



NATIONAL STOCK ASSESSMENT PROGRAM
THE PHILIPPINE
CAPTURE FISHERIES
ATLAS

SPECIAL BOOK PUBLICATION OF THE PHILIPPINE JOURNAL OF FISHERIES

Editors:

Mudjekeewis D. Santos
Noel C. Barut
Drusila Esther E. Bayate



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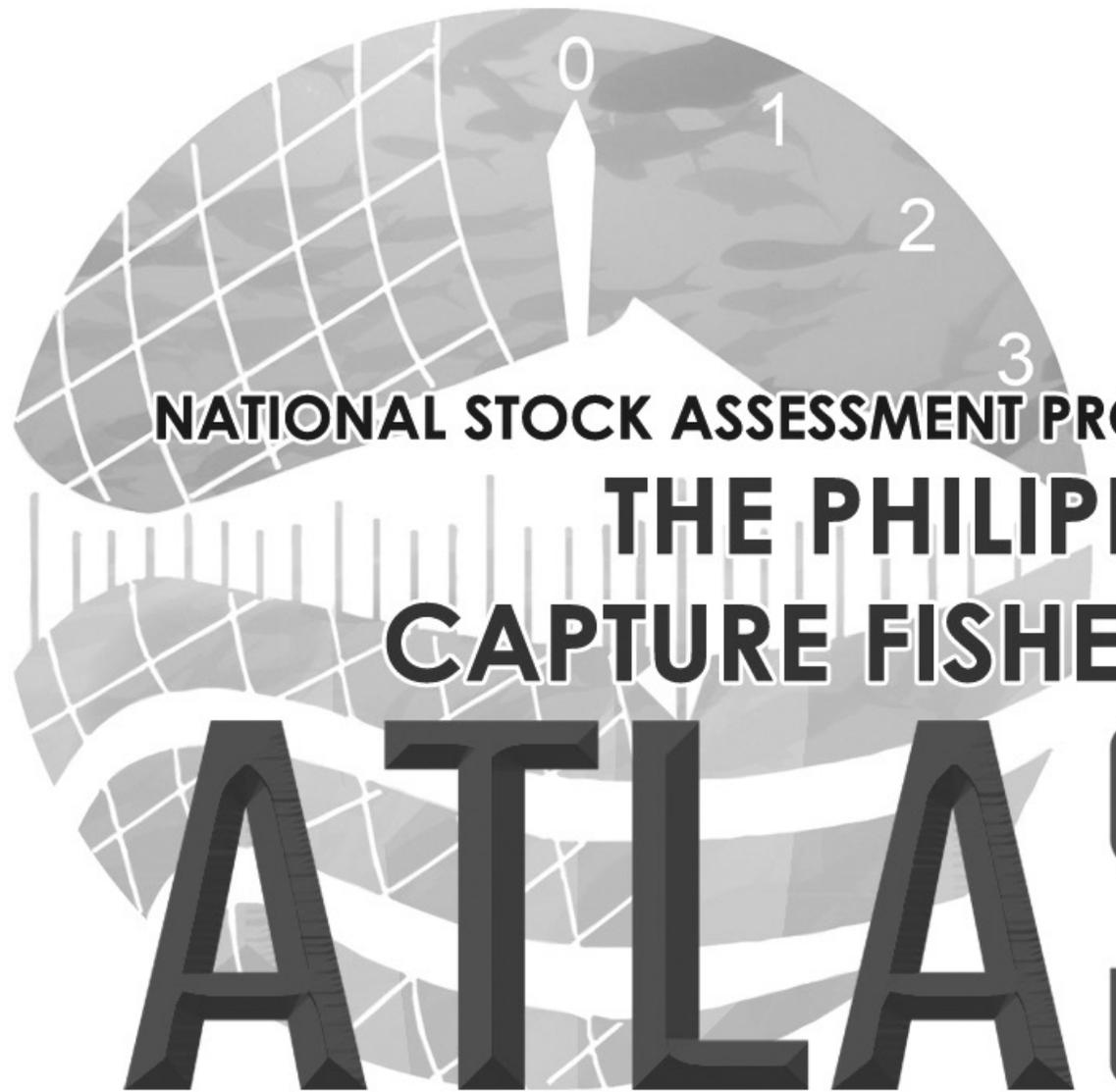
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Foreword



Allow me to congratulate our partners and colleagues at the National Fisheries Research and Development Institute and the National Stock Assessment Program (NSAP) for their successful publication of this atlas of Philippine fisheries.

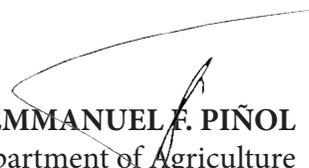
The fisheries sector contributes significantly to the economy, conferring economic benefits such as generating employment, increasing export earnings, and providing cheap source of protein for the population. However, all of us are aware that our marine resources are being fast degraded and depleted.

To prevent this threat from becoming a crisis, we have to judiciously manage our marine resources by striking a balance between environmental sustainability and economic viability. This underscores the need to more accurately locate and identify fish aggregations in space and time, information that the NSAP Atlas can provide.

Upon navigating the pages of this atlas, the reader will discover a plethora of facts and figures on regional and national marine catch and their distribution, data that would help him assess the status and location of fisheries resources/stocks all over the Philippines. Such knowledge input would be of tremendous benefit to the fishery sector, including the policy makers, the scientific and teaching community, fisher folk and fishing enterprises, and other stakeholders.

We in the DA therefore hope that this atlas will be welcomed and used as reference by readers and practitioners from the government, the academe, the private sector and from all walks of life.

May the NSAP program continue to grow and provide useful information for the proper management and sustainability of our country's marine and fisheries resources.


EMMANUEL F. PIÑOL
Secretary, Department of Agriculture

Foreword



The publication of this Atlas is a dream come true for the whole National Stock Assessment Program (NSAP) and a success for the Philippine fisheries. Since its inception, NSAP has envisioned to publish a material that will contain its critical findings to aid fisheries stakeholders in crafting appropriate and sustainable fisheries management measures.

I would like to thank and congratulate everyone behind this effort especially the National Fisheries Research and Development Institute and the NSAP Team for their effort in putting together this valuable piece of research.

The fisheries sector, with its immense contribution to national welfare in terms of economic benefits and food security, is still beset by various problems such as excessive and destructive forms of fishing that push the resources and the industry to a critical state. Any effort to address this complex network of issues thus begins with a credible assessment of our resources that will allow us to formulate sound management and conservation policies.

I am optimistic that this Atlas, which provides scientific data on the location, distribution and abundance, and size and species composition of the major capture fisheries resources in our fishing grounds will result in a more thoughtful and informed decision making in the local and national policy forums.

Again, my congratulations to the NSAP Team! May this program continue to develop and benefit the fisheries sector.

Mabuhay kayo!



COMMODORE EDUARDO B. GONGONA PCG (Ret)
Undersecretary for Fisheries and concurrent BFAR National Director

Foreword



Congratulations to the National Fisheries Research and Development Institute (NFRDI) and the National Stock Assessment Program (NSAP) for coming up with a timely and relevant publication, the Philippine Capture Fisheries Atlas!

The fisheries sector, even with its vital contribution to the economy, is constantly hounded with various threats that challenge our aquatic resources and thereby affecting employment and income particularly, those in the rural areas.

The sad condition of most of our small fisherfolk in the Philippines is that, on a daily basis, they are often faced with threats such as dwindling fish supply that can be due to overfishing, ocean pollution or climate change, among others.

On a wider scale, the stakeholder is in need of reliable data and information to formulate relevant policies and implement strategies that will address the various threats and effectively manage and conserve the country's capture fisheries resources.

The publication of this atlas is well-timed as this will enable us to address the need for standardized information. This is also particularly beneficial for us in the R&D sector as this will help us in developing proactive interventions specifically on resource assessment and management.

Again, congratulations to all the people who have made the production of this atlas possible!

NICOMEDES P. ELEAZAR, CESO IV
Director, Bureau of Agricultural Research

Preface

The Philippines is one of the largest fish producers in the world. Hence, the fisheries sector is a very important sector in the country as it contributes significantly to the economy; providing employment, economic benefits, export earnings, and as cheap source of protein for the population. In addition, the Philippines is recognized as the center of the center of marine shore fish biodiversity in the world, having the highest number of aquatic species per square area (Springer and Carpenter, 2005). It is also at the apex of the Coral Triangle considered the global centre of marine biodiversity and a global priority for conservation.

While the Philippine fisheries contribute significantly to the community, it is also under numerous threats. Unsustainable harvest, habitat degradation, aquatic pollution, alien and invasive species, and climate change are just some of the issues undermining its sustainability. Should there be no proactive management interventions put in place soon, this fishery could face dire consequences, such as collapse.

To attain optimal living aquatic resource utilization, information on the resource itself is crucial. Landed catch and effort, recruitment and distribution patterns, abundance, spawning, and migration of a resource in a given fishing ground are examples of scientific information needed for effective management strategies to be formulated and implemented. Hence, the National Stock Assessment Program (NSAP) was institutionalized in 1997 as a regular program of the Bureau of Fisheries and Aquatic Resources (BFAR) to meet the following objectives:

General:

- To generate reliable data as basis in the formulation of policies for the management and conservation of the country's capture fisheries resources in order to attain sustainable utilization and conservation,
- To develop and institutionalize the capacity of BFAR Regional Offices in resource assessment and management.

Specific:

- To determine trends on seasonal distribution, relative abundance, size and species composition of the major capture fisheries resources in each fishing ground,
- To provide estimates of population parameters of the major capture fisheries resources in each fishing ground,
- To complement Bureau of Agricultural Statistics (now under the Philippine Statistics Authority) in the generation of species specific fisheries statistics.

The NSAP, since the beginning, envisioned to publish a material in the form of a book that will show information and data on the capture fisheries of the Philippines. This was thought off as early as the late 90's when the Fisheries Resources Research Division was still under BFAR with office at Arcadia Bldg., Quezon Ave., Quezon City. This Atlas therefore, is a realization of that dream. We hope that the information contained in this Atlas will serve as a useful reference material for fisheries managers, students and industry practitioners alike when they do think about the sustainable utilization and management of the country's fisheries and aquatic resources.

