



Republic of the Philippines
Department of Agriculture
BUREAU OF FISHERIES AND AQUATIC RESOURCES



TUNA HANDLINE FISHING OPERATION

Preliminary Results on Impact Assessment of Tuna Handline Fishing Utilizing FADs on Bycatch and Endangered, Threatened, and Protected (ETP) Species in Fisheries Management Areas (FMA) 2 and 3.

2 ZERO HUNGER



12 RESPONSIBLE CONSUMPTION AND PRODUCTION



14 LIFE BELOW WATER



17 PARTNERSHIPS FOR THE GOALS





OUTLINE

- 1 BACKGROUND
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- 3 TUNA HANDLINE PROJECT
- 4 RESULTS
- 5 WAYS FORWARD
- 6 GOOD PRACTICES
- 7 KEY FINDINGS



Republic of the Philippines
Department of Agriculture
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Background

2009

Established and implemented
by BFAR MFD MMVOC



Western & Central Pacific
Fisheries Commission

Authorized by the WCPFC



Contributes independent, reliable catch data,
bycatch, and regulatory compliance to support
sustainable fisheries management.





LEGAL MANDATES

UNCLOS

United Nations Convention on the Law of the Sea



United Nations



THE LAW OF THE SEA

- Article 61. Conservation of living resources
- Article 62. Utilization of the living resources
- Article 119. Conservation of the living resources of the high seas

CCRF & IPOA IUUF



Food and Agriculture
Organization of the
United Nations

Code of Conduct for Responsible Fisheries (CCRF)

- CCRF Article 7. Fisheries Management (7.7.3)

7.7.3 Should implement effective fisheries monitoring, control, surveillance and law enforcement measure including where appropriate, **observer programs, inspection schemes and vessel monitoring systems.**

International Plan of Action to Prevent, Deter, and Eliminate Illegal, Unreported and Unregulated Fishing (IPOA-IUUF)

The objective of the IPOA is to prevent, deter and eliminate IUU fishing by providing all States with comprehensive, effective and transparent measure by which to act, including through appropriate regional fisheries management organizations established in accordance with the international law

WCPFC

Western and Central Pacific Fisheries
Commission



Western and
Central Pacific
Fisheries
Commission

- CMM 2018-05 Conservation Management Measure for the Regional Observer Program



RA 10654

Section 116. Noncompliance with Fisheries Observer Coverage.

(a) It shall be unlawful for Philippine distant water fishing vessel to sail without a fisheries observer on board as required by RFMO conservation and management measures.

"SEC. 65. Functions of the Bureau of Fisheries and Aquatic Resources. – As a line bureau, the BFAR shall have the following functions:

(s) train, designate and deploy fisheries observers in Philippine flagged fishing vessels engaged in commercial fishing in Philippine waters or distant water fishing to ensure compliance with conservation and management measures adopted by RFMOs and by the Department;



FAO 240 series of 2012
FAO 245-4 series of 2018
FAO 236-5 series of 2018
FAO 261 series of 2018



TUNA HANDLINE PROJECT

Background

To conduct a preliminary impact assessment of Fish Aggregating Devices (FADs) on bycatch, endangered, threatened, and protected species (ETP) within Tuna Handline Fishery Operations in Fisheries Management Areas (FMAs) 2 and 3

The project aims to strengthen fisheries observer data collection to support the implementation of Fisheries Administrative Order 261 series of 2018



SOCKSARGEN FEDERATION OF FISHING & ALLIED INDUSTRIES, INC.

September 30, 2023

Atty. Demosthenes Eacott
National Director
Bureau of Fisheries and Aquatic Resources

THRU: Mr. Isidro Velazco, Jr.
Assistant Director
Mr. Zaldy Perico
Assistant Director
Mr. Marko De-mora
MEMS

Dear Director Eacott,

Magandang Gensai!

The Fresh Frozen Seafood Association of the Philippines, Inc. initiated the conduct of an environmental assessment in the early part of 2021 in their attempt to seek third-party eco-label certification for yellowfin and bigeye fisheries of Sargen Fish Port Tuna Handline Fishery Association (SARGEN HANDLINE) operating in FMA 2 and FMA 3. The assessment resulted to some failing marks which the fisheries and its stakeholders need to act upon to address the gaps. Under Principle 2- minimizing environmental impacts, surprisingly while the fishery is highly selective in nature, the unavailability of verifiable information led to failing marks for the fishery. There is no way to obtain information on whether the fishery interacts with ETP species and how the fishery interacts with its habitat. Thus, complying with performance indicators of Principle 2 poses a serious challenge. The fishery needs to work on to provide enough information that can be verified.

Information derived from observer programs, electronic monitoring of locations/positions such as that from vessel monitoring system, technologies to monitor impact or compliance (e.g. cameras), and information from independent research projects or programs are considered to have higher level of verifiability or lower bias compared to information derived from logbooks, interviews from fishers and information obtained from co-management and community-based management.

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Website: www.ffaai.com



SOCKSARGEN FEDERATION OF FISHING & ALLIED INDUSTRIES, INC.

A study on the use of fish aggregating devices (FADs) in the fishery is needed to be conducted to assess the impact to habitat and ecosystem as a whole. When necessary, result of the study will be used to amend the FAD Policy of the country and corresponding association FAD policy will be adopted.

There is no information on the design of the FADs, or the habitats the fishery encounter, thus the impact of the operation on the vulnerable marine ecosystem (VME) habitat cannot be determined. Studies need to be conducted on the impact of FADs on habitat.

In this regard, as part of the FFSAP-SARGEN HANDLINE Fisheries Improvement Project, a collaboration of BFAR, Fresh Frozen Seafood Association of the Philippines (fryer group) and SFFAI, we would like to request the conduct of the use of FADs by the handline fishery particularly operating in the FMA 2 and FMA 3 using observer data and logsheet information.

We truly appreciate the support of the agency in this endeavor to promote improvement in the tuna fishery. For any queries, you can reach us at your most convenient time.

Hoping for your favorable consideration.

Thank you very much.

Respectfully yours,

Rosalinda Bernadette S. Contreras
Executive Director

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2023

2024

How did we implement?

The Philippines Fisheries Observer Program (PFOP) implemented the tuna handline project through several key activities.

The project was launched on **September 30, 2023**, at the request of the Fresh Frozen Seafood Association of the Philippines, Inc., with support from the SOCKSARGEN Federation of Fishing & Allied Industries Inc. (SFFAI).

Virtual Consultation and Collaboration of the PFOP with Sargen Fish Port Tuna Handline Fishing Association (SARGEN HANDLINE) on **January 2024**.

Pre-orientation of fisheries observers for the implementation of the study on **April 2024**.

The Memorandum of Agreement (MOA) was formally executed on **May 16, 2024**, signifying the parties' mutual commitment to the agreed terms and their shared pursuit of strategic collaboration.

Project Proposal and Consultation with the National Fisheries Research Development Institute (NFRDI) on **May 29, 2024**

Meeting to review and revise the implementing rules and regulation (IRR) of Handline Fishing Law, Pursuant to S.O. No. 1 s. 2024 on **July 2024**.

Hiring progressively to achieve full coverage as mandated by **Fisheries Administrative Order (FAO) 261 s. 2018 - Rules and Regulations on Fisheries Observer Program (FOP) in the Philippines and distant water fishing targeting straddling and highly migratory fish stocks**

This effort is intended to partially implement FAO No. 261, develop policy recommendations for sustainable management of target, bycatch, and ETP species, and validate existing fisheries administrative orders



TUNA HANDLINE PROJECT

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Objectives



- To provide baseline information on the bycatch rate of ETP

H'

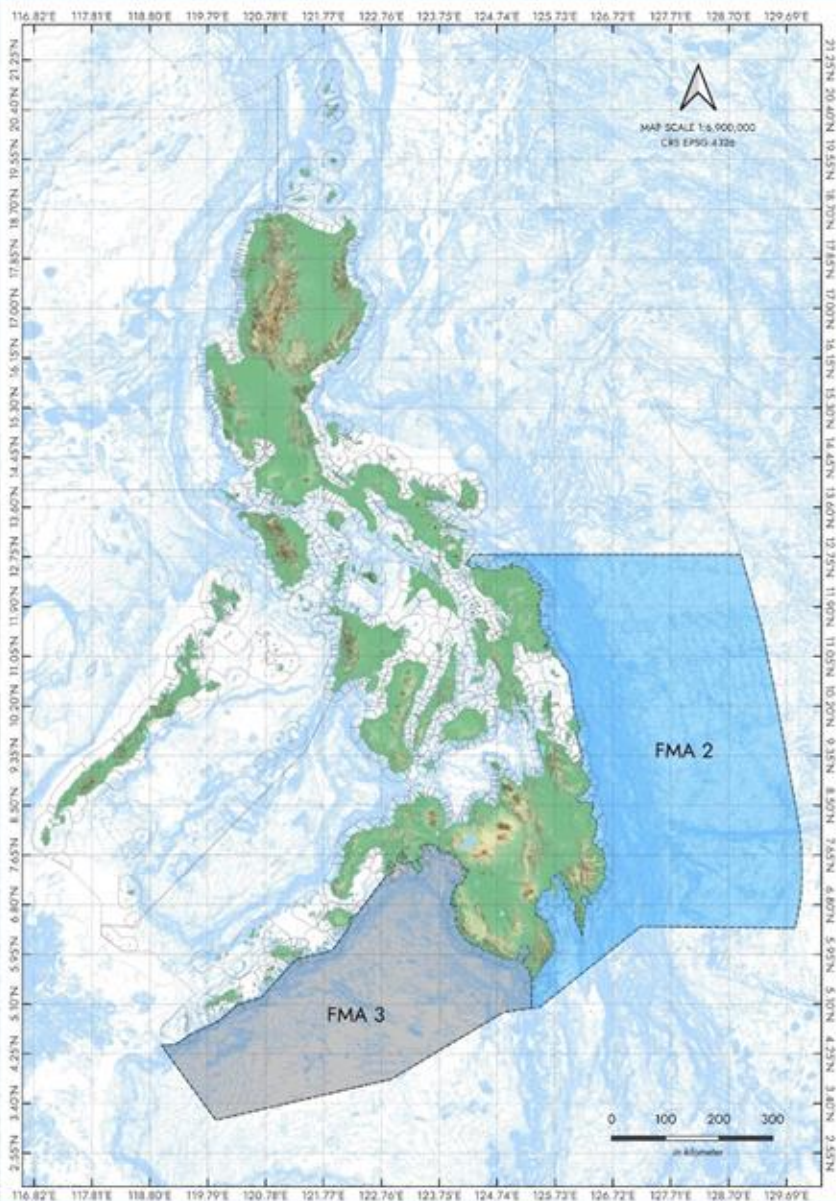
- To evaluate the richness and evenness of both target and non-target species in the catch.



- Identify the impacts of Tuna handline fishing operation utilizing Fish Aggregating Devices (FAD) and risk associated with endangered, threatened, and protected (ETP).

$$HR = \frac{B}{N} \times 100$$

- To standardize and define the appropriate unit of bycatch and fishing effort for tuna handline fishing utilizing FADs within the period of one (1) year; and



Sampling site

- **Study Area:** The assessment focuses on Fisheries Management Areas (FMAs) 2 and 3 under DA-BFAR FAO 263, delineated based on biophysical and oceanographic characteristics to support the Ecosystem Approach to Fisheries Management (EAFM).
- **Fisheries Importance:** These areas, located in the southern Philippine archipelago, are key pelagic fishing grounds supporting tuna handline fisheries associated with anchored Fish Aggregating Devices (aFADs).
- **Biodiversity Context:** FMAs 2 and 3 lie within the Coral Triangle, a globally significant biodiversity hotspot supporting migratory pelagic species regulated by the WCPFC.
- **ETP Interactions:** Productive oceanographic features attract ETP species such as pelagic thresher sharks, marine turtles, and spinner dolphins, which may interact with fishing operations.
- **Bycatch Risk:** The use of aFADs may increase incidental interactions with non-target species, particularly long-lived and low-fecundity ETP taxa vulnerable to fishing pressure.

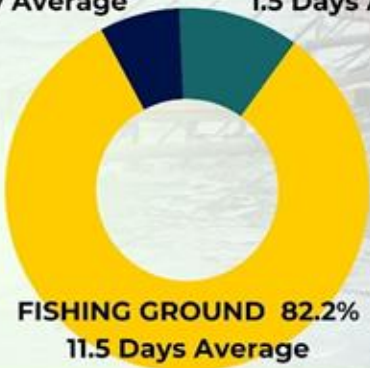
VESSELS COVERED

June 2024 – Dec. 2025

	Min-Max Gross Tons	Min-Max Length overall (LOA) Meters	Min-Max No. of Utility Boats	Crew size	No. of Trips
 (25) Outrigger boats	4.39 – 48.40	12.9–26.00	3–24	5–27	69
 (11) Launch type boats	5.71–100.62	13.7–31.0	8–19	12–24	38

IN PORT 7.1%
 1 Day Average

TRANSITING 10.7%
 1.5 Days Average



TOTAL = 107 Trips

Fishing Operation

- The maximum recorded days in a fishing trip was 26 days
- The least number of days recorded in a fishing trip was 7, attributable to the fish well reaching full capacity.
- Fishing operations are contingent on the availability of ice; once the ice has melted, the vessel is compelled to transport the catch to port.

VESSEL ACTIVITIES

1



**Embarkation of
Observer**

2



**Transiting to
port of call**

3



**Loading rocks,
Ice, water and
other provisions**

4



**Transiting to
Fishing Ground**

5



**Maintenance of
"Pakura" and
Fishing Gears**

6



Tied to FAD

7



Bait fishing

8



**Deployment of
Pakura**

9



**Catch transfer or
tendering**

10



Hauling

11



**Sampling
(Morphometrics)**

12



**Post-capture
processing and
Stowing**



What data do we collect on SSI/ETP species?



