket No. 1 from 2013 to 2023. Observers were trained to follow standardized protocols to ensure consistent data recording, including species identification, catch weight measurement, and vessel characteristics documentation.

To minimize selection bias, Observers were randomly assigned to vessels and their data were periodically reviewed for accuracy. Only data from associated sets were analyzed, as vessels in the Philippine EEZ are FAD-dependent. Both operations utilize traditional group seine methods with fresh and ice-chilled refrigeration.

Table 1. Key vessel characteristics in HSP1 and EEZ highlighting differences in net depth, length, and power that may influence CPUE

PARTICULARS	HIGH SEAS POCKET NO. 1	PHILIPPINE EEZ
Unique Vessel Count	60*	77
Average net Depth (fathoms)	132 (92-201)	112 (84-130)
Average of Net Length (fathoms)	451 (300-855)	395 (111-560)
Average power (HP)	492 (142-1300)	407 (104-750)
Average Gross Tonnage	138 (23-218)	146 (45-339)
Average Length Overall (meters)	29 (18-38)	31 (19-44)
Average Main body mesh size (cm)	7.5 (7.4-15.2)	5.5 (2.2-15.2)

*Includes replacement vessels

2.2 Catch-Per-Unit-Effort (CPUE) Calculation

Nominal CPUE was calculated as the total catch (in metric tons) per fishing set for each vessel with Fisheries Observer coverage. The formula used was:

$$CPUE = \text{Total Catch (MT)} / \text{Total fishing set}$$

The data were aggregated annually due to incomplete monthly datasets for Philippine EEZ. For HSP1, the number of days spent by these vessels was also measured through the Vessel Monitoring System tracking each vessel's entry and exit from the area.

2.3 Species Composition Analysis

The species composition of the catch was analyzed to determine the proportion of key tuna species, including skipjack, yellowfin, and bigeye tuna, as well as other significant species such as mackerel scad, which constitutes a substantial portion of the catch in the Philippine EEZ compared with species caught in HSP1.

3. Results

3.1 Catch-Per-Unit-Effort (CPUE)

The average CPUE for vessels operating in the Philippine EEZ for 2013-2023 was 6.16 MT per set, whereas, in HSP1 in the same period the average CPUE was 9.98 MT per set (Figure 1). This indicates higher catch efficiency in HSP1 compared to the Philippine EEZ. Figure 2 suggests that HSP1 CPUE is equivalent to 1.6 times more of that of CPUE in the Philippine EEZ.

The average number of sets conducted by these vessels was around 10 per month. However, in HSP1, it was observed that with the capability of some vessels to conduct free school sets, the average ratio of days spent (HSP1 days) to sets conducted has decreased from 3:1 in earlier years to 2:1 in recent years (Figure 3). The additional days are spent allowing anchored FADs to aggregate tuna or awaiting for the availability of fish carriers to transport the catch.

3.2 Species Composition

In the Philippine EEZ, the catch was predominantly composed of skipjack tuna (46%), yellowfin tuna (22%), and mackerel scad (23%). In contrast, HSP1 catches were dominated by skipjack tuna (63%) and yellowfin tuna (27%), with a smaller proportion of bigeye tuna (4%) (Figure 4).

A significant portion of the purse seine catch on anchored FADs in the Philippine EEZ consists of mackerel scads, which have shown an increase in the catch composition over the past five years. Conversely, the catch composition in HSP1 remains below 10% for mackerel scads along with other non-tuna species.

4. Discussion

The study reveals a higher CPUE in HSP1 compared to the Philippine EEZ, suggesting that HSP1 is either more productive or subject to less fishing pressure. Factors such as oceanographic conditions, prey availability, and fishing pressure likely contribute to these differences. The

dominance of skipjack and yellowfin tuna in both areas indicates their prevalence in the region, while the presence of bigeye tuna in HSP1 underscores its significance for high-value species.