This Atlas would not have been possible without the support of many people including the past members of NSAP who are either retired from the government service or have moved on to another work place or unit; Salud R. Ganaden, Fe Gonzales, Rosita Calvello, Leony Mijares, Luz Regis, November Romena, Suzette Barcoma, John Zartiga, Belmor Bugaoan, Leo Palolan, Laleine Estamo, Maureen Aragon, Lilian Rueca, Nelson Bien, Ronald Bathan, Aida Luistro, Rolando Tiam, Raul Tosoc, Hanani Torilla, Dino Nunal, Felicitas Alducente, Jane Natan-Ayon, Lea Tumabiene, Said Kalbi, Ahadullah Sajili, Evie Lumingkit, Gigi Albor, Gena Abao, Daisy Burgos, Ambutong Pautong, Abdelnasser Tarabasa, Edgardo Balambao, Salma Sabdani. We thank former Research Assistants at NSAP Program Monitoring Office (PMO), Mr. Graceous Von Yip and Ms. Roselyn Aguila, as well as Administrative Assistants, Aron Alcantara, Lilibeth Abina, and John Dela Peña.

We likewise cite the support of the BFAR Regional Directors; RO I- Dir. Nestor D. Domenden; RO II- Dir. Milagros C. Morales; RO III- Dir. Wilfredo M. Cruz, RO IV CLABARZON- Dir. Lilian C. Garcia; RO IV MIMAROPA- Ruben J. Jardin; RO V- Dir. Dennis V. del Socorro; RO VI- Dir. Remia A. Aparri, Dir. Andres M. Bojos; RO VIII- Dir. Juan D. Albaladejo; RO IX- Dir. Isidro M. Velayo, Jr.; RO X- Dir. Visa Tan Dimerin; RO XI- Dir. Fatma M. Idris; RP XII - Dir. Sammy A. Malvas; RO XIII - Dir. Nerio G. Casil; RO ARMM - Dir. Janice D. Musali; and RO CAR - Dir. Lilibeth L. Signey. We acknowledge the support of previous BFAR National Directors, Dennis B. Araullo, Malcolm I. Sarmiento, and Asis G. Perez, as well as the members of the NFRDI-Genetic Fingerprinting Laboratory: Minerva Fatimae Ventolero, Roselyn Aguila, Angelli Marie Jacynth Asis, Jacqueline Marjorie Pereda, Angela Aguila, Jennifer Poniente, James Lee Abad, Graceous Von Yip, and Katreena Sarmiento for their unfailing support and encouragement in the course of the development of this Atlas.

Other partners outside of BFAR-NFRDI are also deeply acknowledged for their help in funding support, training, and others; Dir. Joaquin Abejar, Jr., OIC, Office of the Director, Administrative Service Department of Agriculture, Mr. Rollan Geronimo of the University of Hawaii at Manoa and Dr. Eric Paringit of the UP Engineering, Ms. Ethel Llana a former Scientist II and Section Chief of FRRD-BFAR. Special thanks to Dr. Geronimo Silvestre, Professor Nygiel Armada, Mr. Ian Tajonera, Ms. Regina Bacalso, Mr. Albert Vargas and team of the USAIDFISH and ECOFISH Projects for their technical and financial support. And we wish to thank Mr. Len Garces for reviewing the manuscript.

The funding support for development of this Atlas was provided by the National Fisheries Research and Development Institute (NFRDI) and the Bureau of Agricultural Research (BAR).

Dedication

We dedicate this Atlas to the members of the NSAP family who has already gone before us. Mr. Homerto Riomas (BFAR-NFRDI), Mr. Rodolfo Tabing (BFAR III NSAP), Mr Randy N. Abinal (BFAR V NSAP), Mr. Hader Ismael (BFAR IX NSAP), Alain Daymiel (BFAR IX NSAP), and Mr. Miguel Baay (BFAR CARAGA NSAP).

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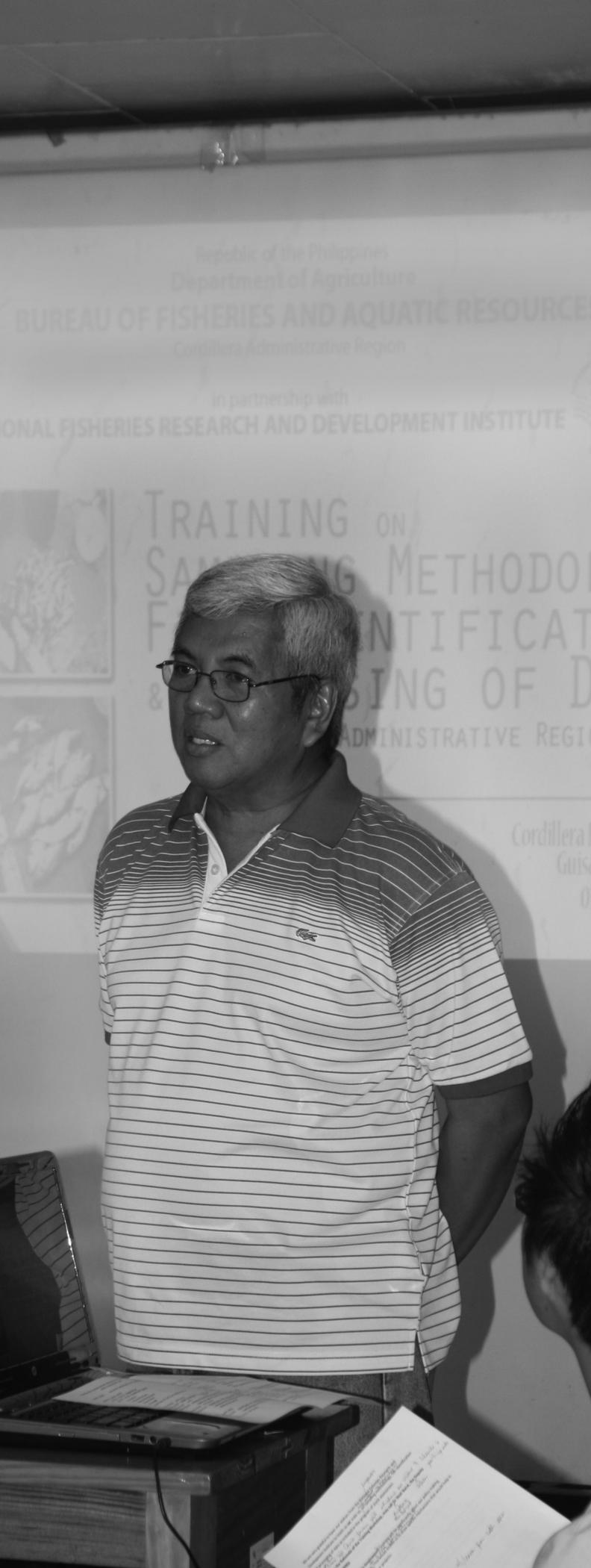
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Acronyms and Abbreviations

ARMM	- Autonomuos Regiton in Muslim Mindanao	PCG	- Philippine Coast Guard
BAS	- Bureau of Agricultural Statistics	PCRA	- Participatory Community Resource Assessment
BFAR	- Bureau of Fisheries and Aquatic Resources	PFDA	- Philippine Fisheries Management Organization
CALABAZON	- Cavite Laguna Batangas Quezon	PPMG	- Philippine Police Maritime Group
CAR	- Cordillera Aministrative Region	PNS	- Philippine National Standard
CFLC	- Community Fish Landing Center	PPPs	- Public Private Partnership
CRS	- Coordinate Reference System	R&D	- Research and Development
DA	- Department of Agriculture	RA	- Republic Act
DABAR	- Department of Agriculture Bureau of Agricultural Research	RFMO	- Regional Fisheries Management Office
EEZ	- Exclusive Economic Zone	RSBSA	- Registry System on Basic Sectors in Agriculture
FARMCs	- Fisheries and Aquatic Resources Management Councils	SOP	- Standard Operating Procedure
LGU	- Local Government Unit	SWOT	- Strengths Weaknesses, Opportunities, and Threats
MIMAROPA	- Mindoro, Marinduque, Romblon, Palawan	TARGET	- Targeted Action to Reduce Poverty and Generate Economic Transformation
MSMEs	- Micro Small Medium Enterprises	TESDA	- Technical Education and Skills Development Authority
MT	- Metric Ton	TWG	- Technical Working Group
MTP	- Medium Term Plan	UNESCO	- United Nations Educational, Scientific and Cultural Organization
MTPDP	- Medium Term Philippine Development Plan	UP	- University of the Philippines
NAPC	- National Anti-Poverty Commission	US	- United States
NCR	- National Capital Region	VAT	- Value Added Tax
NCWC	- National Coast Watch Council	VMS	- Vessel Monitoring System
NEDA	- National Economics and Development Institute	WPS	- West Philippine Sea
NFRDI	- National Fisheries Research and Development Institute	UNESCO	- United Nations Educational, Scientific and Cultural Organization
NGA	- National Government Agency	UP	- University of the Philippines
NGO	- Non-Government Organization	US	- United States
NHTS	- PR National Household Targeting System for Poverty Reduction	VAT	- Value Added Tax
NSAP	- NAtional Stock Assesment Program	VMS	- Vessel Monitoring System
NSO	- National Statistics Office	WPS	- West Philippine Sea
OPAPP	- Office of the Presidential Adviser on the Peace Process		



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1

Chapter

NATIONAL STOCK ASSESSMENT PROGRAM

History
Methodology
Database



HISTORY

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“The National Stock Assessment Program (NSAP) was conceptualized due to the lack of standardized and continuous information on fishery resources which is fundamental to fishery management and the apparent institutional incapacity of the Regional Field Units to conduct resource assessment studies in their respective areas of jurisdiction”
-Noel C. Barut

The National Stock Assessment Program (NSAP) was first conceptualized in 1995 by Mr. Noel C. Barut, who was then the Chief of the Pelagic Section of the Fisheries Resources Research Division of the Bureau of Fisheries and Aquatic Resources and is regarded as the “Father of NSAP”. With the transfer of the BFAR statistics’ function and people to the Bureau of Agricultural Statistics in 1988, and subsequent change in mandate, he saw the need for BFAR to establish its own landed catch and effort monitoring system to generate data that could be used for capture fisheries management.