Silky Shark (*Carcharhinus falciformis*)



- Species Identification
- Type of Interaction (Hooked, Interacted, and sightings)
- Coordinates, Time, and Date
- Adult or Juvenile
- Length, weight, and sex if landed on board
- Release method (Dehooked or Leader/line cutting)
- Condition of the species when caught and when released
- Species Description

Traditional Fishing Method

"Shabu-shabu"



Squid ink bag

- Used to simulate squids predator escape mechanism, and it also serves as chemical attractant



Latak Method

- An efficient traditional fishing technique that utilizes ink-filled plastic, baitfish or squid, and a rock.

Tuna Handline Fishing Strategies

(1) Mother Boat Set

- The Captain, Cook, and labor/icer employ the latak fishing method, primarily using live bait, though dead bait may also be used.



(2) Pakura Set

- Crew members (Auxiliary/utility boat operators) predominantly uses dead bait (Mackerel Scad, Squid, etc.)



(3) Latak Set on dolphin pod sightings (free school)

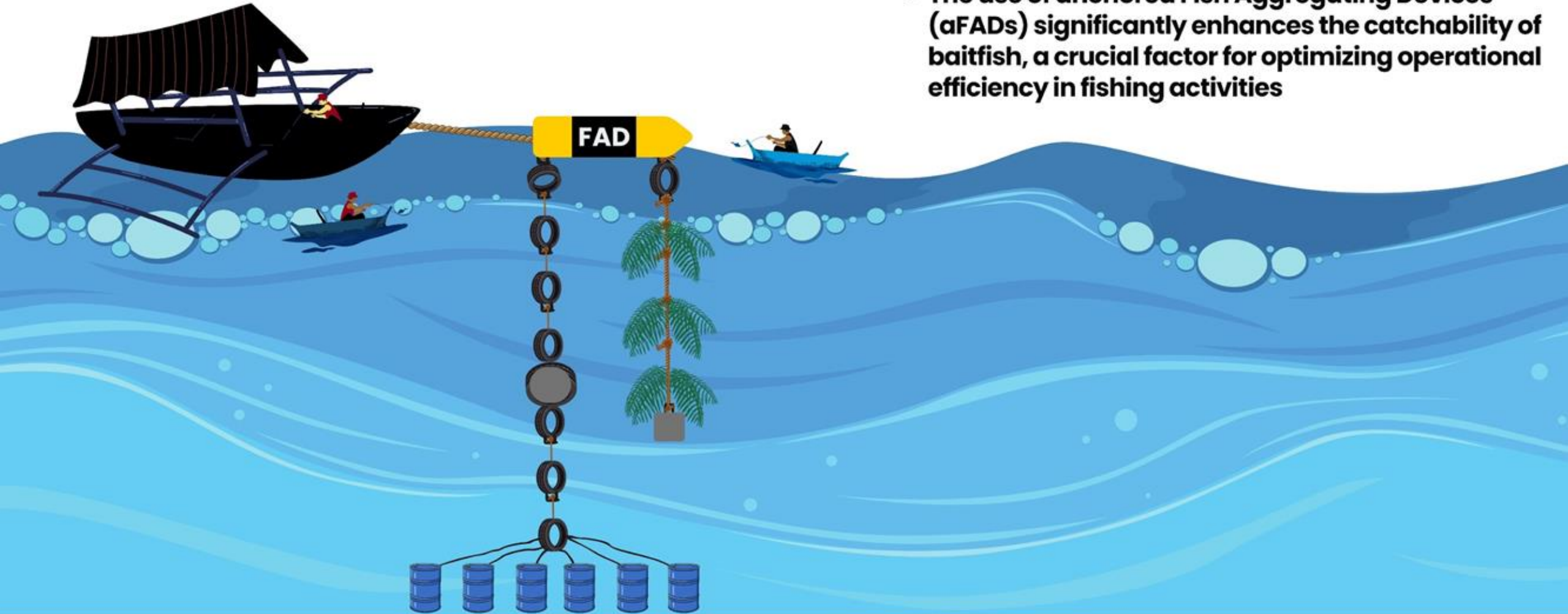
- When a crew spots a dolphin pod, they position themselves ahead and deploy their gear, knowing that large tunas follow the pod during their hunt.



Tuna Handline Fishing Strategies

Tuna handline operations are predominantly dependent on anchored FADs

- The use of anchored Fish Aggregating Devices (aFADs) significantly enhances the catchability of baitfish, a crucial factor for optimizing operational efficiency in fishing activities



RESULTS SUMMARY JUNE 2024 – DECEMBER 2025

1



TRIPS MONITORED

107

2



HOOKS DEPLOYED

18,658

3

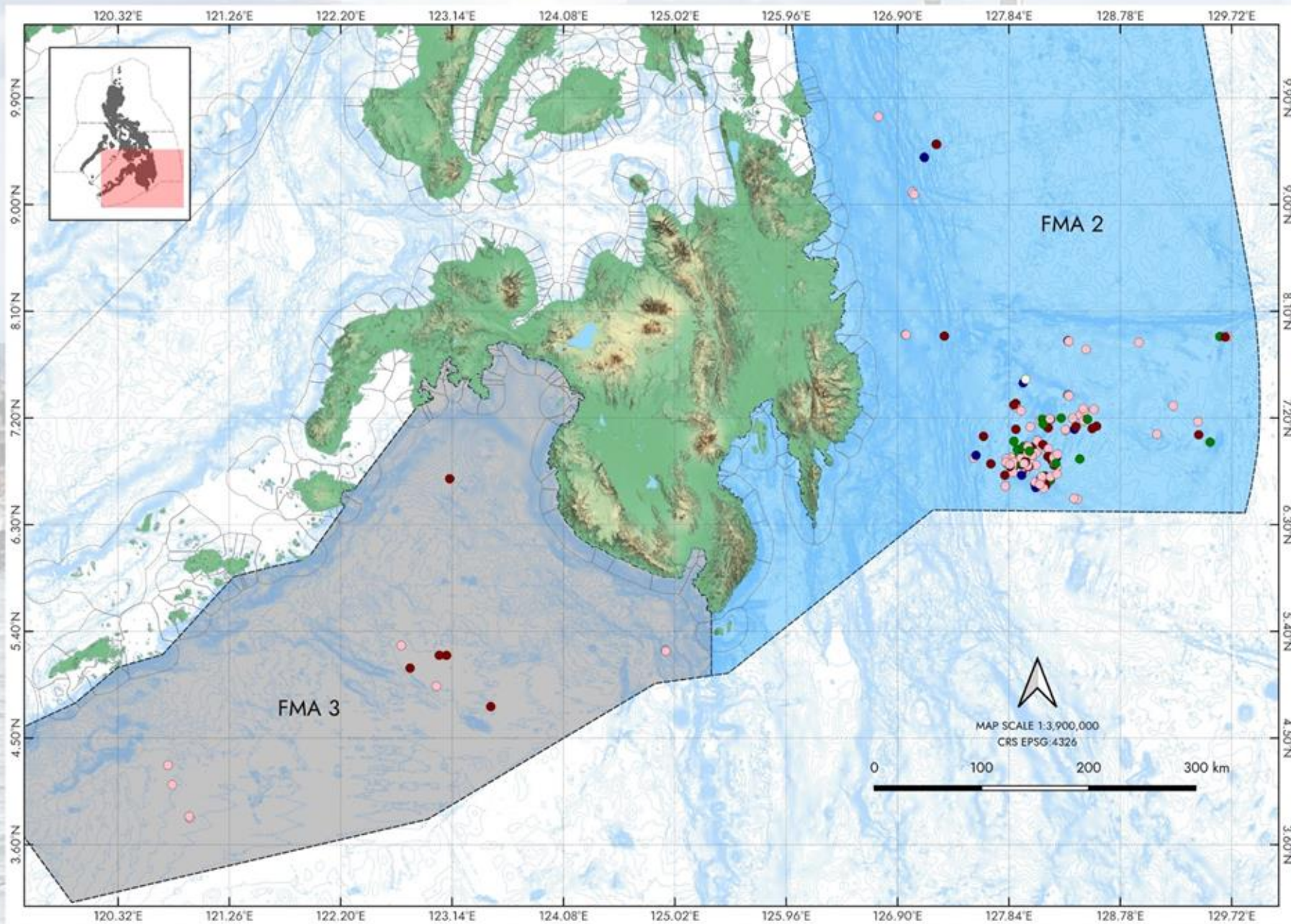


HOOKED ETPs

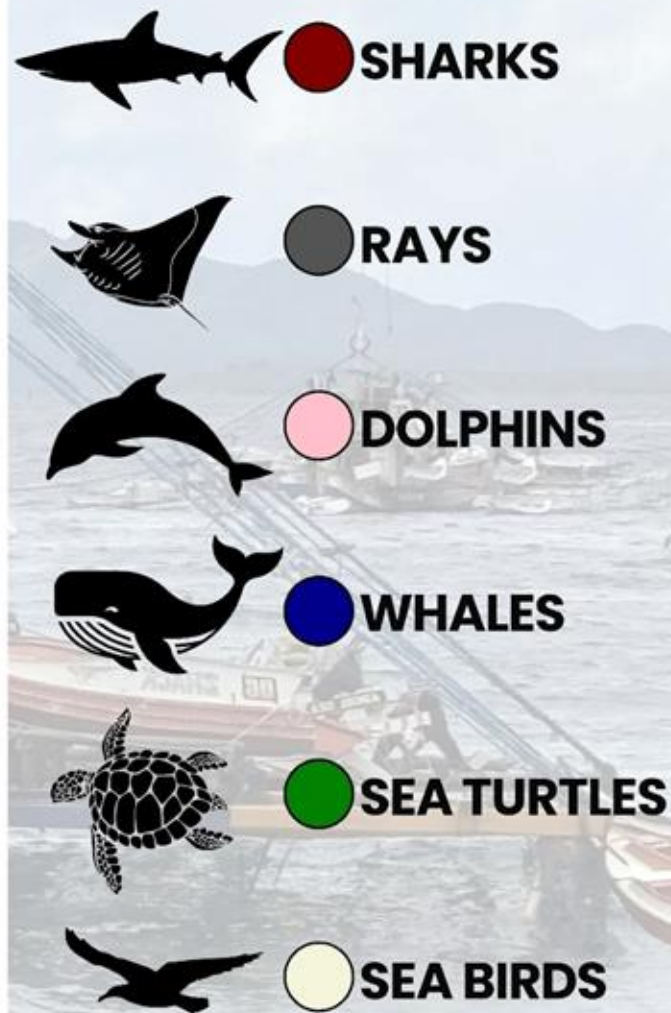
52

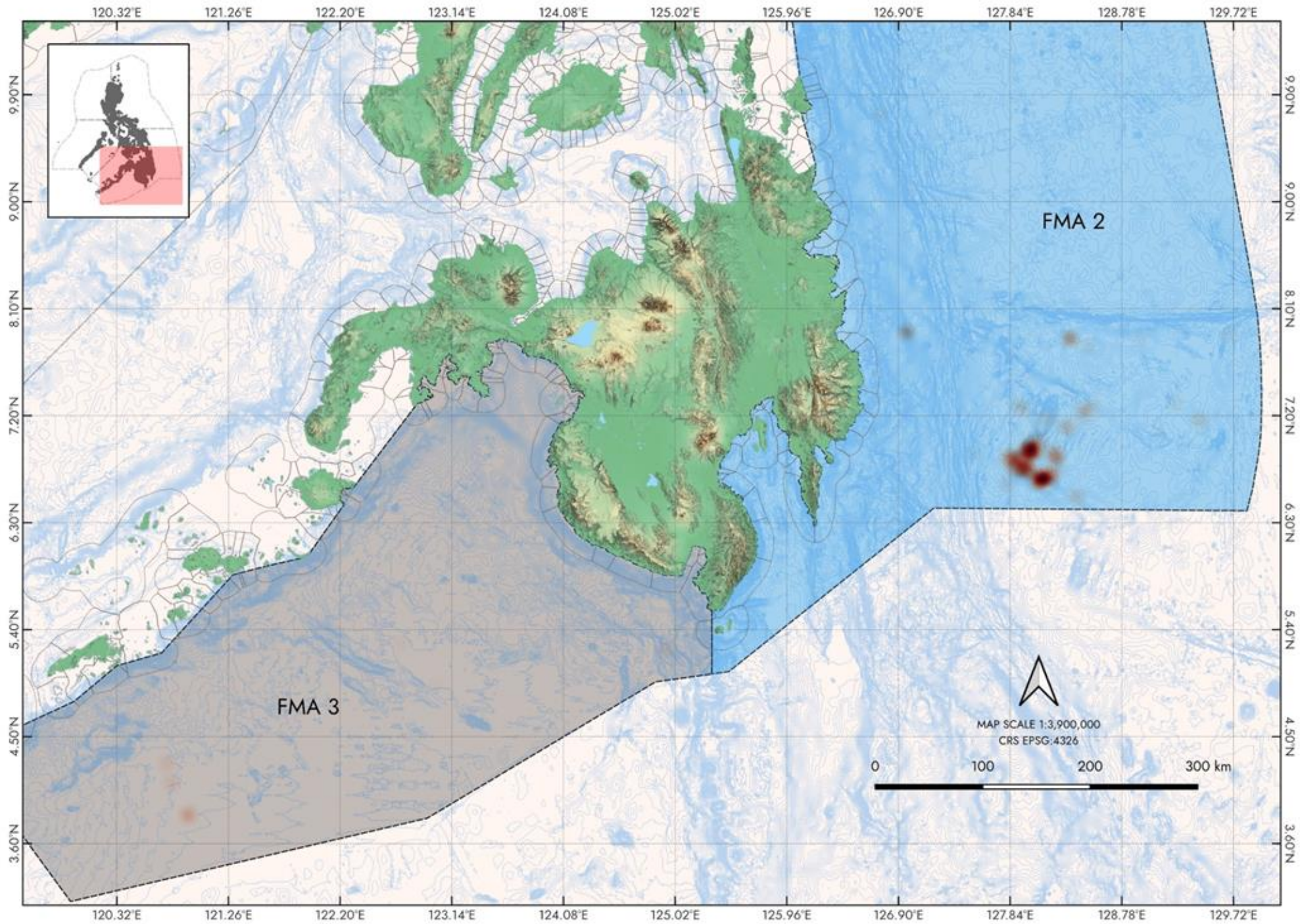


Geographical Distribution of ETP Species Interactions



LEGEND:





ETP HEATMAP

Sharks



Ni = 59

Dolphins

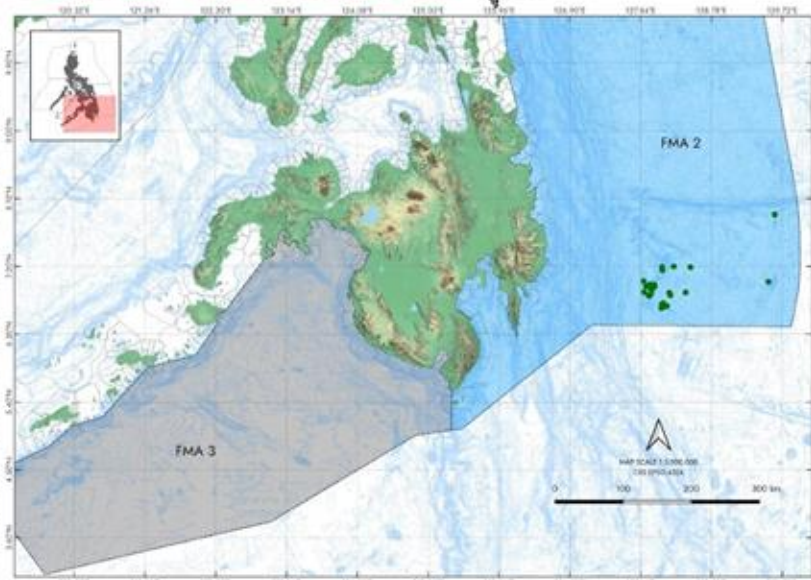
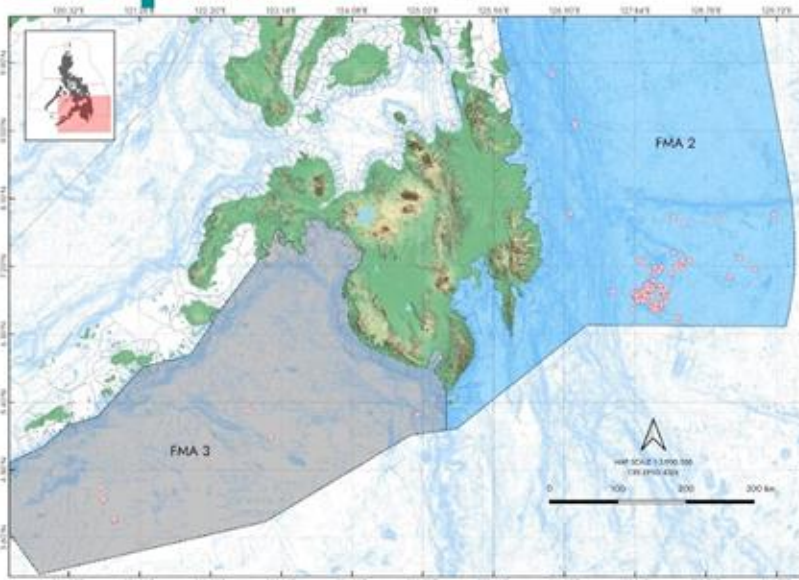
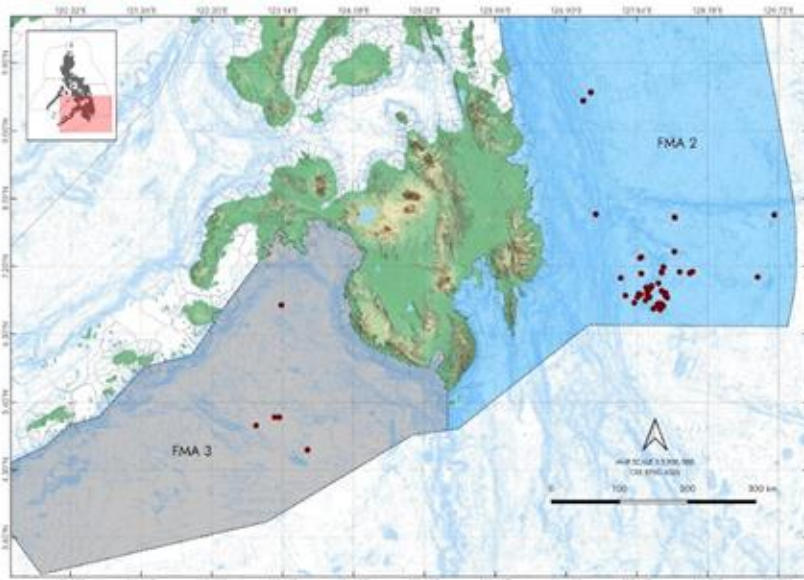


Ni = 1089

Sea Turtles



Ni = 30



Rays



Ni = 4

Whales

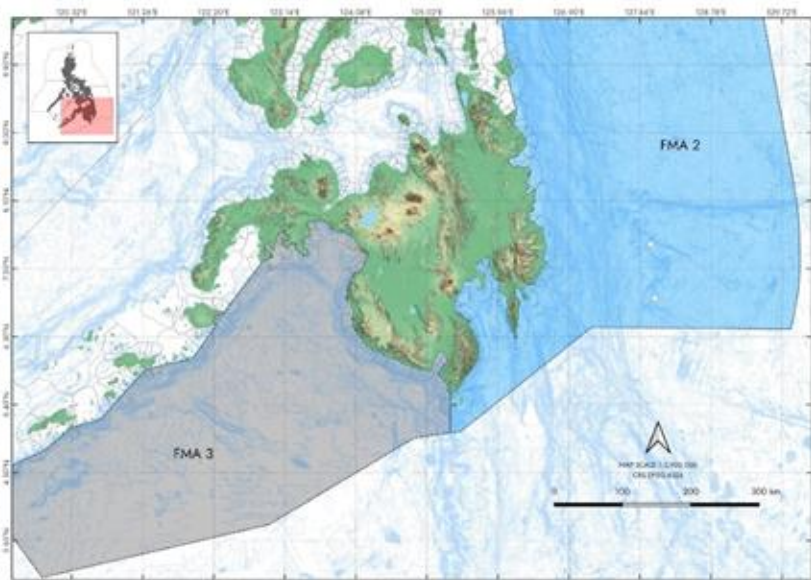
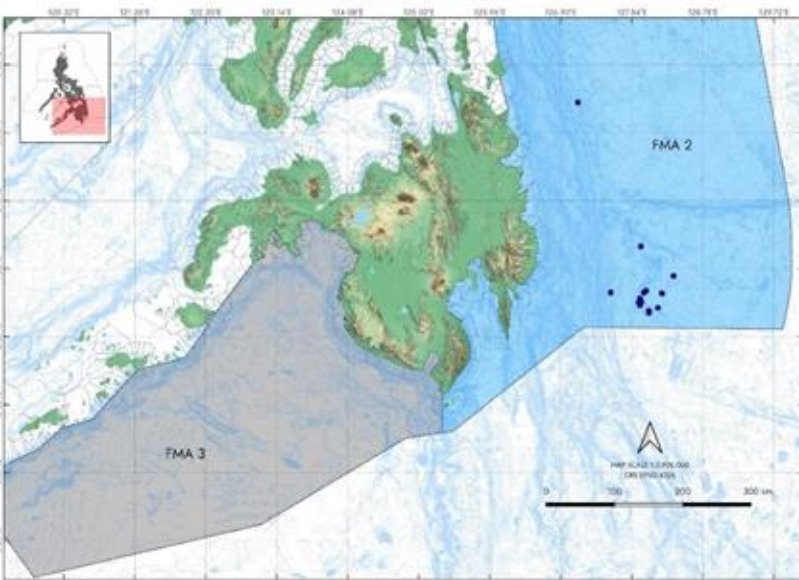
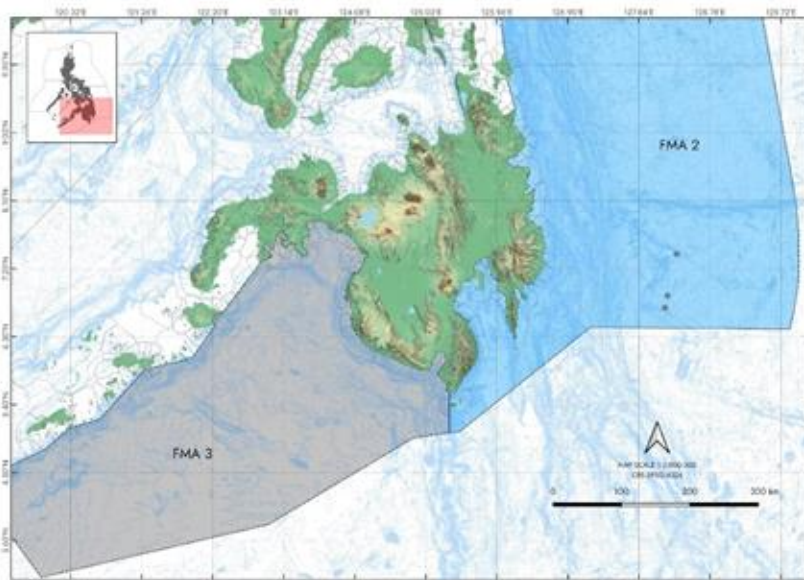