The results of this study are consistent with the findings from previous research by Bigelow et al. (2019) and Bigelow et al. (2020). Specifically, their studies reported skipjack tuna CPUE at 4.371 metric tons per day and yellowfin tuna CPUE at 0.91 metric tons per day for the purse seine fleet based in General Santos City. Additionally, the observed species composition in Region 12 from 2005 to 2016 was predominantly skipjack tuna (59.0%), followed by yellowfin tuna (16.7%), mackerel scad (8.9%), and other species. These proportions are slightly lower than those reported by Pechon et al. (2022) for purse seine catch observer data from 2013 to 2017, which indicated a catch composition of 63.22% skipjack tuna, 18.83% yellowfin tuna, 8.25% neritic tunas, and 9.70% other species.

With the introduction of purse seine fishing day limits in the Exclusive Economic Zone (EEZ), it is important to consider that vessels operating in these areas may have similar attributes but differing catch efficiencies and target species. These differences can affect fishing pressure on tuna stocks and align with the Western and Central Pacific Fisheries Commission's (WCPFC) goals for sustainable resource use. Consequently, these limits should be designed to accommodate the unique characteristics of each zone, ensuring both equitable and sustainable fisheries management.

5. Conclusion

This study highlights significant differences in catch efficiency and species composition between the Philippine EEZ and HSP1. The findings reinforce the need for aligned management strategies that consider the unique characteristics of each fishing zone. Implementing fishing day limits proportional to catch efficiency can contribute to more sustainable fisheries management within the WCPFC convention area. However, limitations such as observer data biases and incomplete temporal coverage must be acknowledged. Future research should explore the impacts of environmental changes on species distribution and assess the socio-economic outcomes of proposed management strategies.

The analysis reveals a ratio of 1.6 between the catch-per-unit-effort (CPUE) in HSP1 and the Philippine EEZ, which can be utilized by the Philippines to substantiate the HSP1 fleet's CPUE ratio of 5.6. This ratio is crucial for determining the adjusted purse seine EEZ limit that the Philippines has submitted to the Commission. However, it is important to highlight that this ratio is based on comparisons with other high seas purse seine fleets.

Given this context, it is recommended to perform additional comparisons with other EEZ fleets to ensure the robustness of the findings. Furthermore, incorporating other data sources, such as purse seine logbooks submitted to TUFMAN2, could provide a more comprehensive understanding and validate the results. This approach would enhance the accuracy and reliability of the adjusted EEZ limits and ensure that they are based on a well-rounded analysis of available data.

6. References

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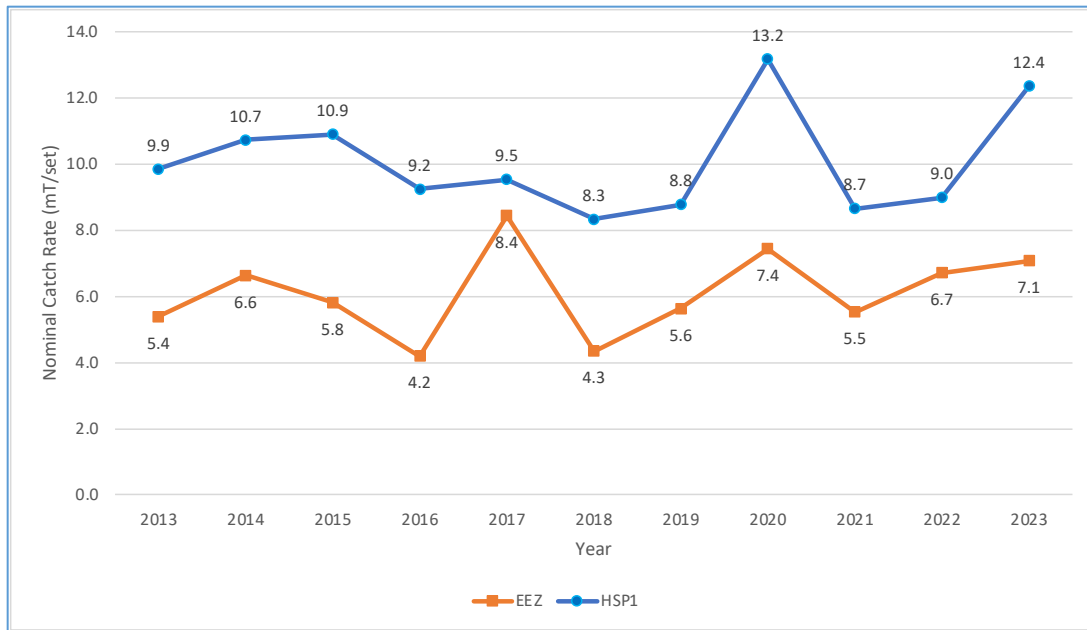