With the support of then Director Dennis B Araullo of BFAR, a BFAR/FRRD Fishery Resources Assessment Training Course was conducted at Anne Raquel’s Resort, Olongapo City on November 16, 1996. Technical staff from the different DA Regional Field

Units (now BFAR Regional Offices) participated in the training. Scientists from the International Center for Living Aquatic Resources and Management, ICLARM (now Worldfish) and the University of the Philippines (U.P.) Visayas served as Resource Speakers/Trainers namely: Mr. Felimon Gayanillo, Mr. Elviro Cinco, Mr. Len Garces, Ms. Leticia Dizon, Prof. Nygiel Armada and Dr. Jose Ingles.

On June 1, 1997, by virtue of the Department of Agriculture, Special Order No. 269, Series of 1997 signed by Secretary Salvador H. Escudero III, the NSAP became official with Mr. Noel C. Barut being assigned as the National Program Coordinator, Ms. Salud R. Ganaden as Assistant National Program Coordinator and technical staff from the DA-Regional Field Units as Project and Assistant Project Leaders and DA-BFAR Central Office as Co-Project Leaders (Appendix 1).

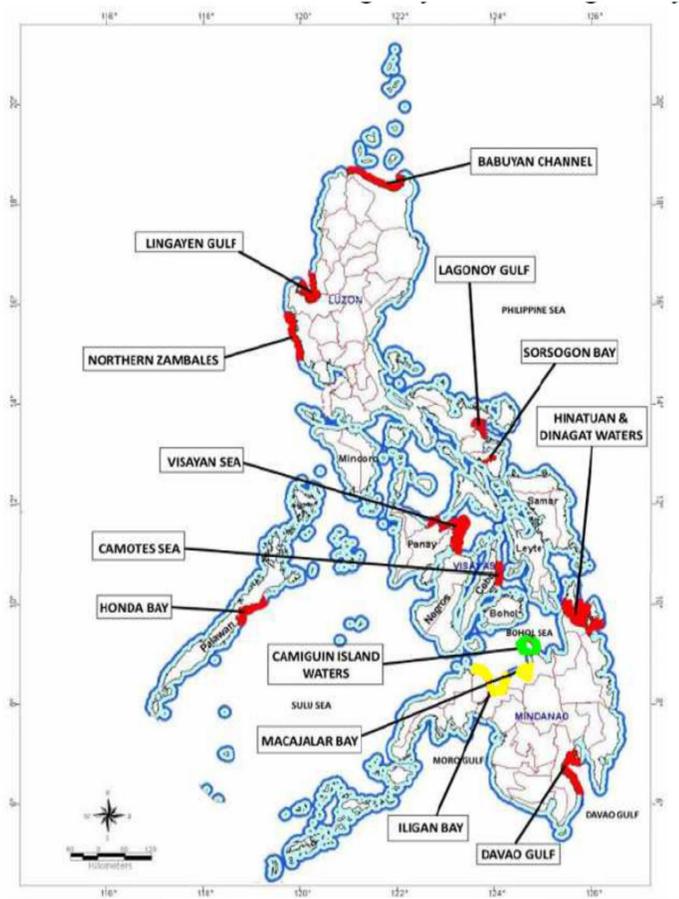


Fig.1. Fishing Ground in the Philippines and Exploitation ratio

2009 CBD Biodiversity Report

The first significant publication contributed from NSAP was the Fisheries Report under The 4th National Report to the Convention on Biological Diversity of the Republic of the Philippines entitled “Assessing Progress Towards the 2010 Biodiversity Target” in 2009. This is where the 1st map of the fisheries exploitation ratio in major fishing areas in the country was published indicating that 10 out of the 13 major fishing grounds in the country were already experiencing overfishing (Fig. 1). The map uses color coding: red means the Exploitation (E)-value exceeds the recommended maximum, yellow means the E-value falls within the ideal range, and green means the E-value is lower than the minimum exploitation rate (E0.1).

Technical Paper Series

The next significant reports published by NSAP were the Technical Paper Series published by the BFAR-

National Fisheries Research and Development Institute in 2009. Six (6) technical papers on the fish stock assessment of Honda Bay, Lagonoy Gulf, Northern Zambales, Sorsogon Bay, and Visayan Sea were featured. There were other stock assessment reports from the other fishing grounds but these were included for later publication.

NSAP Conferences

There were also two (2) conferences that the NSAP organized to showcase the many results of the stock assessment studies conducted by the various NSAP teams at the national and regional levels. The first was held in the Bureau of Soils and Water Management (BSWM) 2011 and the second was in General Santos City in conjunction with the Annual Tuna Festival in September 2014.

NSAP National Database

The development of the NSAP Database system was initiated in 1997 by Mr. Valeriano Manlulu with the help of Dr. Peter Williams of the South Pacific Commission following the Landed Catch and Effort Monitoring framework of the Program. The different versions of the database have since been used by the NSAP Regional Teams for data storage and analysis. But it was only in 2014 that the NSAP National Database was developed with the creation of an NSAP Program Monitoring Office at the NFRDI. The NSAP National Database allowed for the uploading and synchronization of all Regional NSAP data to a single server in NFRDI. The National Database also provided additional level of storage and back-up, as well as security for the millions of data points being uploaded in the system from all over the country. It was also during this time that the Regional NSAP teams were provided by high throughput scanners by NFRDI that allowed them to electronically store raw data forms to the NSAP Database System.

Seasonal Fishing closures

The NSAP has provided information in support of numerous management strategies at various levels, whether local, regional, national and/or international. Considered as the most notable contribution of NSAP is the passing of the highly successful large, seasonal fishing

closures for pelagic species being implemented by DA-BFAR and the DILG-LGUs. These are: 1) Zamboanga Peninsula for sardines (BFAR Administrative Circular No. 255 Series of 2914 entitled “Establishing Closed Season for the Conservation of Sardines in East Sulu Sea, Basilan Strait and Sibuguey Bay”); 2) Davao Gulf for small pelagics (Joint DA-DILG Administrative Order No. 2 Series of 2014 entitled “Establishing a Closed Season for the Conservation of Small Pelagic Fishes in Davao Gulf”); 3) Northern Palawan for roundscads (Joint DA-DILG Administrative Order No. 1, Series of 2015 entitled “Establishment of a Closed Season for the Management of Galunggong (roundscad: Decapterus

spp.) in Northern Palawan. The seasonal fishing closures are such a success that it is being replicated now in various parts of the country.

NSAP Expansion in 2014

In January 2014, following the commitment of the Philippines to improve port sampling and data collection of tuna to the Western and Central Pacific Commission (WCPFC), the BFAR Management Committee lead by then Director Asis G. Perez approved the expansion of NSAP from a budget of Php 30M to Php 190M pesos and endorsed the same to the



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Department of Budget and Management (DBM) for funding. This was subsequently approved and is now part of BFAR's Annual Budget.

On April 16, 2014, by virtue of the Fisheries Office Order No. 36, Series of 2014 approved by Interim Executive Director Melchor M. Tayamen, the NFRDI-NSAP Team for the Project "Expansion of the National Stock Assessment Program (NSAP)" was established. Mr. Noel C. Barut was designated as the National Program Coordinator and Dr. Mudjekeewis D. Santos as

the Assistant National Program Coordinator (Appendix II).

With the retirement of Mr. Noel Barut on January 4, 2017, the management of NSAP has been designated to Mr. Francisco Torres, Jr. as the National Program Coordinator as per instructions of the current Interim Executive Director of NFRDI and concurrent BFAR Assistant National Director, Drusila Esther E. Bayate, CESO IV.



METHODOLOGY

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1. INTRODUCTION

One of the main thrusts of the Bureau of Fisheries and Aquatic Resources (BFAR) is to ensure sustainable management of aquatic resources in the country to achieve food security, a situation that needs for a countrywide detailed assessment as basis to formulate management options. Based on this demand, the National Stock Assessment Program (NSAP) was conceptualized and implemented by BFAR to provide standardized and continuous information on fishery resources, i.e. fish catch statistics and biological information, which are fundamental for fisheries management. This also aims to develop the institutional capability of the regional field units of BFAR to conduct resource assessment studies in their respective areas of jurisdiction.

To ensure accurate data collection and recording, a standard NSAP method should be followed. This manual of methods was prepared to guide the program implementers particularly the data enumerators in the implementation of the project in the regions.

2. DATA COLLECTION

2.1. SAMPLING STRATEGY

Fisheries data are collected through “sampling method” in which a small part of something or a small number of items from a group are selected for examination or analysis to estimate the quality of nature of the whole. In this method only a small number of units are sampled to minimize time and cost without reducing the accuracy. Data collection by sampling method can be done through random

sampling whereby samples are acquired in a random manner. In such sampling operation, all observations in the fish population are given the same probability of being sampled. In the case of a very big landing area that the assigned enumerators cannot possibly record all the fishing boats that are landing, a stratified random sampling maybe applied. In this method, the whole population/area is first subdivided into strata then a stratum is selected to be the sampling area wherein a random sampling method is applied. The opportunity for inclusion of each observation in the sample is constant for each stratum or segment of the population.

2.2. REQUIRED DATA TO BE COLLECTED
(in priority sequence):

- a. **Catch & effort.** This is the overall landings and fishing activities within the sampling area. This can be done through direct interview with the fisherman or fishing operator. The three main points of conversation are: *total landed catch* (by boat, by gear); *type of fishing gear used* (e.g. ringnet, purse seine, surface gillnet, Handline, etc.); and *fishing effort* (e.g. number of hauls, number of hours fishing, etc.) (Refer to 3.2.2 for the list of fishing efforts). All catch and effort information are recorded in Form 2.
- b. **Total sub-sample weight and weight of each species group.** This can be done by borrowing sub-samples from the catch by gear. Know the total sub-sample weight then sort to species group (identify to species level and use Scientific Name e.g. *Nemipterus japonicus*, *Decapterus macrosoma*) and get the *weight of each species group*. The weight measurements are entered in Form 2a.