Ni = 30

Sea Birds

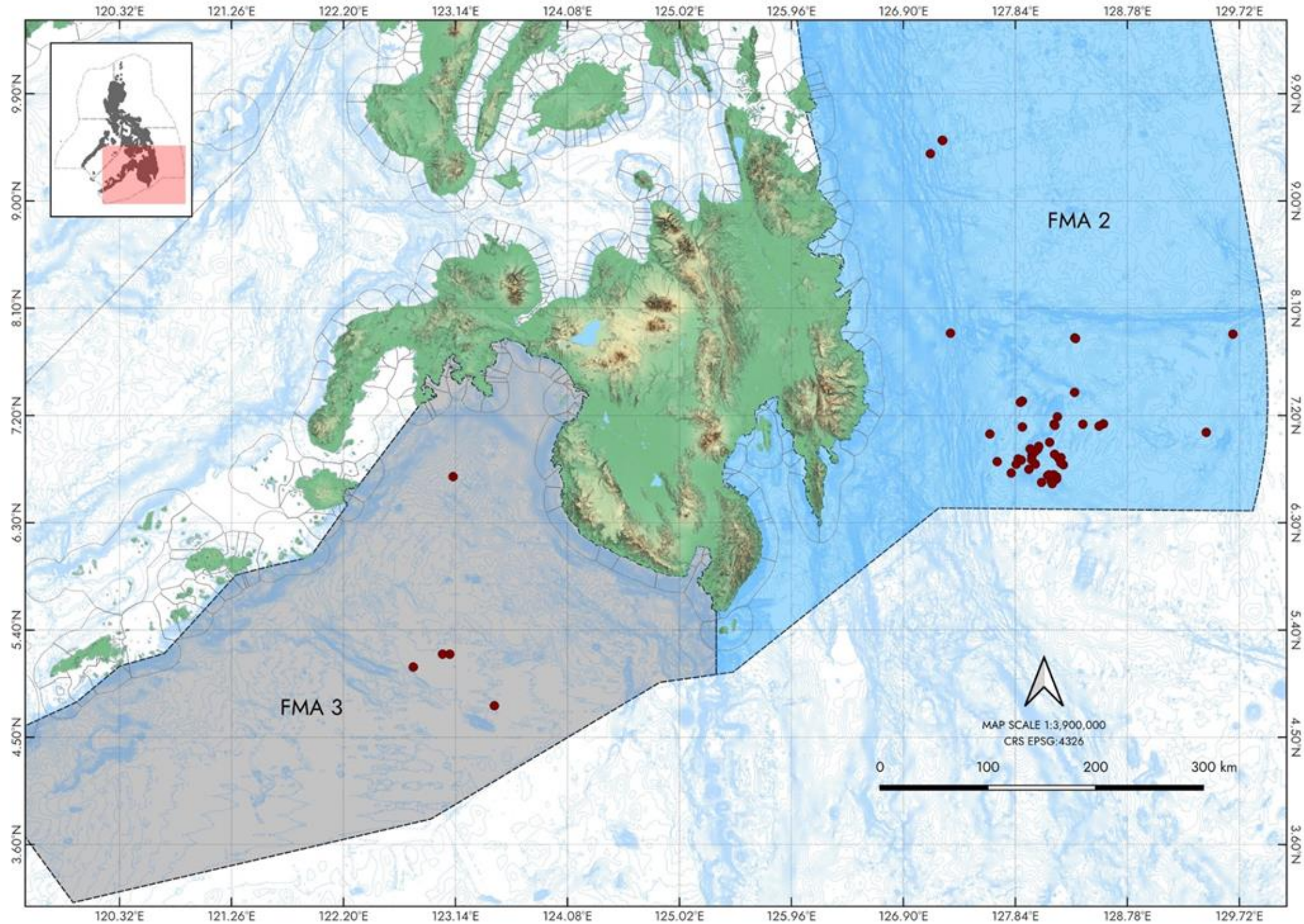


Ni = 11



SHARKS

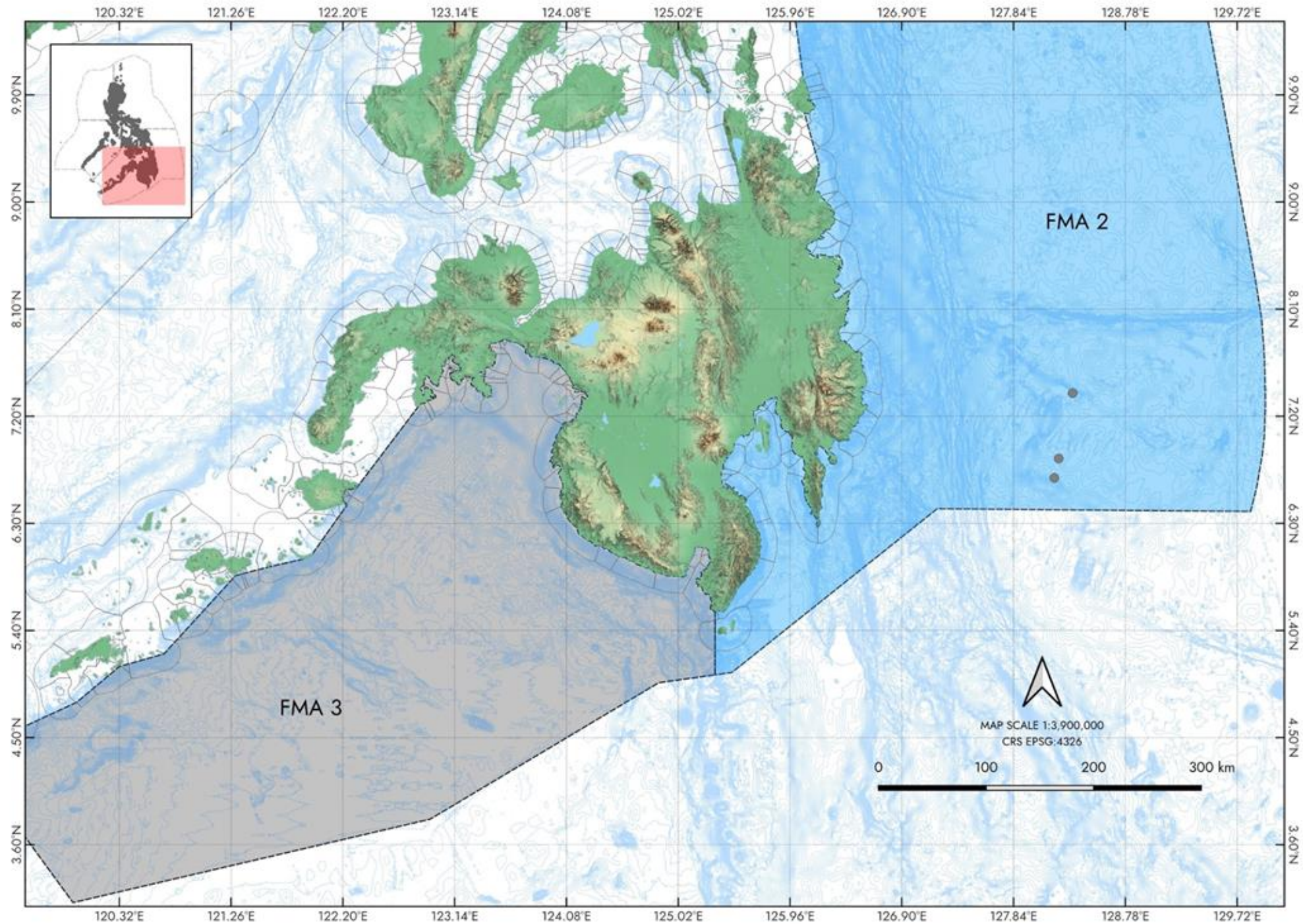
Ni = 59



RAY S

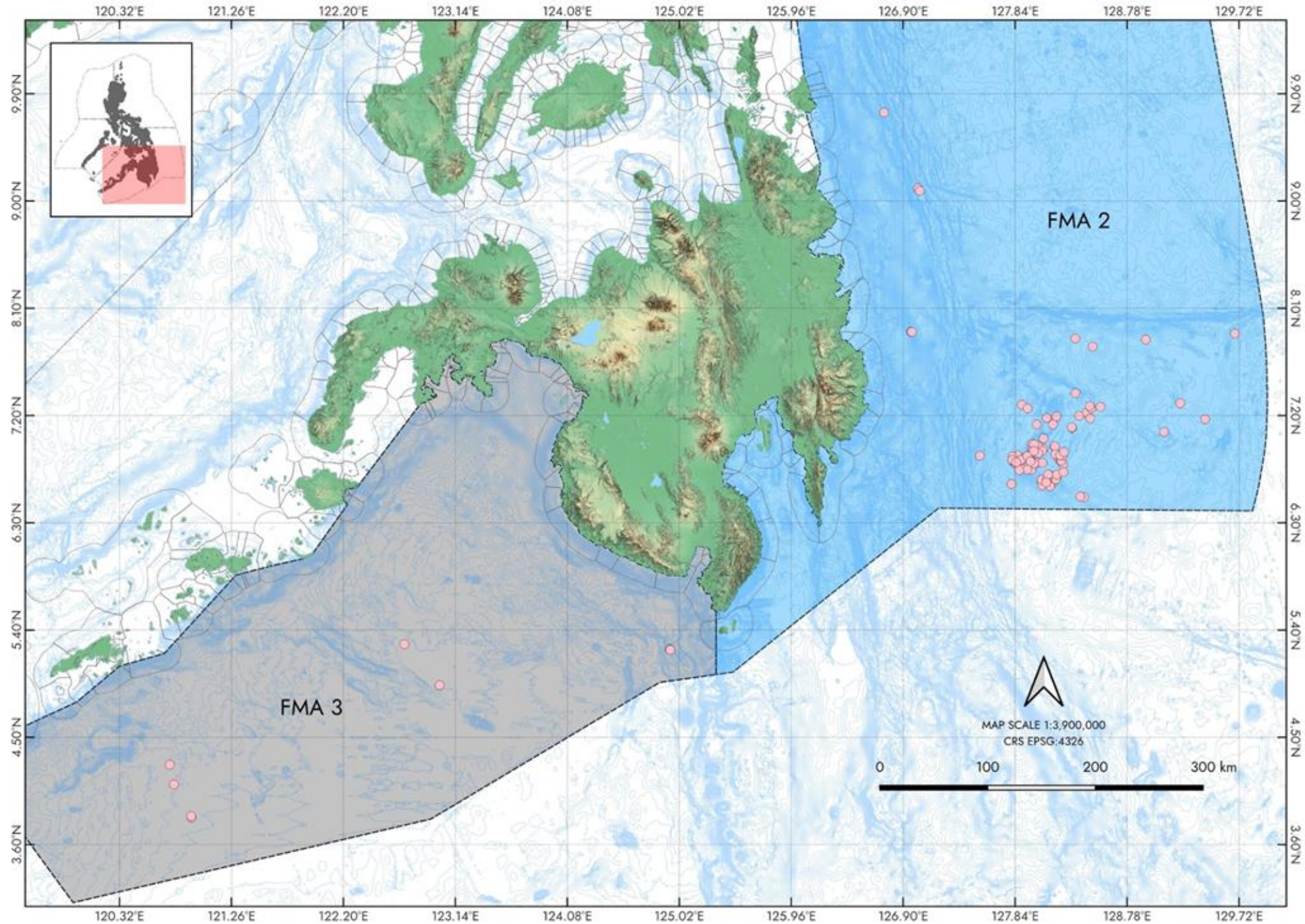


Ni = 4



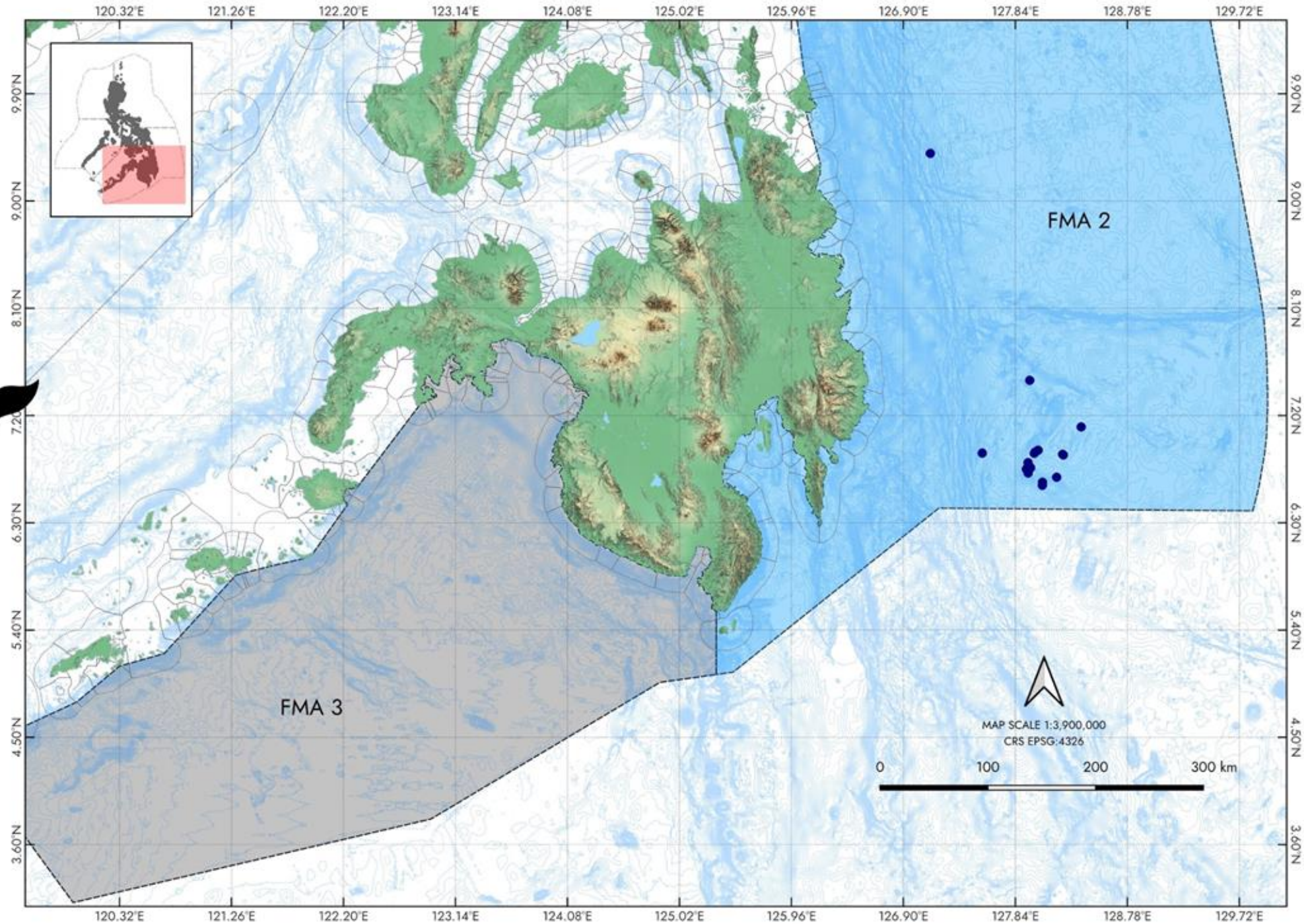
DOLPHINS

Ni = 1089



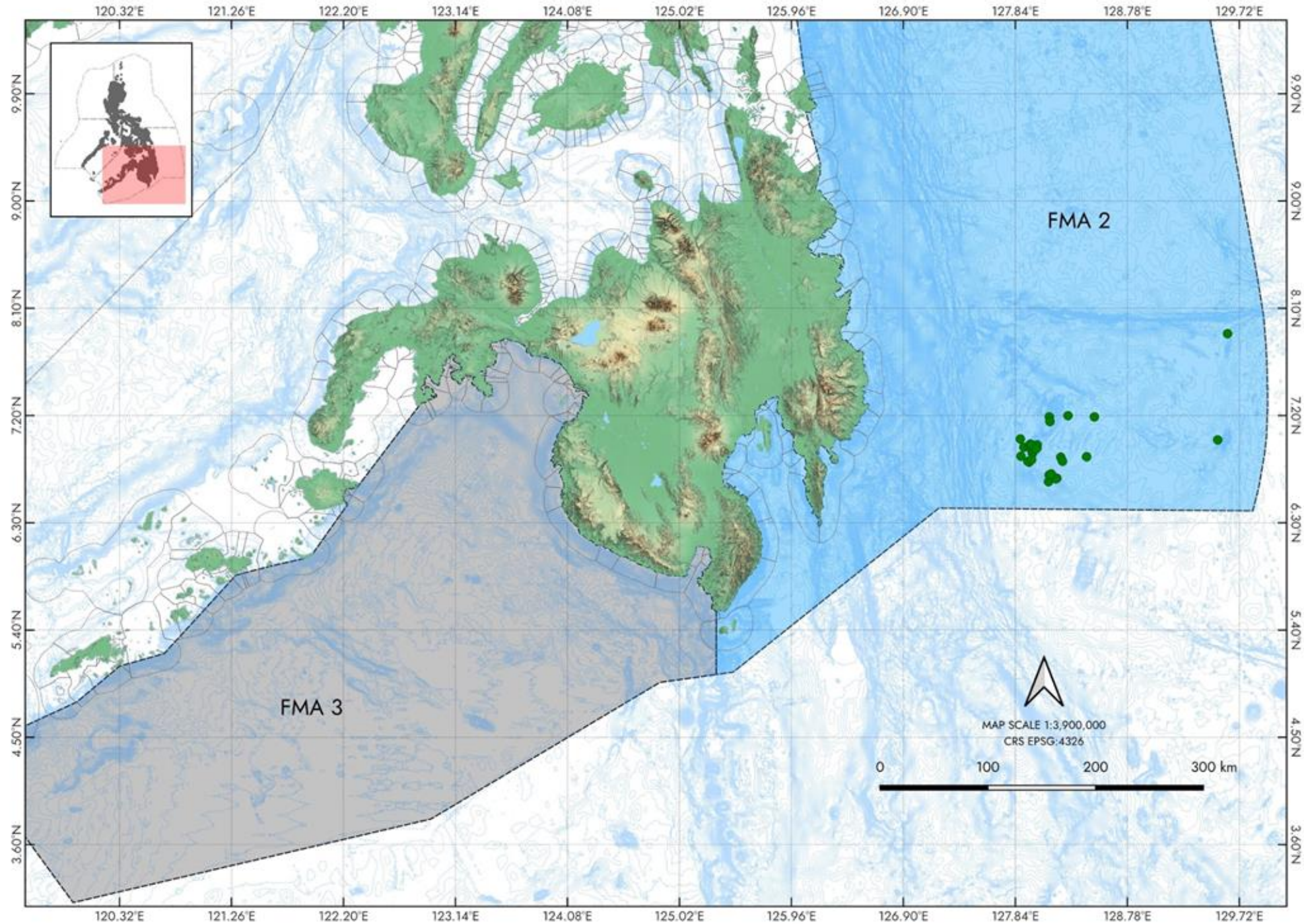
WHALES

Ni = 30



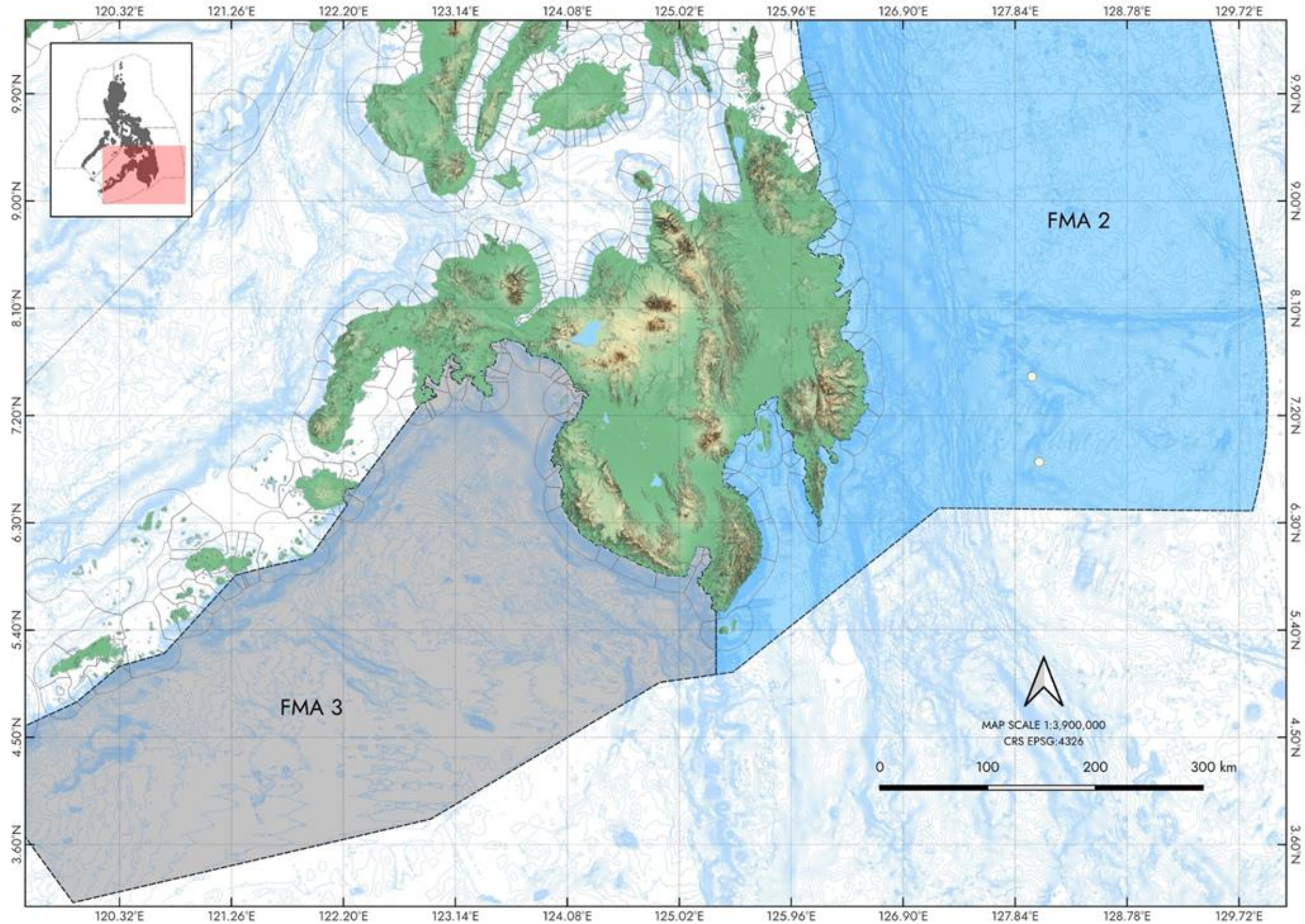
SEA TURTLES

Ni = 30



SEA BIRDS

Ni = 11



FISHERIES OBSERVER GENERAL -2 FORM

Landed/Hooked

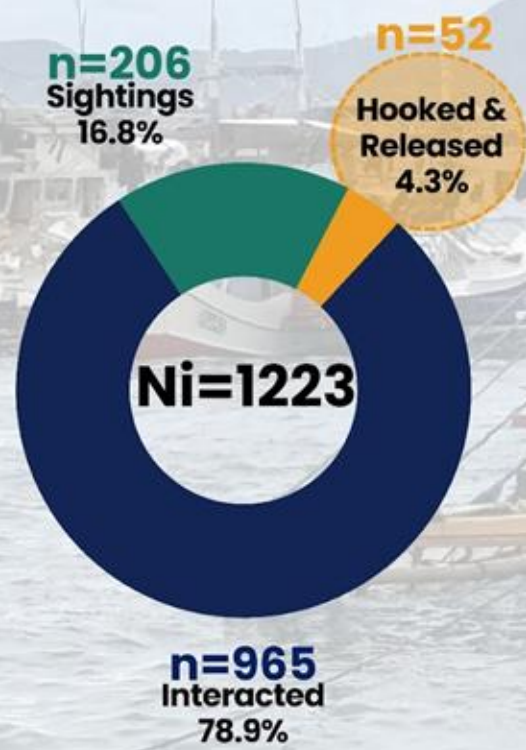
Interactions

Sightings

PHILIPPINE FISHERIES OBSERVER PROGRAM										PFOP FORM GEN-2	
GENERAL FORM											
SPECIES OF SPECIAL INTEREST MINIMUM DATA STANDARDS											
REVISED AUGUST 2014											
OBSERVER NAME				VESSEL NAME				OBSERVER TRIP ID		PAGE OF	
The Species was:		Tick to indicate → ↓		LANDED ON DECK ☐		INTERACTED WITH VESSEL'S GEAR ONLY ☐		SIGHTED ONLY ☐			
TIME OF LANDING (see PS-2, PL-2, LL-4)		OR		SHIPS DATE AND TIME		LATITUDE		N		LONGITUDE	
				DD MM YY hh mm		(dd°mm.mmm')		S		(ddd°mm.mmm')	
TIME OF INTERACTION /SIGHTING											
SPECIES CODE		SPECIES DESCRIPTION									
SPECIES LANDED ON DECK:											
LANDED:		CONDITION CODE		CONDITION DESCRIPTION							