Figure 1 . Annual CPUE Comparison for high seas pocket no. 1 and Philippine EEZ for 2013-2023

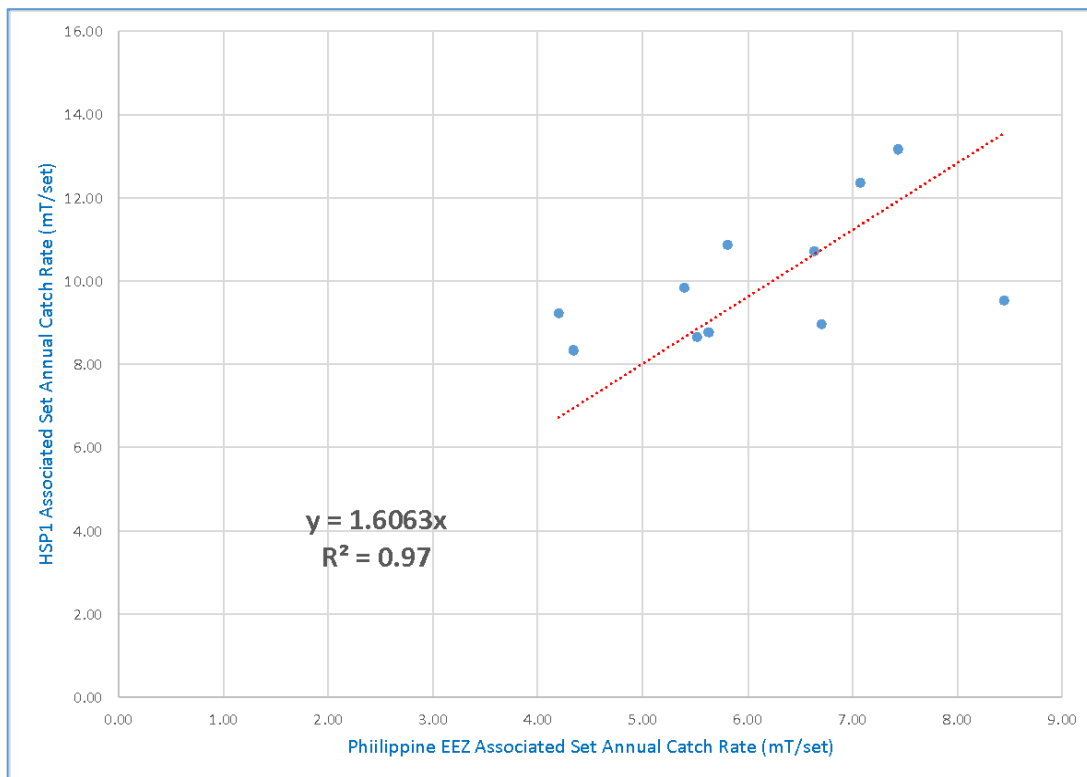


Figure 2. Relationship between the CPUE (catch/set) in HSP1 (Y-axis) and Philippine EEZ (X-axis) from 2013-2023 fisheries observer data