- c. **Length measurements by species by gear.** All the species in the sub-sample can be measured immediately or only selected commercially or dominant species, depending on the instruction of the Project Leader. The length measurements are recorded in Form 2b.

2.2.1. Source of catch & effort data:

- 1. **Survey at landing center** – The data are collected by the enumerators at the landing site through direct interview with the fishermen to obtain information on when, where, how much of the fish were caught by what fishing gear and how much effort was used, etc. This method is usually effective only for coastal fisheries, which operates near shore and take a trip for a day or few days only since it depends mostly on the fishermen’s memory.
- 2. **Survey by logbooks** – This method is effective for large-scale fisheries (i.e. commercial boats), particularly for boats that stay in the fishing ground for a considerable length period (e.g. Purse Seiners). Data on catch & effort are recorded thru logbook system. Generally, commercial boats keep their own navigation and fishing logs.

2.3. FREQUENCY OF SAMPLING AND SCHEDULES

There is a standard sampling schedule for NSAP. Sampling day is every after two-days in each landing site regardless of Saturdays, Sundays and Holidays or a total of 10 to 11 surveys each month per fish landing site for

Standard Monthly Sampling Schedule

Days

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31

- Landing Site 1 – Major or Commercial Landing Site
- Landing Site 2 – Minor or Municipal Landing Site
- Data Checking and Form Completion (non-sampling day)

30 and 31 days in a month, respectively. Classification of major and minor fish landing sites depends on the bulk of boat landings. Major fish landing sites have more number of boat landings than minor fish landing sites and a combination of commercial and municipal boats maybe landing in the area. In the case of commercial and municipal landing sites, only commercial boats (with more than 3 GT) are being monitored in the commercial landing site and municipal boats (weighing 3 GT or less) in municipal landing site. Each Data Enumerator or pair of Data Enumerators are usually assigned in two fish landing sites where they move from Landing Site 1 to Landing Site 2, by following the NSAP schedule. For example, if the first day of the month is scheduled for major landing site (Landing Site 1) the second day is scheduled for minor landing site (Landing Site 2). Or if the first day is for commercial landing site (Landing Site 1), the second day is scheduled for municipal landing site (Landing Site 2). Every third day following the 2 sampling days is a non-sampling day. This day is allotted for data checking and form completion. The same sampling pattern is followed for the succeeding days until the end of the month. In case of months with 31 days, the last day is scheduled for Landing Site 1. On the first day of the following month, the assigned Data Enumerator(s) will still go back to Landing Site 1 as a start of the month. This is so since every month is treated separately and a standard monthly sampling schedule is strictly followed. Below is the standard monthly sampling schedule for strict compliance by the NSAP team.

2.4. SAMPLING ACTIVITY

Reminders when collecting catch and effort information:

- Before recording the catch, ascertain whether it is a complete catch, incomplete catch (determine how much were eaten from the catch, set aside to be divided among the crew or given out to other people), partly sold (determine how much were sold), or mixed catch coming from different fishing gears (single fishing boat that use multiple fishing gears).

- To determine the weight of the container, check if it is full of fish or with water and ice (by pushing down the fish). Estimate the weight of the container with fish minus ice and water.
- Record boats that land even with “no catch” provided an “effort” was used. Know the reason for having no catch (e.g. due to “engine trouble”, “entangled net”, etc.).
- Include and monitor “night landings” during sampling day.
- Do not mix samples coming from various gears since each gear type is selective for different sizes of individuals from the stock
- Do not include fish of floating buyers (buyers that buy the fish directly at the fishing ground) especially if coming from different sources and cannot be segregated.
- Remember the priority sequence. The catch and effort information of all the boats that land during sampling day should be recorded. If the fisherman is not in a hurry to dispose his catch, go to the second priority and immediately to the third priority if it is still okay with him.

2.5. SUB-SAMPLING THE CATCH

Sub-sampling should be done by gear. This is important to determine the distribution of the species composition and likewise to collect data on length frequency.

A reminder on how to obtain a representative sub-samples:

- Get fish samples at random and from top and bottom of container. Exercise caution during sub-sampling because sometimes large fish are selectively placed at the bottom or on top of the container. In most cases, the small fish are the one placed at the bottom of the container.

- For pre-sorted catch (by species, by size) upon landing, borrow sub-samples from each pre-sorted group. First determine the weight of each pre-sorted group then proceed with the sorting and the usual sub-sampling method.
- Data coverage should be reasonably good but not always necessary to attain 100% for the catch of un-sampled boats can still be raised or segregated. It is important to take a sub-sample of the catch by gear but not necessarily from all the boats. If possible, at least 10% of the landed boats should be sampled.

3. DATA FORMS

In order to facilitate the encoding, collection and processing of data, all essential data elements are collected and recorded in standard forms. The data will be encoded and processed using the developed NSAP database. The length frequency data can be analyzed using FISAT Program (see Reference & User's Manual, Gayanilo, et. al., 1997) or by using other assessment programs. The basic design of the NSAP forms was adopted from the Food and Agriculture Organization (FAO) and was also used by the other assessment projects of BFAR i.e. Tuna Project, and Small Pelagics Management Program. The survey method is carried out using the following NSAP Forms (See Appendix 1 for the Sample Forms).

NSAP Form 1	: Monthly Report (Landing by Gear & Length Frequency)
NSAP Form 2	: Fish Landing Survey Form (Catch & Effort)
NSAP Form 2a	: Landed Catch & Effort Monitoring (Weight Measurement)
NSAP Form 2b	: Landed Catch & Effort Monitoring (Length Measurement)
NSAP Form 3	: Length Frequency Tally Sheet
NSAP Form 4	: Boat Particulars
NSAP Form 5	: Gear Particulars

3.1. NSAP FORM 1 - Monthly Report (Landing by Gear & Length Frequency)

NSAP Form 1 is a monthly summary report of the boat landings by gear, the sampled boats and the length measurements. All information in this form are derived from forms 2, 2a & 2b. This form is usually accomplished every sampling day after completing forms 2, 2a, 2b, and 3.

3.2. NSAP FORM 2 - Fish Landing Survey Form (Catch & Effort)

NSAP Form 2 is for catch & effort statistics. This is the most essential part of the NSAP reporting forms for this contains all fishing boats landing for the day with particular catch information. With this survey form, the total catch, fishing gear and corresponding effort, and the catch composition with weight are recorded.

3.2.1. Coverage Catch

Catch data should cover all fishing boats that will land in the designated fish landing site during sampling day, regardless of gear type, and are recorded by fishing ground. The time schedule of boat landings varies by landing center. It is important that all boats that land during sampling day, including early morning and night landings, and all fishing operations that do not require the use of fishing boat i.e. beach seine, manual push net, fish corral etc. should be recorded. Also, all fishing boats that will land with "no catch" provided the gear was used in the fishing operation even just for a short time, it has already a corresponding effort and should be recorded. Any reasons and observations made should be written in the remarks. Be observant for fishing boats using multiple fishing gears (sometimes 2 to 3 types) for these should be recorded however, it is essential that catches from one gear be separated from catches taken from other gears. Do not mix catches from various gears, since each type of gear is selective for different sizes of individuals from the stock. In case it is not possible to separate the catch by gear, list all the gears used and write in the remarks the estimate of the proportion of catches (%) made by each gear type by asking the fisherman. Fish of floating buyers coming from different sources are not included if it is impossible to separate them by fishing gear or by fishing boat. Some fishermen dispose their catch to floating buyers right at the fishing ground and usually big or first class fish are being sold to them. Be observant and always

ask the fishermen if their catch is still complete. Also, ask for the quantity of catch (kilogram) they set aside as share by the other fishermen on board, those given to friends, and for personal food consumption (“ulam”). These should all be added to the total catch of the boat.

DATE	Refers to the date of sampling
LANDING CENTER	The assigned landing site during sampling schedule. It can either be commercial, municipal, major, or minor landing center.
FISHING GROUND	The water where the fishing boat operated or where the fishes are caught.
ENUMERATORS	The name of the data collectors assigned in the designated landing area.
NO. OF SAMPLES	The total number of boats sampled for length & weight measurements.
SAMPLE SERIAL NUMBER	Refers to the serial number of the fishing boats monitored.
BOAT NAME	The name of the boat that operates in fishing. If the boat has no name, as in the case of some non-motorized boats, the name of the fishing operator or fisherman may be used provided it is constantly used for that particular boat. The boat will be classified according to gear type.
FISHING GEAR	The type of fishing gear used in catching fish.
FISHING EFFORT	The fishing power exerted to capture/harvest the fish in a given fishing area.

3.2.2. Commonly Used Fishing Gears and Measures of Effort

The following are the most commonly used fishing gears with codes and the recommended measures of effort for each gear type. Other fishing efforts may be added when necessary.

Fishing Gears

- Trawl (T)
- Purse Seine (PS), Ringnet (RN), Bagnet (BN); Beach Seine (BS)
- Danish Seine (DS)
- Bottom Gill Net (BGN), Drift Gill Net (DGN), Surface Gill Net (SGN)
- Lift Net (LN)
- Multiple Hook & Line (MHL), Hook & Line (H&L), Longline (LL)
- Handline (H)
- Troll Line (TL)
- Jigger (J)
- Spear Gun (SG) (with or without compressor)
- Fish Pot (FP), Fish Corral (FC), & other fixed gears

Fishing Effort

- Number of hauls, Dragging hours
- Number of hauls, Fishing hours
- Number of hauls
- Length of net in meters (Number of “banata”), Number of hours setting
- Number of hauls, Soaking time
- Number of hooks, Number of sets, Soaking time
- Number of hours fishing, Number of lines, Number of days fishing
- Number of lines, Number of hours fishing
- Number of jigs, Number of hours jiggig
- Number of spear used, Diving hours
- Number of hours during which the gear was in the waters, Number of hauls per day, Number of unit

Know if the fishing operation was done in “payao” (Fish Aggregating Device/FAD) or “free school” (F), especially for ringnet, purse seine, and handline.

For gillnet, always check the number of “banata/panyo” (sheet netting) used during fishing operation and know the length per sheet to compute for the total length of the gear (Length of Banata x Number of sheets). The detailed fishing gear information should be recorded in form 5 (Gear Particulars).