DESCRIBE ONBOARD HANDLING								LENGTH (cm)		LENGTH CODE	
										SEX (M-F-U)	
DISCARDED:		CONDITION CODE		CONDITION DESCRIPTION							
TAGS											
RETRIEVED				PLACED							
TAG NUMBER		TYPE		ORGANISATION		TAG NUMBER		TYPE		ORGANISATION	
INTERACTIONS WITH VESSEL OR GEAR:											
VESSEL ACTIVITY DURING INTERACTION: → SETTING ☐ HAULING ☐ SEARCHING ☐ TRANSITTING ☐ OTHER(specify) ☐											
CONDITION START OF INTERACTION:		No. CODE DESCRIPTION				END OF INTERACTION:		No. CODE DESCRIPTION			
DESCRIBE THE INTERACTION											
SPECIES SIGHTED:											
VESSEL ACTIVITY DURING INTERACTION: → SETTING ☐ HAULING ☐ SEARCHING ☐ TRANSITTING ☐ OTHER(specify) ☐											
NUMBER SIGHTED		NUMBER OF ADULTS		NUMBER OF JUVENILES		ESTIMATE THE ORIGINAL LENGTH(S) (From the head to the tail)					
DISTANCE FROM VESSEL		SPECIES BEHAVIOUR WHEN SIGHTED									
m											
SPECIES OF SPECIAL INTEREST											

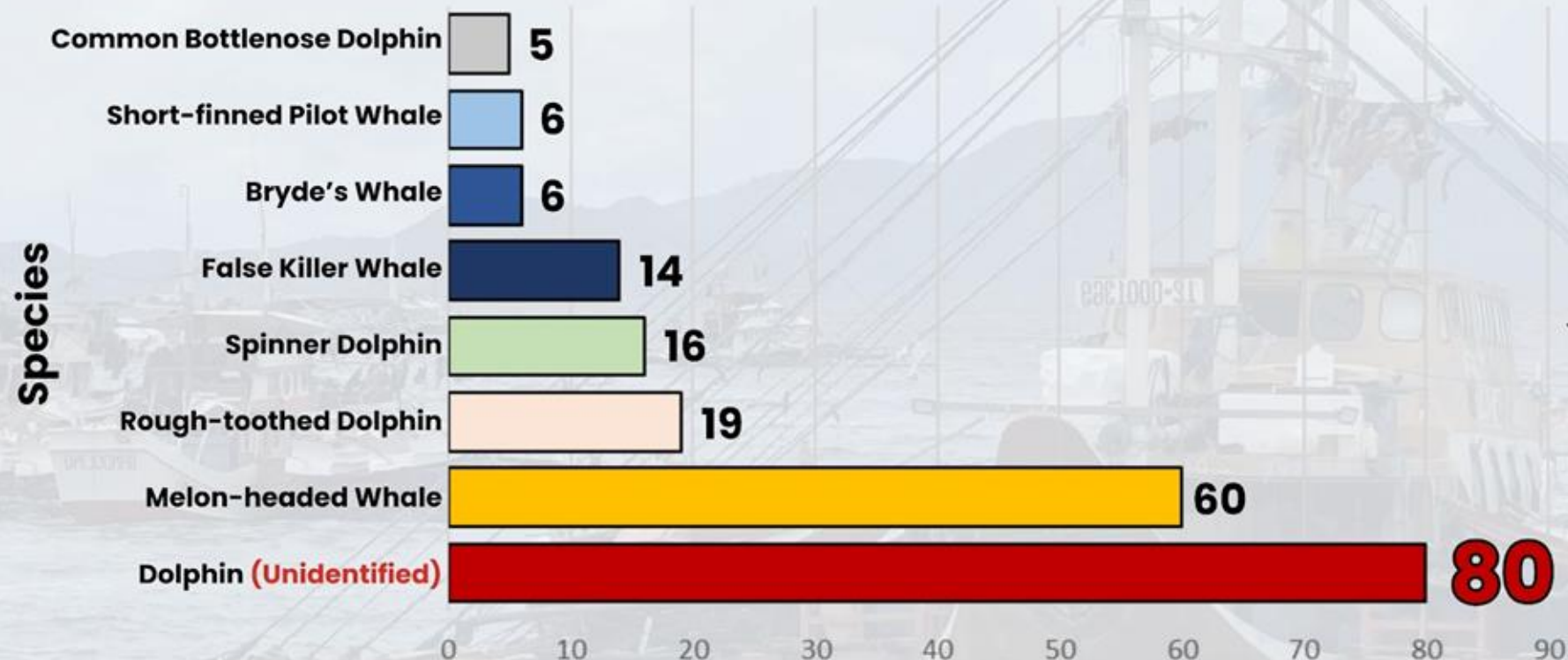
Recorded Interactions

*Out of a total of 107 fishing trips, 88 (82.24%) trips recorded documented interactions with SSI/ETP species, indicating a significant occurrence of bycatch in these operations.