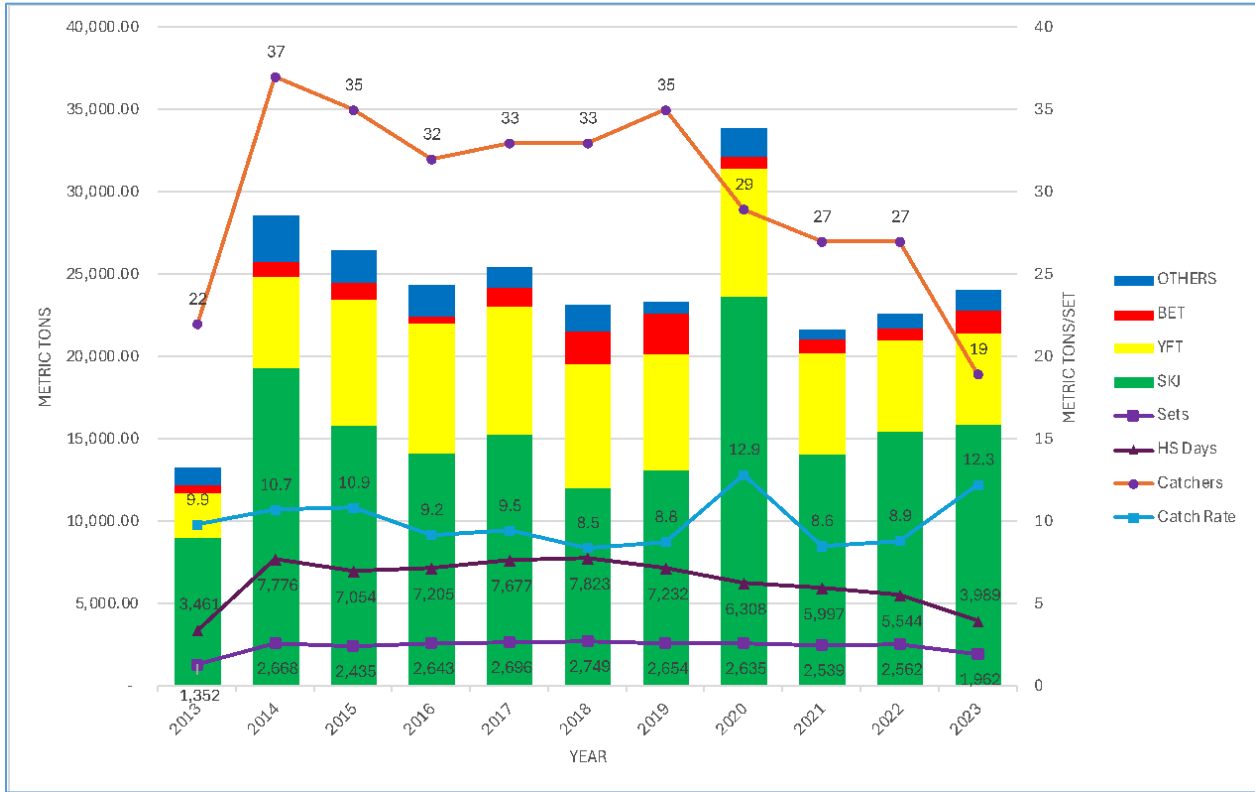


Figure 3. Annual HSP1 Catch and Effort from 2013-2023 including total sets conducted and high seas days