UNIT OF CATCH (Weight) : Record total catch in kilograms or metric tons while the sub-sample weights in grams

TOTAL BOAT CATCH : The quantity (actual estimation) of fish catch by a particular fishing boat per fishing gear. The weights of the species in the catch composition (Market Categories) are summed up to get the total catch.

No. of Boxes : Refers to the number of fish containers used. The containers can be in the form of boxes, bañeras, foams, etc.

Weight in Kg. : Actual estimated weight of catch per boat, per gear. If fish catches are in containers, the standard weight of each container can be determined by asking the fishing operators, fishermen or fish buyers. However, the actual weight of each container with fish, varies depending on the amount of fish and the proportion of water and ice present. In this case, the estimated weight of the catch in each container can be determined by carefully pushing down the fish with the palm. Then, estimate the weight of the fish in the container minus the water and ice.

TOTAL SAMPLE : The quantity of fish sub-sampled for species composition in weight, and for length measurements by fishing boat & by fishing gear.

No. of Boxes : Refers to the number of containers where fish sub-samples were taken for length & weight measurements.

Weight in Kg. : The total weight of the sub-samples taken.

CATCH COMPOSITION Market Categories (Boxes/Kg.) : Refers to the species composition in the catch of the boat by gear with corresponding (Boxes/Kg.) weight by species. If possible, scientific name is used. The estimated catch (under the catch composition) should tally with the number of boxes and weight found in the column of the total boat catch.

from commercial (C) and municipal (M) fishing boats by fishing gear are totaled separately.

3.2.3. Steps in Raising Individual Group in the Sub-sample to Total Catch.

- Determine the **total boat catch** (weight) or count the number of containers filled with fish and record for this can be used in raising to the total catch later. In the first place have an estimated weight of the container filled with fish minus ice & water.
- Determine the state of the catch if pre-sorted (by species, genus, family, or size), unsorted (mixed), or a combination of sorted & mixed. Record accordingly.
- Raise samples to the total catch of the boat (by following the simplified formulas below).

RAISING METHOD:

A. Unsorted or mixed catch:

1. Randomly select containers, get sub-samples and weigh to get the Total Sub-Sample Weight. One or more containers can be sampled by species.
2. Sort by species/genus group.

If possible sort fish to species level and identify them using Scientific Name. Avoid the use of spp., if possible.

3. Weigh each sorted species group to determine the **weight of each group** and record in form 2a.
4. Raise each species group to the total catch by following the formula below (RF1). This will be recorded in form 2 (Catch Composition - Market Categories).

$\text{Raising Factor 1 (RF1)} = \frac{\text{Wt. of each species group}}{\text{Total sub-sample weight}} \times \text{Total Catch of the boat (weight)}$
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5. Add all raised weights to get the total boat catch by species.

At the end of each sampling day, the number of boats that landed and their catch equivalent by species for the day should be raised and totaled. Catches coming

B. Pre-sorted Catch (either by family, genus or species):

1. Determine how many classes are there and if only sorted by genus or family.
2. Determine the number of containers of each class or group.
3. If the catch is pre-sorted by species, estimate the total weight of each species group by following the formula below (RF2).

$\text{Raising Factor 2} = \text{Wt. of container of Species A} \times \text{Number of Containers}$ <p>(RF2)</p>
--

4. Add all raised weights to get the total catch of the boat by species.

If the fish are only pre-sorted by genus or family, sort further by species. Follow A2-5.

C. Pre-sorted Catch (by size):

1. Determine the number of containers of species having the same size (e.g. large, medium & small) to get the **total catch by size**.
2. Randomly select containers by size, get sub-samples and weigh to get the Total Weight of Sub-Sample by Size. Get sub-samples from different sizes and have a separate record of the total sub-sample weight & species weight by size.
3. Raise individual weight of each species group by size to total catch by size.

$\text{Raising Factor 3} = \frac{\text{Wt. of species group by size}}{\text{Total weight of sub-sample by size}} \times \text{Total Catch of the boat}$ <p>(RF3)</p>	<p>(weight)</p>
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4. Add all raised weights of the same species regardless of size
5. Add all sub-totals by species to get the total catch of the boat.

D. Combination of Mixed & Sorted Catches:

1. Determine the number of containers with sorted catches and mixed catches then record separately.

2. Raise sorted & mixed catches separately. In raising the sorted catch, follow B1-4. For mixed catch, follow A1-5.
3. Add all raised weights of the same species from the sorted & mixed catches.
4. Total all weights by species to get the total catch of the boat.

Record in Form 2 (under Catch Composition – Market Categories) the raised weights by species. Raisings of catch is usually done at the end of sampling when no more boats are expected to land on that day.

The space for “**Remarks**” is provided for any unusual observations/comments during sampling day (e.g. weather condition, barangay or town fiesta, etc.).

The Data Enumerator/s who accomplished the forms should sign at the space provided, noted by the Project Leader or the Assistant Project Leader.

3.3. NSAP FORM 2A - Landed Catch & Effort Monitoring (Weight Measurement)

This form is used when conducting sub-sampling activity together with NSAP Form 2b (Length Measurement). The actual weights of species group from sub-samples are first entered in this form. These are the weights that are raised to total catch of the boat.

3.3.1. Steps in Sub-Sampling for Weight Measurement:

- Determine the total catch (weight) of the boat (by gear) to be sampled.
- Borrow sub-samples at random by gear, weigh then record.

Exercise caution during sub-sampling because sometimes, large fish are selectively placed at the bottom of the container or vice-versa. If only the fish at the top of the pile are measured the sample is biased.

- Sort sub-samples to species groups.

Sub-samples are sorted to species group and properly identified to species level, if possible, using Scientific Name. Species should be identified correctly because any small errors in species identification will become magnified to huge errors when raised.

- Weigh each species group.

Each species group is weighed (in grams) & recorded in NSAP Form 2a.

3.4. NSAP FORM 2B - Landed Catch & Effort Monitoring (Length Measurement)

Species are collected for length measurements by fishing gear. Taking the length measurement is important to assess their growth and mortality within the fishery.

3.4.1. Collection of Length Data

1. Determine if all the species in the sub-sample are to be measured or only selected species.
2. Get individual length measurement of species

After weighing the samples, individual length measurement is taken. For fish that grow >15 cm, use centimeter. For fish that does not grow >15 cm (e.g. anchovies and all invertebrates), the actual reading is in millimeter.

If possible measure at least 30-50 pcs per species per gear, per sampling day. In case not all species are measured, weigh total fish measured per species and write at the upper right side of the space provided for (wt: ____). Weigh remaining fish not measured and write at the left side below the Box no.

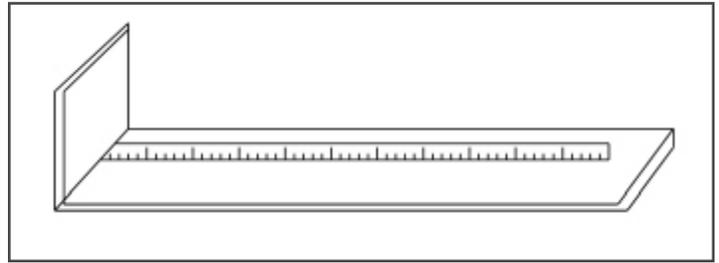
Box number refers to the number of boxes sampled. One or more boxes maybe sampled from a particular fishing boat depending on the quantity and type of catch.

After measuring, count the number of pieces measured per species and entered in the appropriate boxes provided. This is copied to form 1.

3.4.2. Measuring Instruments:

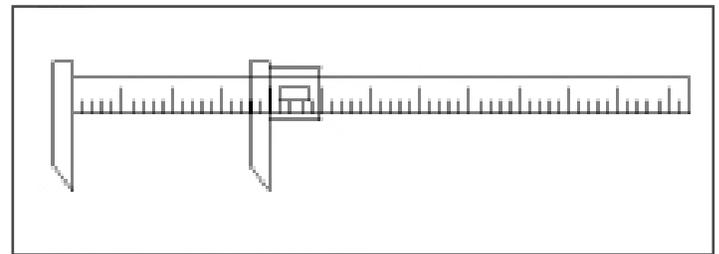
i) Measuring board

Measuring board is a suitable tool for measuring particularly, smaller fish.



ii) Caliper

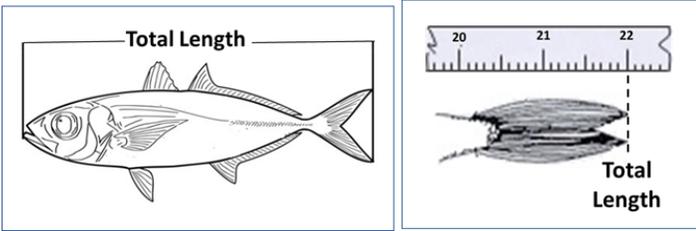
Caliper is usually used for measuring invertebrates. In the case of big tunas & billfishes, an improvised caliper made of wood can be used.



3.4.3. Types of Length Measurements:

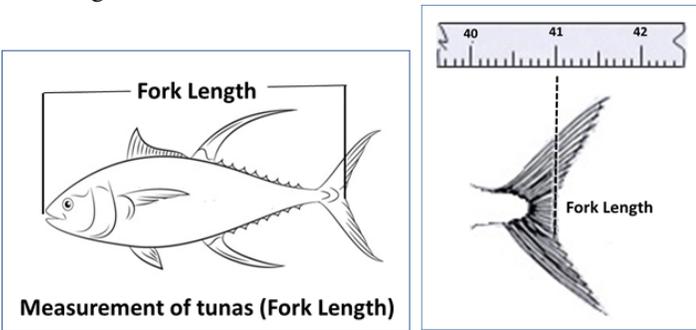
The fish is placed on a in a measuring board on a flat surface in a horizontal position while being measured. Fish with a broken snout or tail, or frozen fish not in a straight position should be rejected.

- a. **Total Length** - The distance from the tip of the snout to the tip of the caudal fin. Used for fish with soft caudal fin.