SPECIES	SIGHTINGS (>100m)	INTERACTED	HOOKEED & RELEASED	TOTAL EVENTS	% OF GRAND TOTAL
 DOLPHINS	200	886	3	1089	89.04%
 SHARKS	0	11	48	59	4.82%
 WHALES	6	24	0	30	2.45%
 SEA TURTLES	0	30	0	30	2.45%
 SEA BIRDS	0	11	0	11	0.90%
 RAYS	0	3	1	4	0.33%
TOTAL	206	965	52	1223	100.00%

Frequency of Sighted SSI/ETP species



SIGHTINGS
(>100)

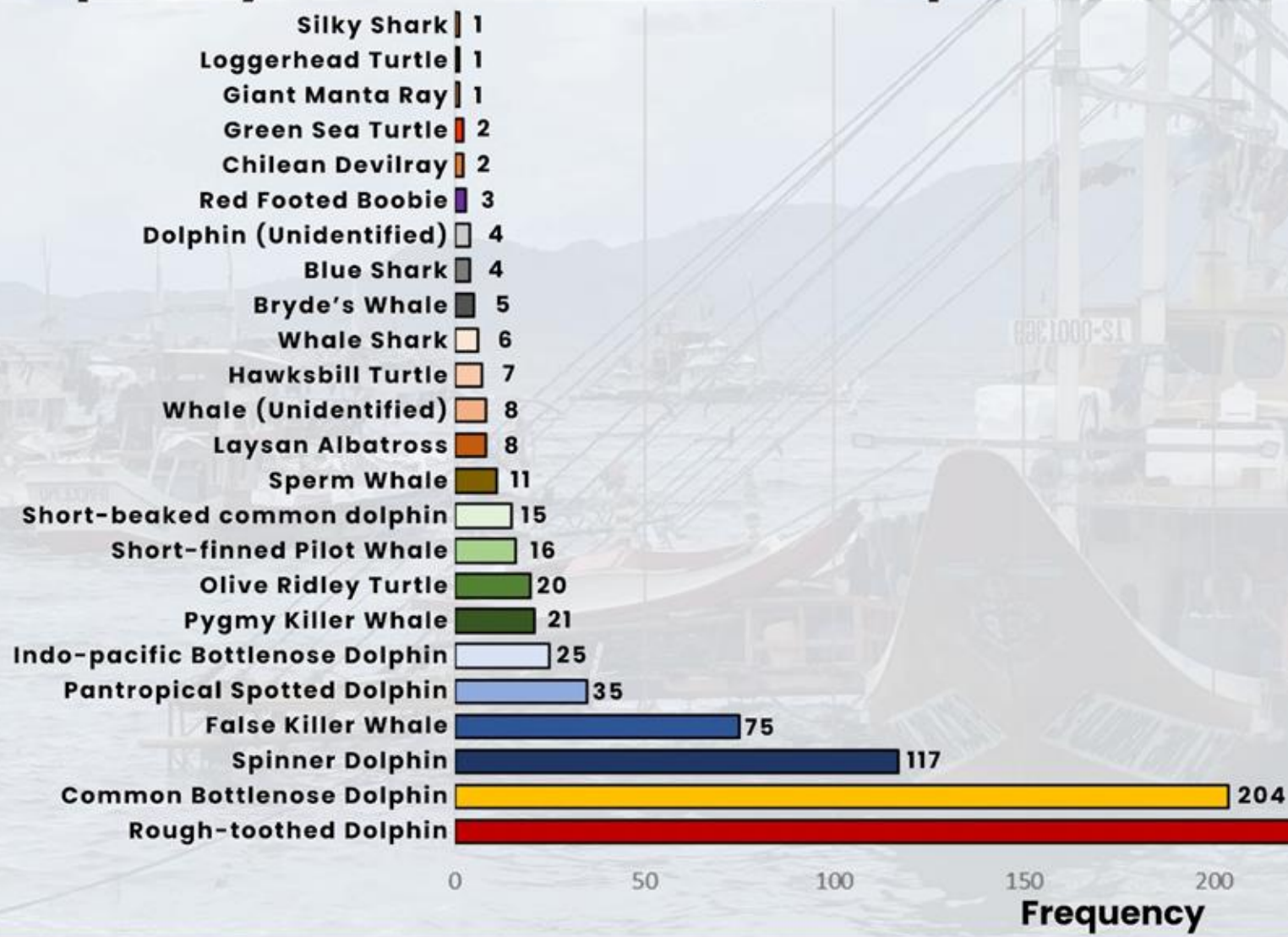
	CETACEANS	206
	SHARKS & RAYS	0
	SEA TURTLES	0
	SEA BIRDS	0
TOTAL		206

NOTE:

- "SIGHTINGS or SIGHTED" refers to SSI/ETP species that are not directly affected by the vessel's presence, usually >100 meters away, when so close, the observer estimates carefully for interaction behavior.

Frequency of Interacted SSI/ETP species

Species



INTERACTED

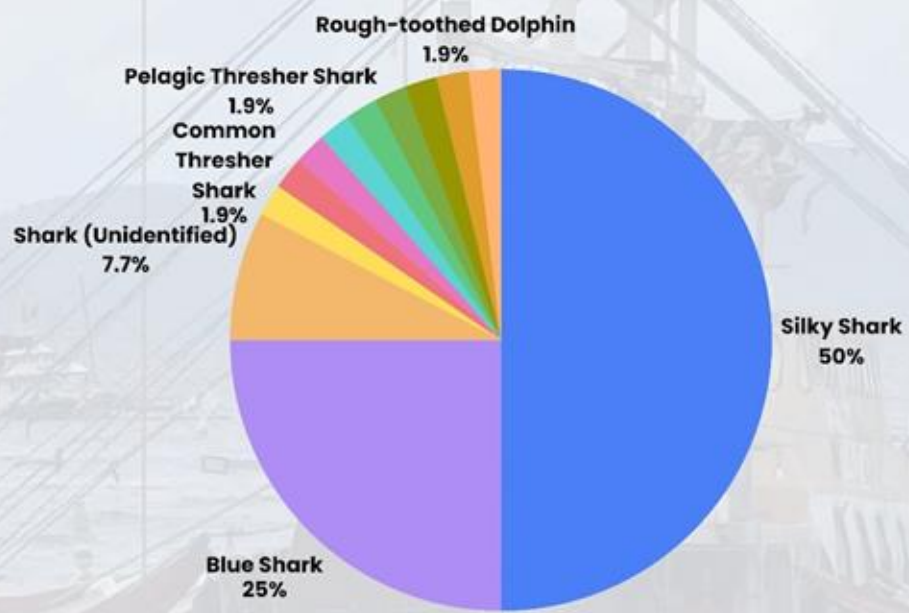
	CETACEANS	910
	SHARKS & RAYS	14
	SEA TURTLES	30
	SEA BIRDS	11
TOTAL		965

374

Frequency of Hooked & Released SSI/ETP species

Species

- Dolphin (Unidentified) 1
- Rough-toothed Dolphin 1
- Pantropical Spotted Dolphin 1
- Pelagic Stingray 1
- Smooth Hammerhead Shark 1
- Bigeye Thresher Shark 1
- Pelagic Thresher Shark 1
- Copper Shark 1
- Common Thresher Shark 1
- Shark (Unidentified) 4
- Blue Shark 13
- Silky Shark 26



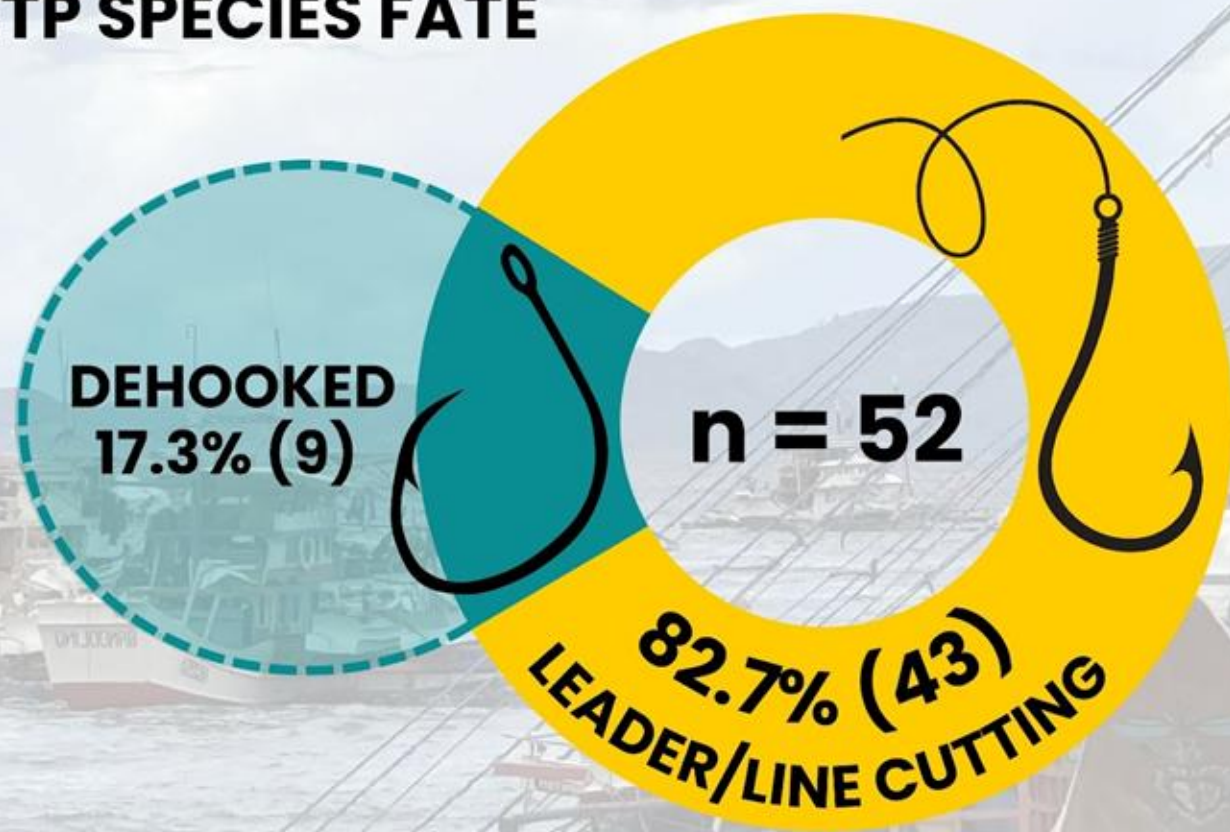
HOOKED & RELEASED

	CETACEANS	3
	SHARKS & RAYS	49
	SEA TURTLES	0
	SEA BIRDS	0
TOTAL		52

0 5 10 15 20 25 30

Frequency

ETP SPECIES FATE



DEHOOKED & LEADER/LINE CUTTING

- Observers record handling for SSI/ETP species, including dehooking, entanglement evaluation, and line/leader cutting near the mouth to reduce post-release mortality, complying with WCPFC bycatch measures.
- Dehooked – hook removed successfully
- Leader/Line Cutting – cutting the secondary line closest to the mouth.

SEVERITY OF INTERACTION

Type of ETP	A2 – Alive & injured	Dead
 DOLPHINS	3	0
 SHARKS	46	2
 RAYS	1	0
TOTAL	50	2

SEVERITY OF INTERACTIONS

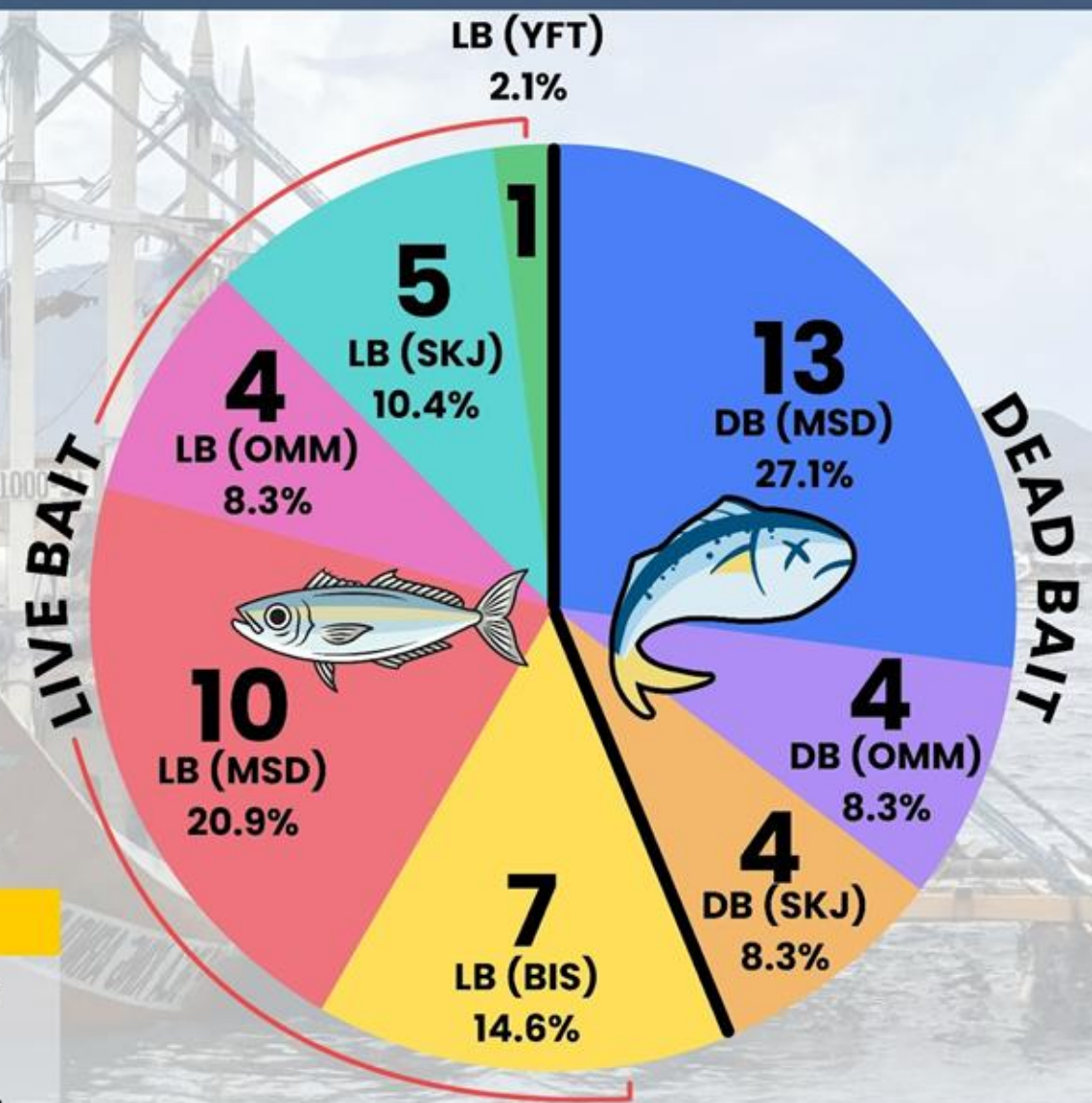
- Fisheries Observers record the status of SSI/ETPs when caught and when released (ex. such as A2 when caught and Dead when released).
- All SSI/ETPs that were hooked are recorded as A2.

BAIT PREFERENCE (SHARK)

	HOOKED & RELEASED
 DOLPHINS	3
 SHARKS	48
 WHALES	0
 SEA TURTLES	0
 SEA BIRDS	0
 RAYS	1
TOTAL	52

BAIT USED/PREFERENCE

- Sharks accounted for 92.31% of the fish hooked and released, followed by dolphins (5.77%) and rays (1.92%).
- Aggregate proportions for sharks indicate 56.3% attraction to live baits (predominantly mackerel scad and tuna juveniles) versus 43.7% to dead baits (dominated by mackerel scad).