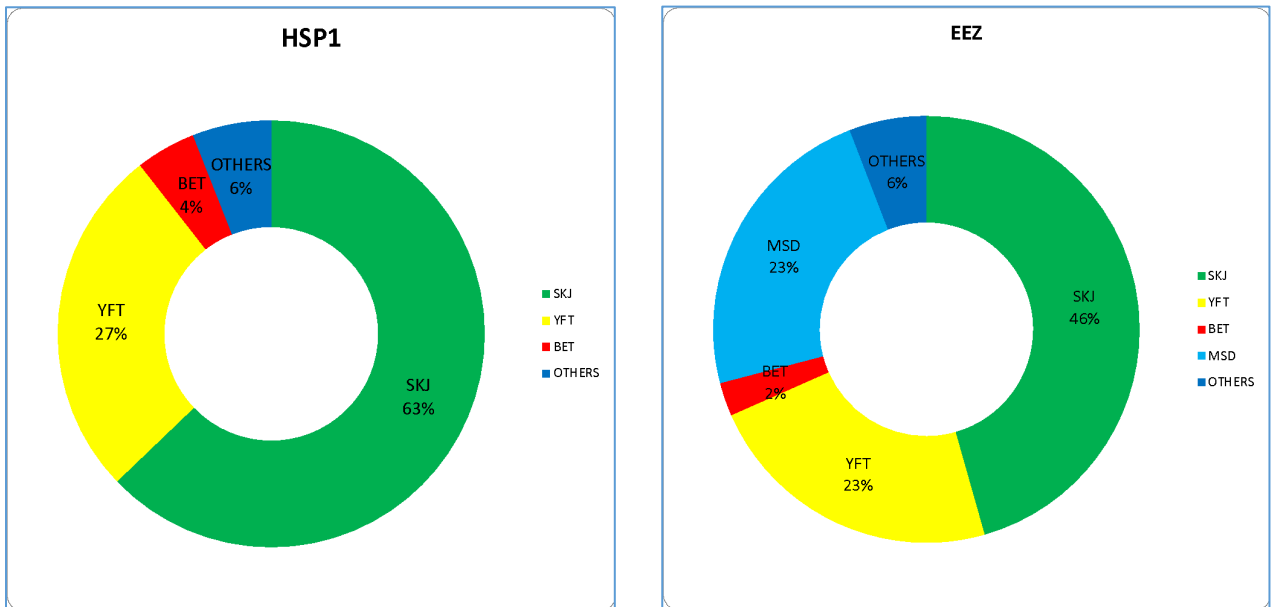


Figure 4. Average Catch Composition Comparison for HSP1 (left) and EEZ (right) from 2013-2023