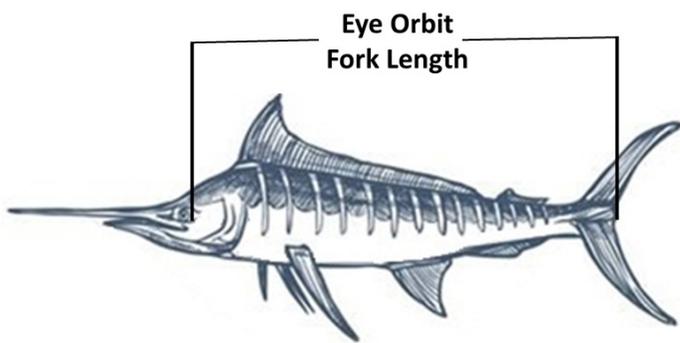


For fish with **prolonged upper or lower jaw**, measure from shorter jaw to tail; for **fish with extending filament in caudal fin**, exclude extending filament; for **fish with unequal tail length**, measure from the jaw to shortest caudal fin.

b. **Fork Length** - the distance from the tip of the upper jaw to the cartilaginous median part of the caudal fork. Used for fish with hard caudal fin, (e.g. tunas).



c. **Eye Orbit Fork Length** – the distance from the posterior edge of the eye orbit to the posterior tip of the shortest caudal ray (for billfishes).

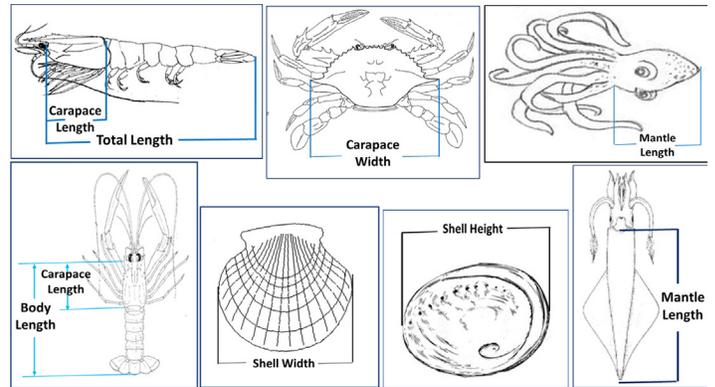


Measurement of Billfishes

d. Measurements for invertebrate species (in millimeter):

- shrimp/lobster = carapace length
- crab = carapace width

- squid/octopus = mantle length
- shells (bivalve or univalve) = total length
 - those that grow vertically – dorso ventral measurement (**shell height**)
 - those that grow horizontally – antero-posterior measurement (**shell width**)
 - In bivalves with almost the same size in length & width, measure both and get the biggest measurement.



3.5. NSAP FORM 3 – Actual Length Frequency Tally sheet (Monthly)

This form is accomplished after every sampling day. This is the grouping together of all length measurements of the same species and gear for the month. The length-frequency data should be grouped into midlength/ midpoint. The class interval to be used for species growing less than or equal to 30 cm is 0.5 cm and the midpoints will be 0.25 and 0.75 values. Those fish that attain a length of more than 30 cm, the class interval will be 1.0 cm and the midpoint value will be 0.5.

3.5.1. For class interval of 0.5 cm

(Example: *Sardinella fimbriata*)

Length interval	Midlength	Frequency
3.0 - 3.499	3.25	
3.5 - 3.999	3.75	
4.0 - 4.499	4.25	1
4.5 - 4.999	4.75	

5.0 - 5.499	5.25	1
5.5 - 5.999	5.75	3
6.0 - 6.499	6.25	14
6.5 - 6.999	6.75	22
7.0 - 7.499	7.25	11
7.5 - 7.999	7.75	18
8.0 - 8.499	8.25	10
8.5 - 8.999	8.75	10
9.0 - 9.499	9.25	15
9.5 - 9.999	9.75	8
10.0 - 10.499	10.25	5
Total =		118

This means that fish lengths which fall between 3.0 – 3.499 cm are grouped in 3.25 cm midlength and those that fall between 3.5 – 3.999 cm in 3.75 cm midlength, and so on.

3.5.2. For class interval of 1.0 cm

(Example: *Thunnus albacares*)

Length interval	Midlength	Frequency
15.0 - 15.999	15.5	
16.0 - 16.999	16.5	
17.0 - 17.999	17.5	1
18.0 - 18.999	18.5	
19.0 - 19.999	19.5	1
20.0 - 20.999	20.5	2
21.0 - 21.999	21.5	5
22.0 - 22.999	22.5	10
23.0 - 23.999	23.5	3
24.0 - 24.999	24.5	5
25.0 - 25.999	25.5	10
26.0 - 26.999	26.5	8
27.0 - 27.999	27.5	15
28.0 - 28.999	28.5	2
29.0 - 29.999	29.5	5
Total =		67

This means that fish lengths which fall between 15.0 – 15.999 cm are grouped in 15.5 cm midlength.

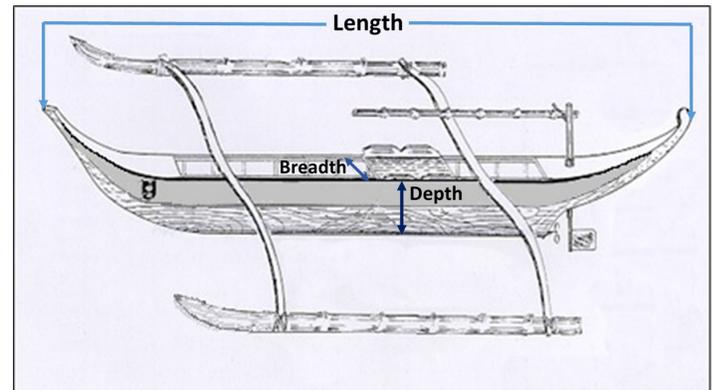
3.6. NSAP Form 4 – Boat Particulars

A record information of the fishing boats that regularly land in the designated landing sites is important. This form can be accomplished once but updated every now and then to know for boats that are no longer operating in the area, already dilapidated, or has been modified, etc.

3.6.1. Inventory of total fishing boats by size:

1. **Boat's name** - refers to the name given to identify the fishing boat.
2. **Length** - refers to the “length over all” or the horizontal distance between the extreme ends of the boat.
3. **Breadth/width** – refers to the horizontal distance of the width in the broadest part of the boat.
4. **Depth** – refers to the vertical distance from the baseline to the free board deck

Boat Measurement:



5. **Gross tonnage** – the total volume of space in cubic meters. It includes the under deck tonnage, permanently enclosed spaces above the tonnage deck, except for certain exemptions. In broad terms, all the vessel’s “closed-in” spaces expressed in volume terms on the bases of one hundred cubic feet (that equals one gross ton).

Computing the Gross Tonnage (GT):

In meter

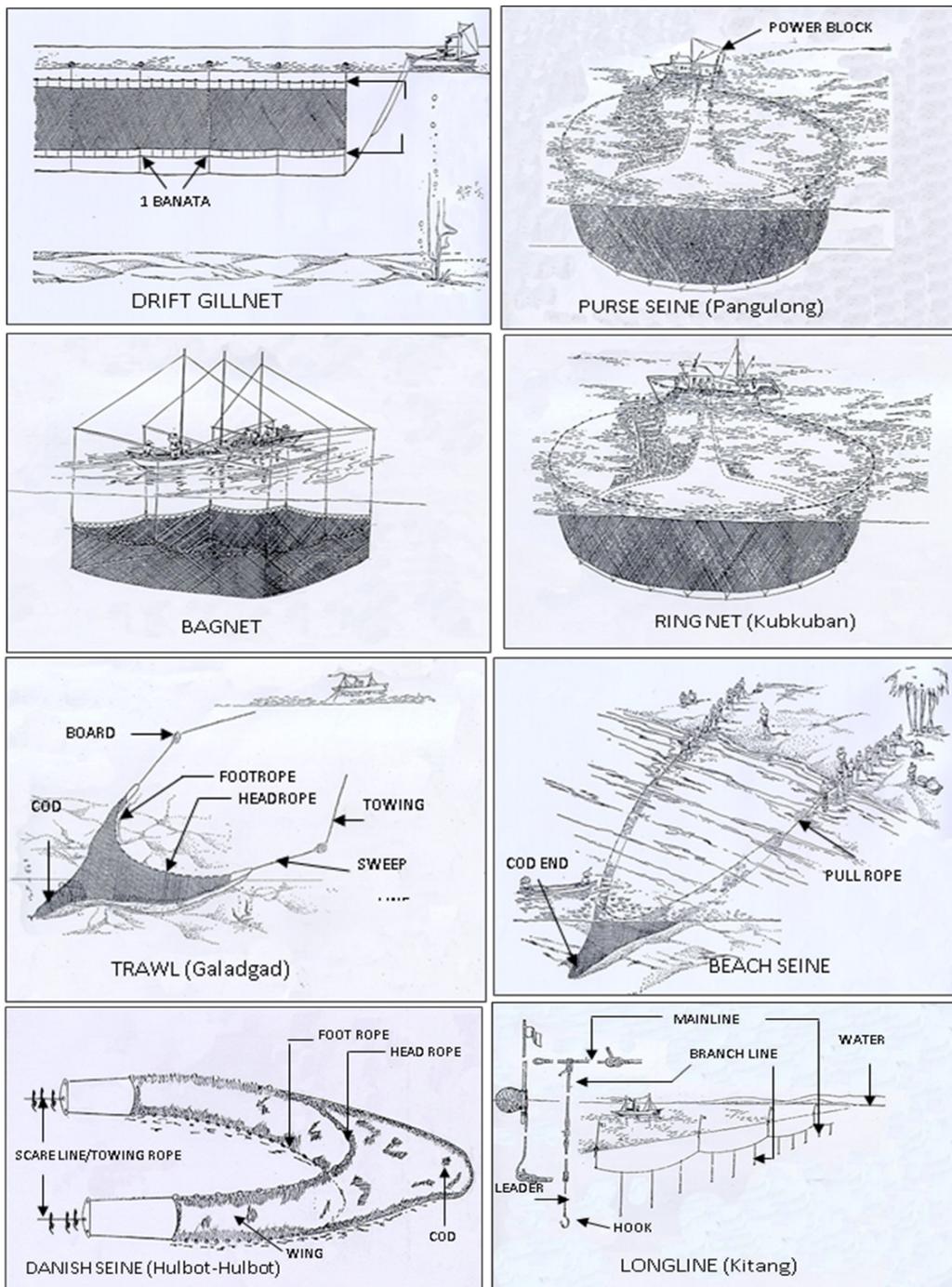
$$\text{G.T.} = \frac{L \times W \times D \times 0.70}{2.83}$$