BASES FOR STANDARDIZATION

FAO Bycatch in longline fisheries for tuna and tuna-like species



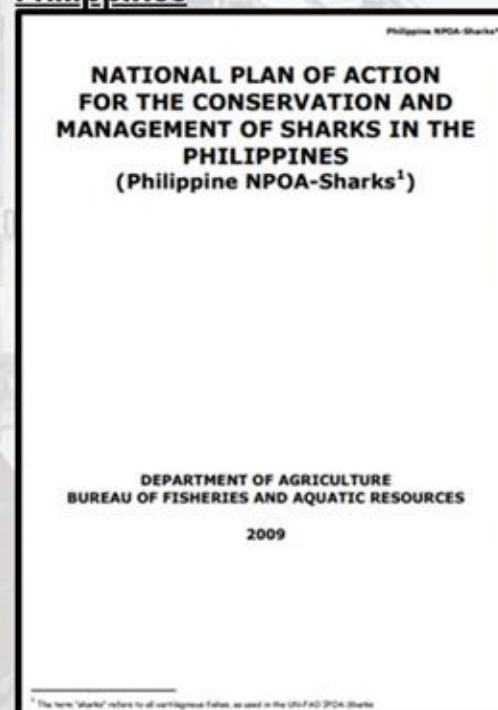
<https://openknowledge.fao.org/server/api/core/bitstreams/e55aaa87-9271-4c20-be9f-6670126c8591/content>

International Guidelines on Bycatch Management and reduction of discards



<https://www.fao.org/4/ba0022t/ba0022t00.pdf>

NPOA for conservation and management of Sharks in the Philippines



<https://openknowledge.fao.org/server/api/core/bitstreams/09bb5ac8-f880-44a0-bd9f-5a25f916087f/content>

Preliminary Integrated Bycatch Management Strategy and 2022 for the Tunago Fishery of the Pacific Ocean Tuna Longline (Thai Union) FIP



https://fisheryprogress.org/sites/default/files/documents_actions/Integrated%20Bycatch%20Management%20Strategy_TU-Tunago_FIP_VI-R1-Dec2021.pdf

RESULTS : HOOKED BYCATCH ETP SPECIES

Hooked bycatch rate per
100 hooks

$$= \left(\frac{\text{Number of Hooked Bycatch Interactions (Ni)}}{\text{Total Number of Hooks Deployed (H)}} \right) \times 100$$

To standardize bycatch rates, this study calculates bycatch per 100 hooks in the tuna handline fishery, ensuring consistency with international standards. FAO (2011) emphasizes the importance of reporting bycatch relative to fishing effort, typically expressed as catch per unit effort (CPUE) or bycatch per unit effort (BPUE). For longline fisheries, this is often standardized as catch per 1000 hooks.

The same approach is applied here, but adapted to handline fisheries, which deploy fewer hooks per operation. By standardizing to 100 hooks, we maintain the principles of effort standardization while reflecting the operational differences in handline fishing. This ensures comparability with other fisheries, as recommended by WCPFC (2010) and ICCAT (2014), and aligns with international bycatch monitoring guidelines.

RESULTS : HOOKED BYCATCH ETP SPECIES

LONGLINE FISHING OPERATION

Formula of Nasution, 1993
Adopted by Zainudin 2017

$$\text{Hooked Bycatch Rate per 1000 hooks} = \left(\frac{\text{Number of Hooked Bycatch Interactions (Ni)}}{\text{Total Number of Hooks Deployed (H)}} \right) \times 1000$$

HANDLINE FISHING OPERATION

$$\text{Hooked Bycatch Rate per 100 hooks} = \left(\frac{\text{Number of Hooked Bycatch Interactions (Ni)}}{\text{Total Number of Hooks Deployed (H)}} \right) \times 100$$

RESULTS : HOOKED BYCATCH ETP SPECIES



HOOKED ETPs

52

$$\text{Hooked Bycatch Rate per 1000 or 100 hooks} = \left(\frac{\text{Number of Hooked Bycatch Interactions (Ni)}}{\text{Total Number of Hooks Deployed (H)}} \right) \times 1000 \text{ or } 100$$

DESCRIPTIVE STATISTICS	RESULT
Hooked Bycatch rate/ 100 hooks	0.27/100 hooks
Hooked Bycatch rate/ 1000 hooks	2.79/1000 hooks
Average Hooked ETP Species per Trip	0.49 per trip
Average Fishing Hours per Trip	382.00 hours
Average number of hooks deployed per Trip	87.14 hooks

- THE OVERALL HOOK-STANDARDIZED INTERACTION RATE WAS 2.79 ETP PER 1,000 HOOKS DEPLOYED.
- LESS THAN 3 ETP SPECIES ARE CAUGHT FOR EVERY 1000 HOOKS USED
- ON AVERAGE, LESS THAN ONE ETP SPECIES IS CAUGHT PER TRIP - OR ROUGHLY ONE HOOKED & RELEASED ETP SPECIES FOR EVERY 2 TRIPS

RESULTS : HOOKED BYCATCH ETP SPECIES



HOOKED ETPs

52

$$\text{MORTALITY RATE} = \left(\frac{\text{Number of Dead ETPs}}{\text{Total ETPs Caught}} \right) \times 100$$

DATA POINTS	RESULT
Total ETPs Caught	52
Total Mortalities (Deaths)	2
Mortality Rate	3.85%

- THE MORTALITY RATE OF ENDANGERED, THREATENED, AND PROTECTED (ETP) SPECIES IN THE TUNA HANDLINE FISHERY IS 3.85%, UNDERSCORING THE NEED FOR ENHANCED BYCATCH MITIGATION STRATEGIES TO MINIMIZE THE IMPACT ON VULNERABLE SPECIES.
- NO EXPLICIT NUMERIC MORTALITY THRESHOLDS ARE CODIFIED

Categorization

TARGET SPECIES



NON-TARGET SPECIES



BYCATCH (ETP SPECIES)





Species composition Summary

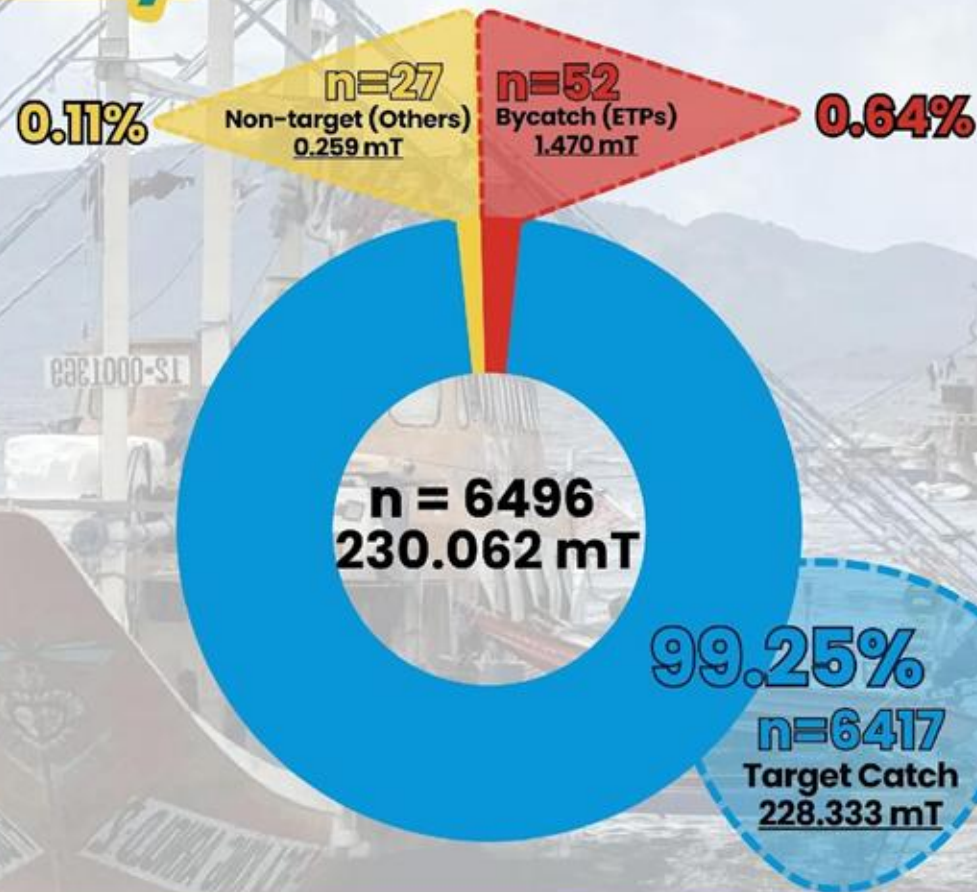
		CATEGORY	NUMBER OF INDIVIDUALS	WEIGHT (mT)
LEGEND		TARGET CATCH	6417	228.333
		NON-TARGET (OTHERS)	27	0.259
		BYCATCH (ETPs)	52	1.470
		TOTAL	6496	230.062

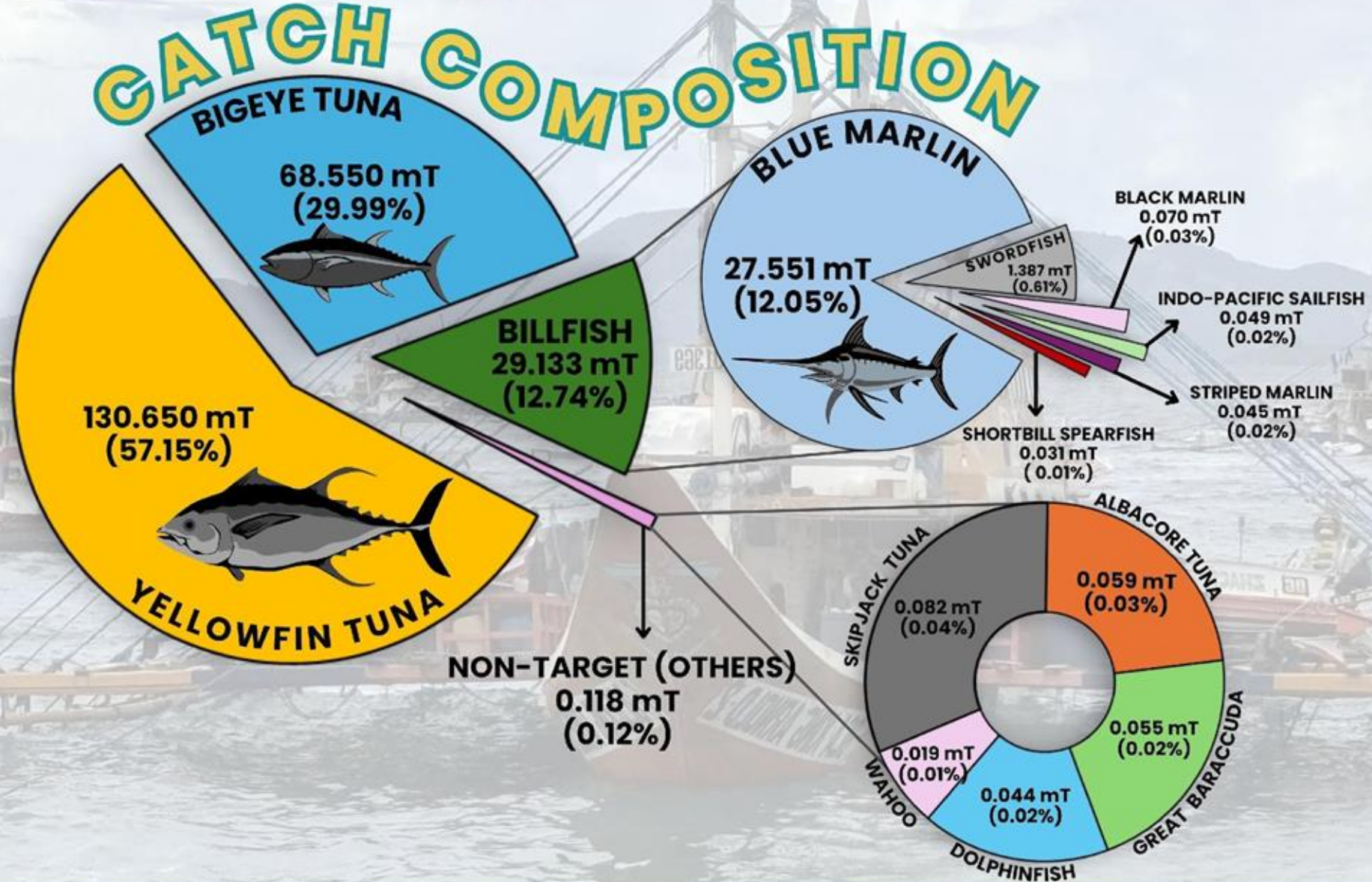
NOTE:

- **TARGET CATCH** - comprises Yellowfin Tuna, Bigeye Tuna, and other billfish species, all retained for commercial purposes.
- **NON-TARGET (OTHERS)** - encompasses finfish species that are not retained for commercial purposes such as skipjack tuna, albacore tuna, great baraccuda, wahoo, and mahi-mahi.
- **BYCATCH (ETPs)** - constitutes Endangered, Threatened, and Protected (ETP) species incidentally hooked but released, including sharks, rays, and dolphins.

BYCATCH (ETPs)

- n = number of Individuals
- Sharks, Dolphin, and Rays were not directly measured due to size and handling constraints.