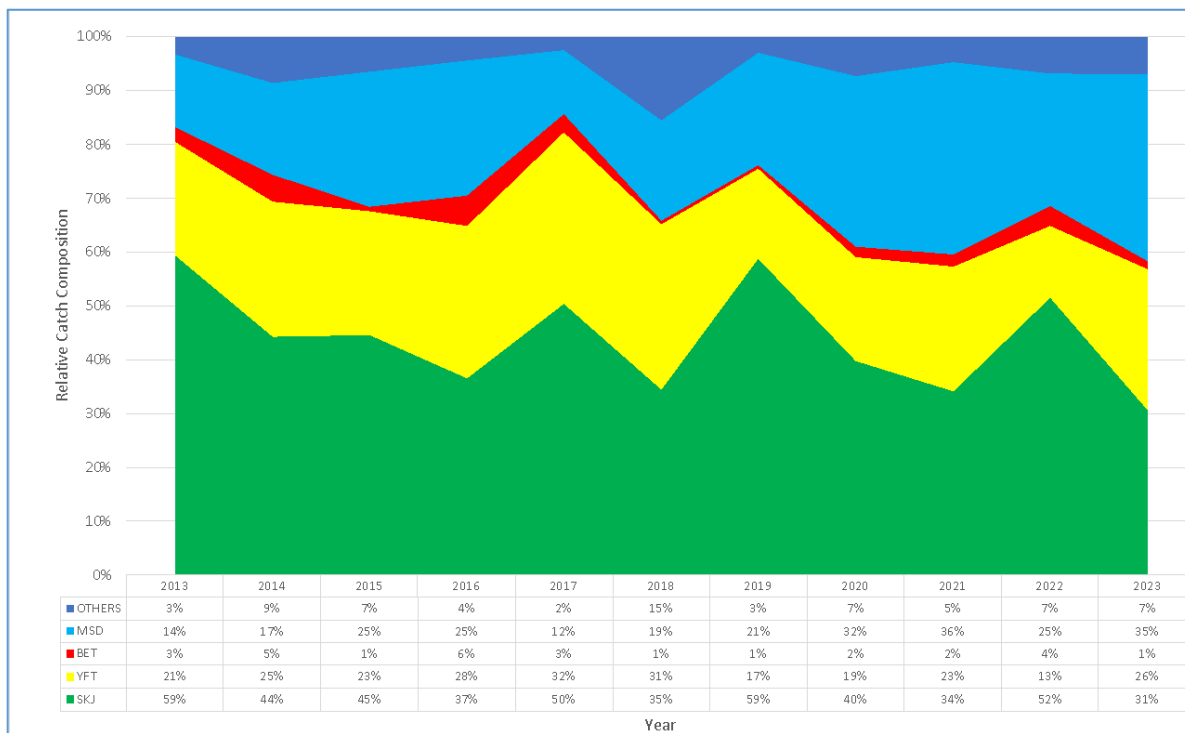
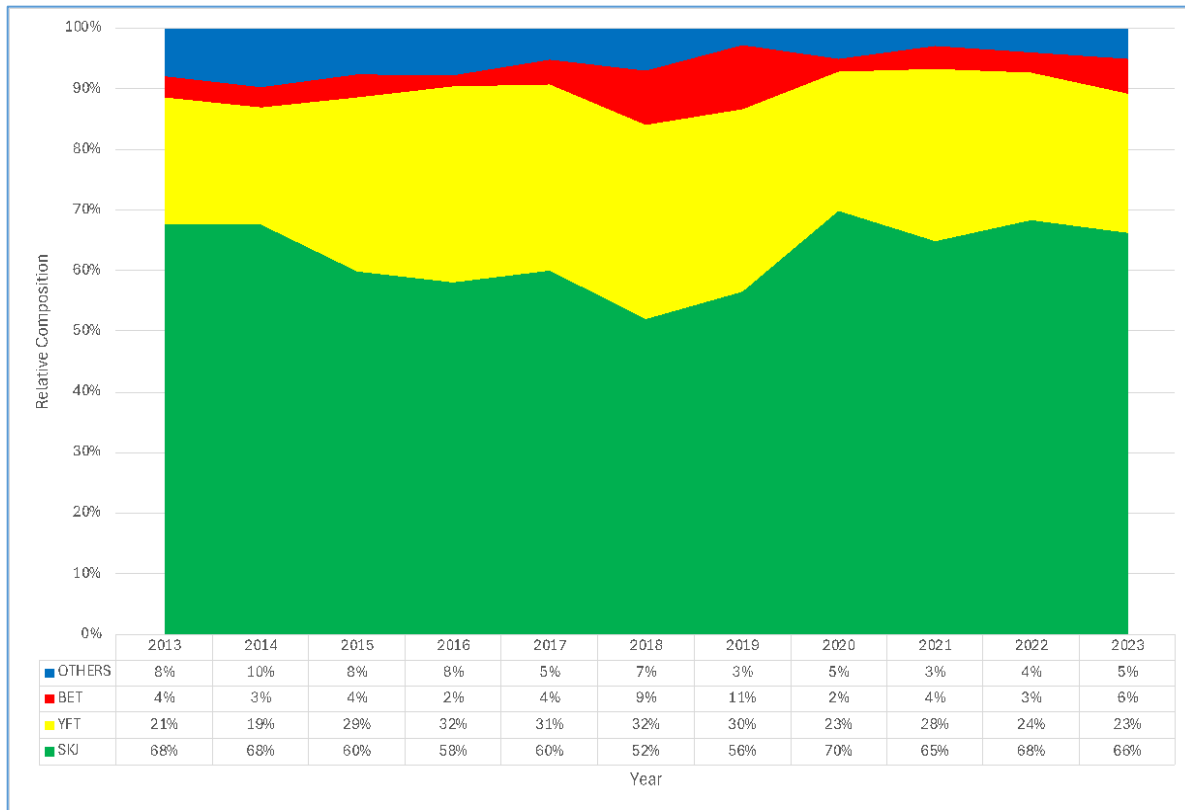


Figure 5. Fisheries Observer Record of Catch Composition from 2013-2023 in High Seas Pocket No. 1 (top) Philippine EEZ facing the Pacific (bottom).