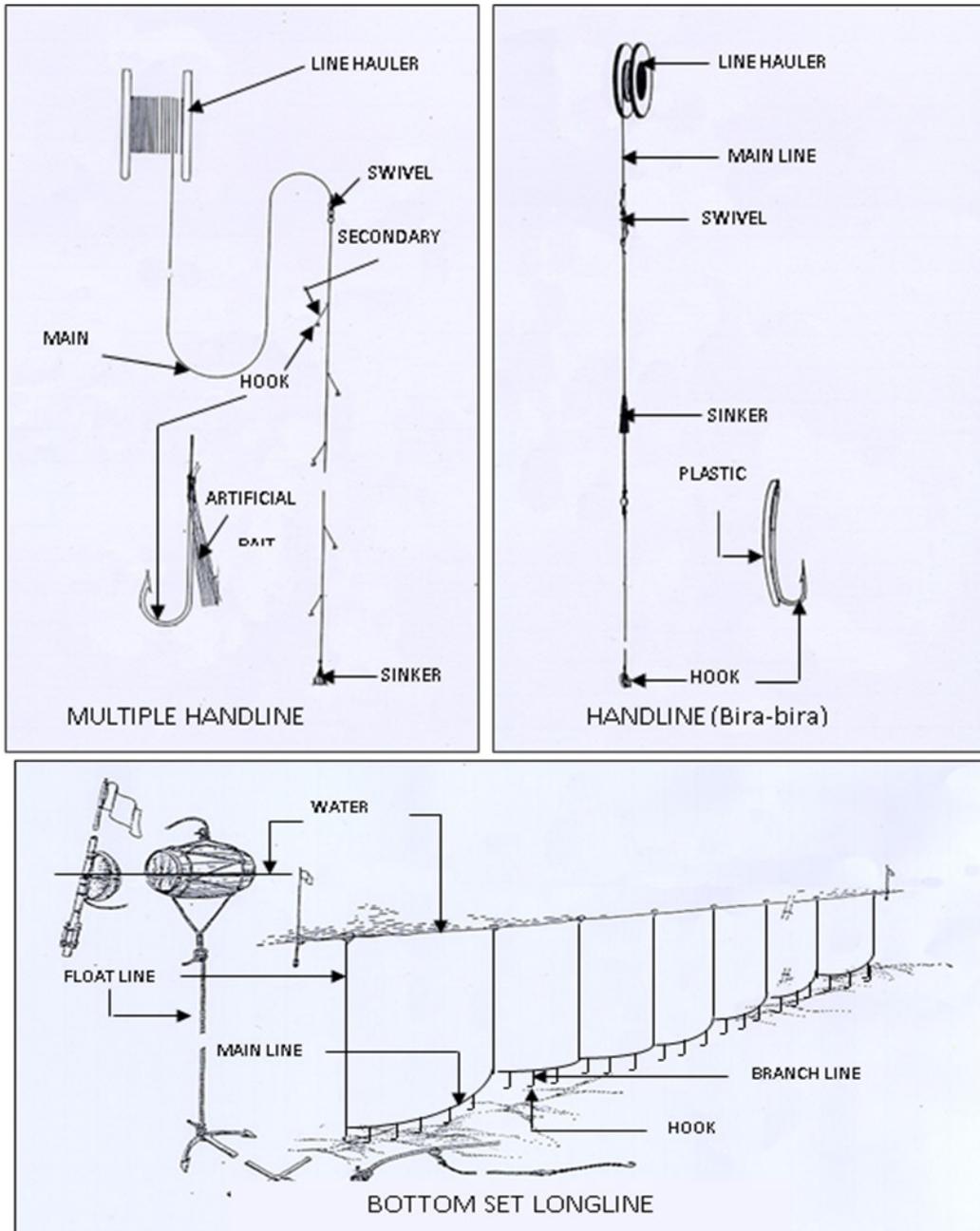
6. **Horsepower** – the power given out by the main engine.
7. **Engine type** – refers both to the brand of the main engine which is used during fishing operation and the fuel being used.
8. **No. of fishermen on board** – the number of crew on board who are involve in the fishing operation.

3.7. FORM 5 – Gear Particulars

This form is also accomplished once, just like form 4 (Boat Particulars). This should also be updated every now and then to know if there are new gears being operated in the area and to know what gears are no longer being used.

3.7.1. Common types of fishing gears being operated in the country:





Equipment and materials needed by the Data Enumerators during sampling:

1. Weighing scale (10-20 kgs & 1-2 kgs)
2. Data forms/record book/notebook
3. Measuring board/caliper
4. Container for fish samples
5. Plastic mat/mantel (for sorting fish)
6. Calculator

Optional:

7. Raincoat
8. Boots
9. Flashlight

National Stock Assessment Program
Region _____
Monthly Report

Fishing Ground _____
 Landing Center _____

Month _____
 Enumerator(s) _____

Sample Dates 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18
 19 20 21 22 23 24 25 26 27 28 29 30 31

1. Landing by gear

Gear	Date																		Total
	Boats																		
	Catch																		
	Boats																		
	Catch																		
	Boats																		
	Catch																		

2. Length Frequency

	Date																		Total
S A M P L E	Boats																		
	Boxes																		
	Kg.																		
N O. O F F I S H M E A S U R E D																			

Comments : _____

Enumerator(s) _____
 Noted : Project Leader _____

National Stock Assessment Program Region _____

LANDED CATCH AND EFFORT MONITORING (Length frequency)

DATE	SAMPLE SERIAL NO.

Landing Center _____
 Boat _____
 Fishing Ground _____
 Fishing Gear _____

Enumerator(s) _____

No. of Boxes Sampled _____
 Total Weight of Sample _____

B O X #	SPECIES :	WT :				B O X #	SPECIES :	WT :			
B O X #	SPECIES :	WT :				B O X #	SPECIES :	WT :			
B O X #	SPECIES :	WT :				B O X #	SPECIES :	WT :			

For RN and PS Indicate if set made on payao or free school

NO. OF FISH MEASURED
BY SPECIES

National Stock Assessment Program BOAT PARTICULARS

Region _____

Landing Center: _____
Fishing Ground: _____

Date: _____
Sheet No.: _____

BOAT SPECIFICATION	B O A T ' S N A M E				
	F/B	F/B	F/B	F/B	F/B
Length(m)					
Width (m)					
Depth (m)					
Gross Tonnage					
Horse Power					
Engine Type					
No. of Fishermen on board					

BOAT SPECIFICATION	B O A T ' S N A M E				
	F/B	F/B	F/B	F/B	F/B
Length(m)					
Width (m)					
Depth (m)					
Gross Tonnage					
Horse Power					
Engine Type					
No. of Fishermen on board					

BOAT SPECIFICATION	B O A T ' S N A M E				
	F/B	F/B	F/B	F/B	F/B
Length(m)					
Width (m)					
Depth (m)					
Gross Tonnage					
Horse Power					
Engine Type					
No. of Fishermen on board					

National Stock Assessment Program GEAR PARTICULARS

Region _____

Landing Center: _____
Fishing Ground: _____

Date: _____
Sheet No.: _____

GEAR SPECIFICATION	B O A T ' S N A M E				
	F/B	F/B	F/B	F/B	F/B
Trawl/Danish Seine					
Length of headrope (m)					
Length of footrope (m)					
Length of towing warp (T) or headrope(DS) (m)					
Mesh size (cod end or bunt) (cm)					
Net material					
Board dimension (T) (m)					
Gillnet					
Length of "banata" (m)					
No. of "banata"					
Depth of Net (m)					
Mesh size (cm)					
Hook and Line/Jigger					
Type: (e.g. H&L, MHL, LL, HL, Jigger, etc.)					
Length of mainline (m)					
Length of branch line (m)					
No. of hook/jigger					
Size of hook/jigger					
Bait					
Purse Seine/Ringnet					
Length of net (m)					
Depth of Net (m)					
Mesh size (cm)					
Net material					
Others					



DATABASE

Valeriano V. Manlulu, Peter Williams, Graceous Von Yip, and Mudjekeewis D. Santos

INTRODUCTION

The NSAP database system was developed to serve as the national platform of all regional NSAP for easy exchange and validation of information. This helps in enhancing fish catch and effort monitoring by serving as an efficient system for effective storing and management of the time-series raw collected information from all regional NSAP forms, and by providing both the national government, local government, and stakeholders the status of the country's fishery resources in real time. The ultimate goal of this database system is to develop the best strategy for effective fisheries management intervention in the country.

Rationale

The Philippines is rich in aquatic resources both commercially important and threatened/endangered

species (Barut et al., 2004). Recent scientific reports have shown that the Philippines is the center of the marine biodiversity in the world (Carpenter and Springer, 2004) because of the remarkable marine species diversity and assemblage.

The fisheries sector, likewise, has been vital to the Philippine economy providing substantial employment and income particularly in rural areas, contributing to export earnings, and ensuring local food security. Unfortunately, numerous anthropogenic activities threaten the fisheries sector making the Philippines “*one of the hottest hotspot*” in the world in terms of marine conservation and management (Myers, et al., 2000). Thus, information on the status of the resources is vital for sustainable management of fisheries.

Fisheries is one of the hardest disciplines to quantify. Determining the status of the resources with the current level of fishing efforts, and assembling time

series of catch and species composition with reasonable accuracy and precision, are difficult tasks (Pauly, 1988). A lack of a standardized resource assessment hinders the capability of managers and stakeholders to make informed decisions (Garces et al., 2006).

The National Stock Assessment Program (NSAP) was designed by the Bureau of Fisheries and Aquatic Resources in 1996 to develop standardized, specific, and time-series information on capture fisheries for the management of the country's marine resources. The NSAP, being a part of the General Appropriations Act (GAA), has become an indispensable tool by contributing the scientific baseline for the effective management interventions of the country's aquatic resources, both in the national and local scene. Moreover, the Philippines has the only fisheries stock assessment program which has a systematized and standardized methodology which is well-regarded among other southeast Asian nations.