RESULTS

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SPECIES CODE	COMMON NAME	NUMBER OF INDIVIDUALS	METRIC TONS
YFT	YELLOWFIN TUNA	3633	130.650
BET	BIGEYE TUNA	1855	68.550
BUM	BLUE MARLIN	750	27.551
SWO	SWORDFISH	171	1.387
BLM	BLACK MARLIN	1	0.070
SFA	INDO-PACIFIC SAILFISH	3	0.049
MLS	STRIPED MARLIN	1	0.045
SSP	SHORTBILL SPEARFISH	3	0.031
SKJ	SKIPJACK TUNA	9	0.082
ALB	ALBACORE TUNA	4	0.059
GBA	GREAT BARACCUA	3	0.055
DOL	DOLPHINFISH/MAHI-MAHI	8	0.044
WAH	WAHOO	3	0.019

TOTAL: **228.592 mT**

TARGET CATCH



NON-TARGET (OTHERS)



NOTE:

Yellowfin tuna (YFT), bigeye tuna (BET), and billfish species are categorized as target catch due to high commercial value or economic significance, while non-target finfish are categorized as "others" for the reason that it is either retained for crew consumption or retained for other reasons (processed into dried fish).

RESULTS

Shannon Diversity Index

$$H' = -\sum p_i \ln(p_i)$$

Shannon Diversity index (H')	Natural Log of Species Richness [ln(s)]	Equitability Index (E_H)
1.11	2.77	0.40

INTERPRETATION:

- SHANNON DIVERSITY INDEX (H') = 1.11 - Indicates moderate biodiversity.
- EQUITABILITY INDEX (E_H) = 0.40 - Suggest Low evenness, and indicates that the samples are dominated by some species.

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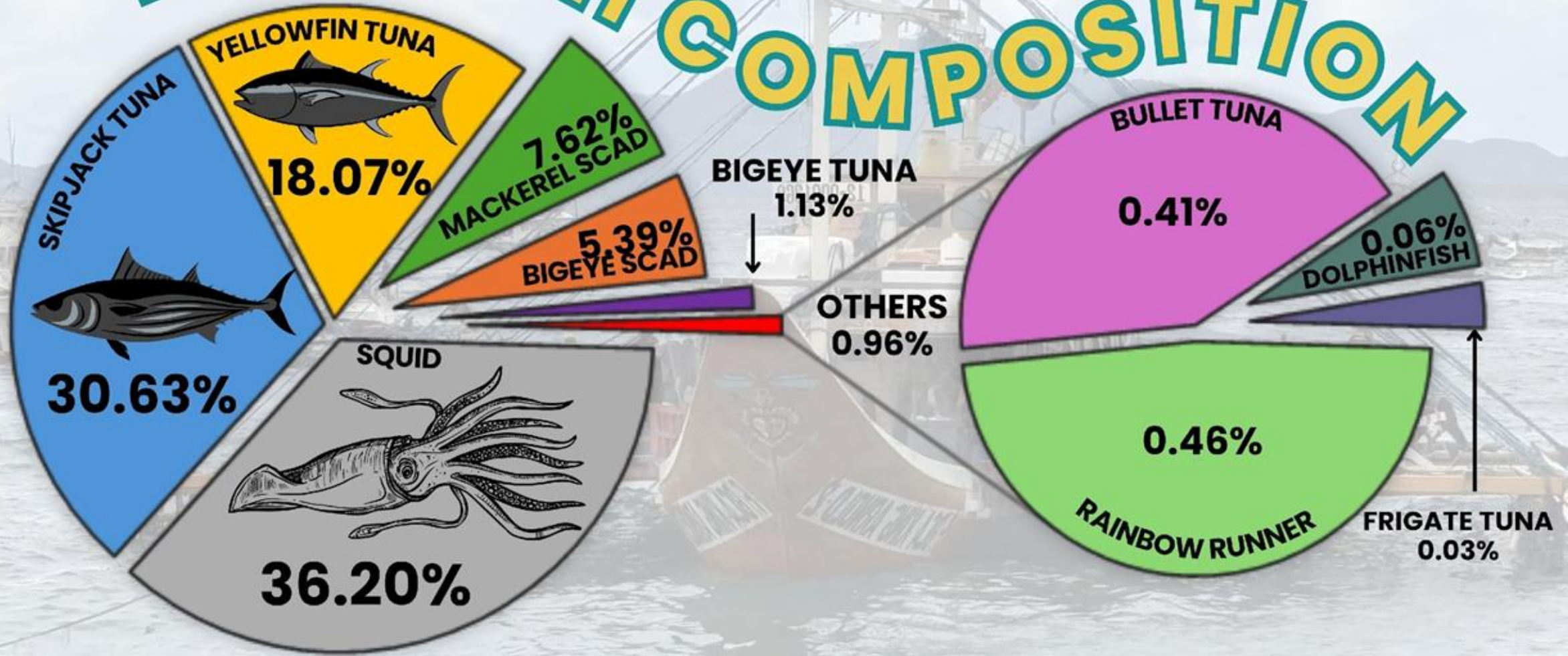
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GBA	GREAT BARACCUDA	3	0.055
DOL	DOLPHINFISH/MAHI-MAHI	8	0.044
WAH	WAHOO	3	0.019
ETPs	DOLPHINS/SHARKS/RAYS	52	1.470

TOTAL: 230.062 mT

BAITFISH COMPOSITION



RESULTS

SPECIES CODE	COMMON NAME	METRIC TONS
OMM	SQUID	7.236
SKJ	SKIPJACK TUNA	6.123
YFT	YELLOWFIN TUNA	3.611
MSD	MACKEREL SCAD	1.522
BIS	BIGEYE SCAD	1.077
BET	BIGEYE TUNA	0.226
RRU	RAINBOW RUNNER	0.092
BLT	BULLET TUNA	0.081
DOL	DOLPHINFISH/MAHI-MAHI	0.013
FRI	FRIGATE TUNA	0.006

TOTAL: **19.989 mT**

BAITFISH TO TARGET CATCH RATIO

$$\text{BAITFISH TO TARGET RATIO} = \frac{\text{TOTAL BAITFISH USED}}{\text{TOTAL TARGET CATCH}}$$

BAITFISH TARGET
0.0874 : 1

- Approximately 87.4 kg of baitfish are required to produce 1 mT of target tuna, or 1 kg of baitfish yields about 11.43 kg of tuna. Which indicates relatively high bait-use efficiency in the tuna handline fishery.
- This underscores efficient bait utilization, mitigating direct strain on bait stocks

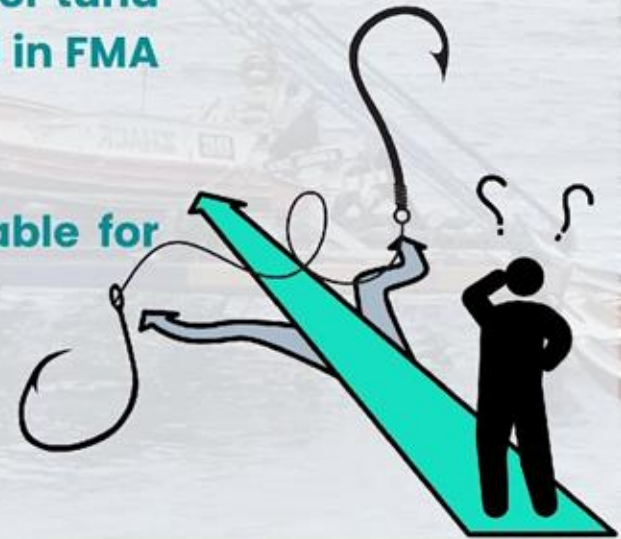
NOTE:

- Tuna handline fisheries are intrinsically dependent on the use of live and dead baitfish, which constitute a critical operational input in the latak fishing method.
- The primary bait species utilized in tuna handline operations include squid, skipjack, and juvenile small tunas, reflecting fisher preference based on availability and target species selectivity.



WAYS FORWARD

1. Require the provision of one (1) dehooker per pakura on all tuna handline fishing vessels to reduce injuries to endangered, threatened, and protected (ETP) species incidentally caught during fishing operations
2. Revisit and stringently enact FAO 244 s. 2012, or the National Tuna FAD Management Policy, by requiring each tuna handline catcher vessel to register its FAD
3. Conduct data collection on tuna handline fishing vessels operating in other major tuna fishing grounds in the Philippines, as the majority of vessels in this study operated in FMA 3, to enable spatial and temporal comparisons
4. Expand spatial coverage within FMA 2, focusing specifically on vessels suitable for observer deployment, to enhance the resolution and accuracy of spatial analysis.



WAYS FORWARD

4. Continuous training/seminar on safe handling and release on ETP species on captains and crews on Tuna Handline Fishing Vessels.
5. Develop an alternative tying/hooking method for the squid ink bag to ensure its retrieval during handline reeling/hauling.
6. Continuous deployment of fisheries observers on board tuna handline fishing vessels for long term impact assessments and management of the Endangered, Threatened, and Protected Species.
7. Prioritize the adoption of electronic monitoring (EM) for small-scale tuna handline fisheries in the Philippines, where observer deployment is impractical, to ensure effective monitoring and sustainable fishing practices.



Current Bycatch Mitigating Practices



- ✓ Across 107 observed trips, 100% of Tuna Handliners utilizes Circle hooks with not more than 10° offset
- The deployment of circle hooks with an offset not exceeding 10° resulted in a significant reduction in the deep hooking rate, decreasing it from 25% to 5.8%, as compared to traditional non-offset J-hooks (Sales et al., 2010)



- ✓ In longline fishery the use of nylon leaders reduced shark bycatch by approximately 50% compared with wire leaders.
- The study found that wire leaders significantly increased shark bycatch, with catch rates for most shark species higher than those recorded with nylon leaders (Ward et al., 2008).

Recommendations : Bycatch Mitigation



1

Article Full-text available
Effects of barium-ferrite permanent magnets on great hammerhead shark *Sphyrna mokarran* behavior and implications for future conservation technologies

January 2015 · *Endangered Species Research* 26(3):243-256
DOI: 10.3354/esr00629

• Craig P. O'Connell · • Saang-Yoon Hyun · • Samuel Gruber · • Pingguo He



Fisheries Research
Volume 29L, November 2023, 107941



Ferrite magnets do not deter blue sharks (*Prionace glauca*) from bait strikes in behavioural trials

Sol Lucas ^{1,2,3}, Gonzalo Araujo ^{1,2,3}, Rosalind M.K. Brown ⁴, Mark Johns ⁵



Gear Modifications : Shark Deterrent Devices/Ferrite magnets (Rare earth magnets)
Deploy electromagnetic repellents (e.g., rare-earth magnets or electropositive metals like lanthanides) on hooks or leaders, exploiting shark ampullae of Lorenzini sensitivity to disrupt approach behaviors, yielding 20–40% hooking reductions in trials without affecting tuna.



2

Gear Modifications : Squid Ink casing (Biodegradable)
replacing plastics with the following biodegradable alternatives:

- Natural latex from rubber trees (Biodegradable for 1-2 months),
- Starch-Based Bioplastics with Plasticizers (e.g., TPS or PBAT blends)
- Seaweed based membranes, alginate/carageenan films



3

Mandates : the implementation of dehooking devices in tuna handline operations
mandate the onboard carriage and use of dehooking devices for each utility boat and motherboat (e.g., long-handled dehookers 1-2m extension). These tools enable rapid, minimally invasive gear removal from externally hooked elasmobranchs, reducing handling time compared to manual methods.

Key Findings

- **Survival and Handling:** 82.7% released via line cutting, 17.3% dehooked; implies deep hooking issues.
- **Catch Composition:** Total 228.59 MT landed; tunas 87% (yellowfin 57%, bigeye 30%), billfishes 13% as valued bycatch.
- **Diversity Metrics:** Shannon Index $H' = 1.11$, Equitability 0.40—moderate diversity, tuna-dominated.
- **PSA Vulnerability:** High for silky shark ($V \sim 2.24$), blue shark ($V \sim 2.50$)—prioritize mitigation.
- **Recommendations:** Gear mods (circle hooks), extended monitoring for MSC compliance.

Key Findings

- **Observer Coverage:** 107 trips observed over 1 year, with average 382 fishing hours and 87 deployed hooks per trip.
- **ETP Species Composition:** 52 hooked ETPs, dominated by sharks (92.3%, e.g., silky, blue, thresher), dolphins (5.8%), and rays (1.9%); no whales, turtles, or seabirds.
- **Bycatch Rate:** 0.29 ETP hooked per 100 hooks, indicating moderate risk; average 0.49 ETPs per trip or 1 ETP in every 2 trips.
- **Bait Preferences:** Sharks prefer live baits (56.3%, mainly mackerel scad); suggests bait switches for mitigation.
- **Spatial Patterns:** Hotspots in FMA 2 offshore zones, sparser in FMA 3 due to sampling limits.

Good Practices

Fisheries Observer

- Active support during Hauling
- Data Collection Amidst High Volumes
- Conducts interviews with the crew to understand the issues and challenges they face in the operations.
- Explains the importance of ETP species
- Educates crew on species identification on cetaceans, sharks, etc.
- Conducts best handling practices in releasing/dehooking sharks



Tuna Handliners

- The crew requests the onboarding of fisheries observers on their vessel to obtain their catch weight.
- Always prioritizes the safety of observer
- Immediate fish delivery and Post-capture processing
- Minimized Handling time on ETP species
- Willingness to release and dehook ETP species
- Cutting the line near the shark's mouth when hooked, mitigating the impact on the ETP species
- Complete vessel safety equipments
- Zero Discards



DAGHANG SALAMAT!



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- Dr. Alma Dickson, Consultant, BFAR-Capture Fisheries Division (CFD)
- Mr. Peter Erick M. Cadapan, Officer-in-Charge, BFAR- National Mariculture Center (NMC)
- Mr. Rafael Ramiscal, Consultant, BFAR-Capture Fisheries Division (CFD)
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- Ms. Princess Marie Alynagen Roque, Technical Staff, BFAR-Capture Fisheries Division (CFD)
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- Mr. Keven Lloyd Dipay, Staff, Contreras Professional Consultancy Corp. (CPCC)

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