The NSAP is the only source of time-series fish catch and effort data, which are primarily recorded in raw forms. Such data, which are not in electronic format, are maintained in all NSAP regional offices, therefore, access and analysis on the raw data provides a fisheries-independent measure of resource and status, and be used to generate historic baselines for restoration and management (Garces et al., 2006).

However, challenges in documentation and archiving information from the raw forms are numerous and complex. Changes in the management body, both administrative and technical, can also hamper the continuity of use of information (Cabral et al., 2014). With the robust amount of data gathered and the challenges in sustaining proper documentation and archiving, there is a need to establish a system for consolidating, managing and subsequent retrieval of information for analytical purposes.

METHODOLOGY

NSAP Data Collection

The NSAP gathers catch and fishing effort data from NSAP-identified landing centers every other two days regardless of the time of day, and of Saturdays, Sundays and holidays. Major landing sites are sampled for the first day while the minor landing sites are sampled on the second day. This is done throughout the month so that a total of twenty (20) sampling days are conducted, ten days for each type of fishery. In cases where there are 31 days in a month, the major landing sites are sampled for eleven (11) days. Non-sampling days are utilized for report generation validation, and transferring of raw data to four (4) NSAP forms. The pertinent data on the landed catch include: name of fishing ground, landing center, date of sampling, name of boat/number

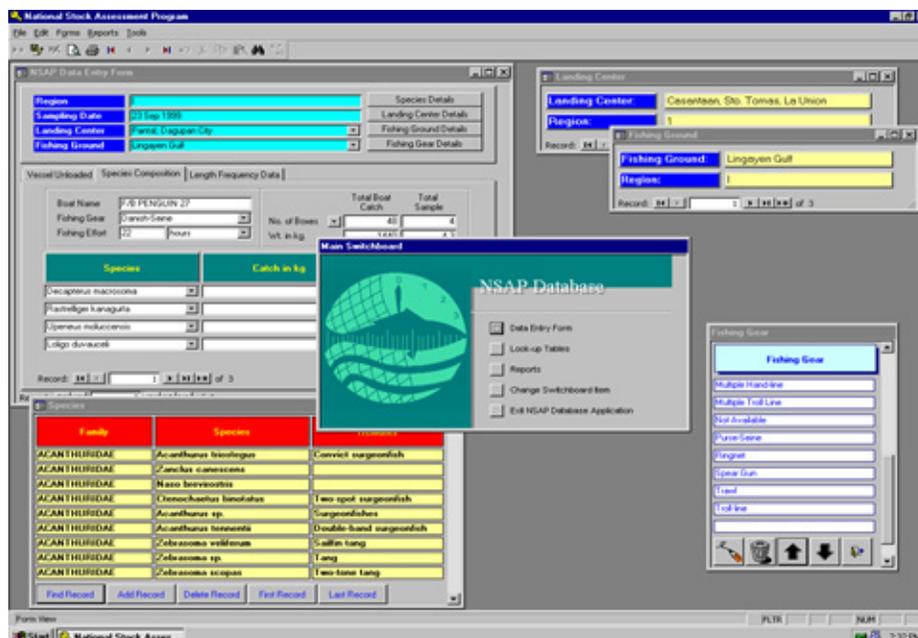


Figure 2. First version of NSAP DB

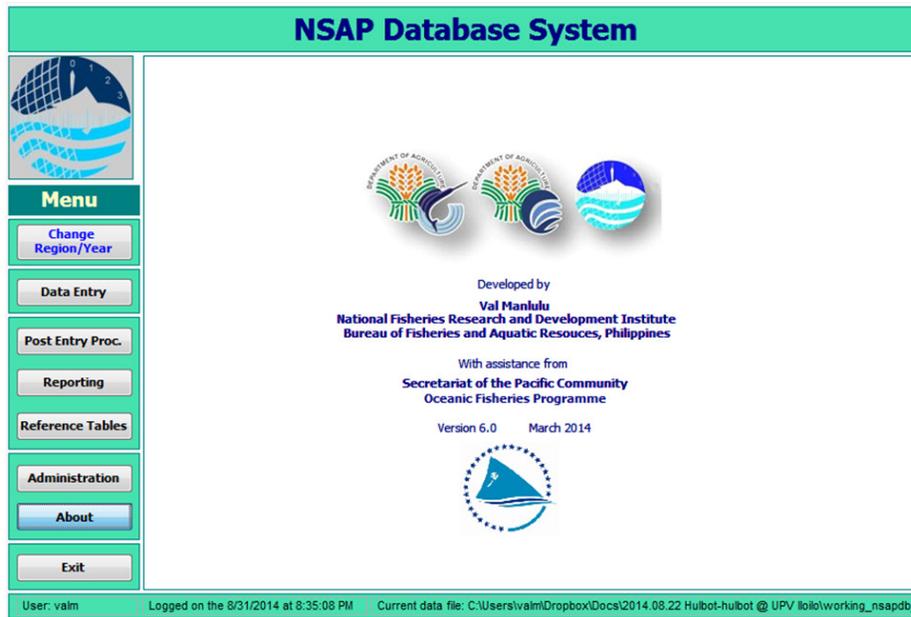


Figure 3. NSAP DB v.6.0 (current beta version)

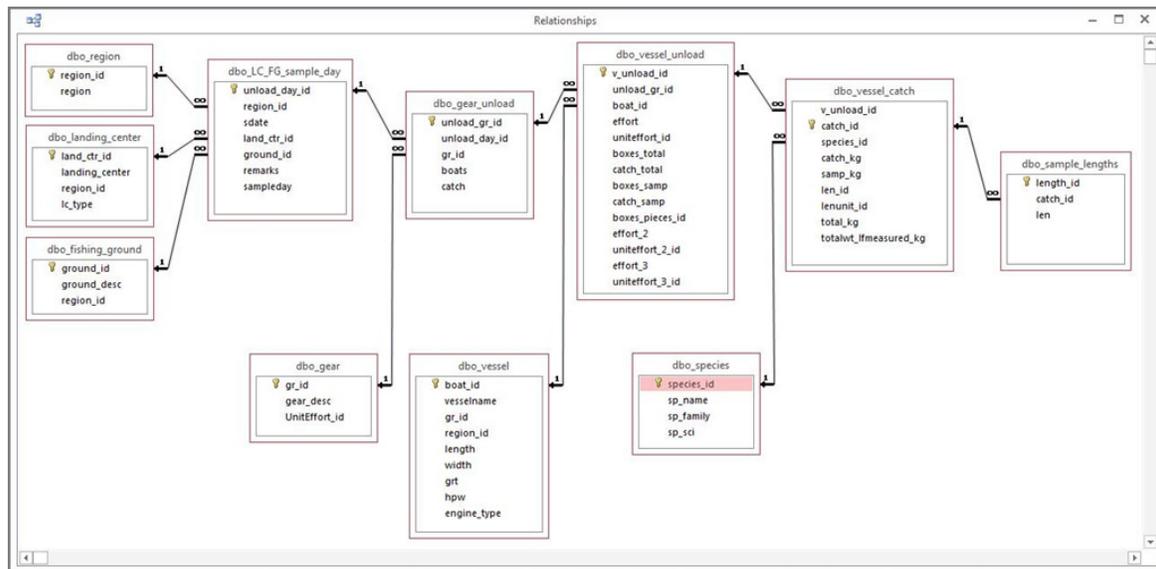


Figure 4. Structure and relationships of the NSAP DB

of fishing days/ the actual fishing operation (time), total catch by boat (no of boxes/bañeras or weight by kg), catch sample weight (kg), length measurements (fish length & frequency), catch composition (identified by scientific names e.g *Thunnusal bacares*) and name and signature of samplers/recorders. At the end of the month, all raw forms are submitted to the regional NSAP data analysts for encoding of the data, both in Microsoft Excel and in the NSAP Database.

NSAP Database System and Data Model

The first version of NSAP DB was developed in 1997 after the Fishery Resource Assessment Training Course for NSAP Project Leaders (Figure 2).

It was further developed with the assistance from the Secretariat of the Pacific Community Oceanic Fisheries Program (SPC-OFP). Currently, the NSAP DB is in version 6.0, which is beta version and is still under development (Figure 3).

Table 1. NSAP-DB File naming conventions

Category	Naming convention	Notes/ Examples
Front-end	NSAP_APP_<version_no.>.mdb	Application MDB File
Back-end File	nsapdb_backend_all_data_<region>.mdb	An example is “nsapdb_backend_all_data_region01.mdb “ Note that the NSAP software requires that word “data” is in the file name somewhere.

The NSAP DB has been structured such that regional data files are separate and distinct from one another. A data inventory subsystem has been imposed in the system. It was organized to identify the key elements for which data are collected during sampling. These elements, once identified, became the fundamental database tables of the system; each database table is linked or related to at least one other database in the system by key attribute fields. The structure and relationships of the NSAP DB are illustrated in Figure 4, and file naming conventions is shown in Table 1.

At the top of the database structure is the Region (dbo_region), which represents the 14 fisheries regions. For example, the Region 01 represents NSAP – BFAR RFO 1 (National Stock Assessment Program of Bureau of Fisheries and Aquatic Resources – Regional Field Office 1).

The NSAP database system has been structured such that a regions data file is separate and distinct from another regions data file – before data from several landing centers can be combined within each Region, there may be one or many Sampling Days (dbo_LC_FG_sample_day). There is no overlap of one region’s data with another region and so consolidation of all regions data (which may be at an aggregated level) at the national level is relatively straight forward. A “*sampling day*” unit is defined as a day when sampling is undertaken at a Landing center (either ‘commercial’ or ‘municipal’), on vessels that have fished at one or more fishing grounds.

The current protocol suggests that sampling occurs at a particular landing center once every three days. Note that there is also provision for recording information in this entity for days that have not been

sampled (for example, total catch unloaded at a landing center on days when sampling did not occur). For each Sampling Day, there may be vessels of one or more gears unloading (dbo_gear_unload). The gear unload unit groups with the total number of vessels unloading and the total catch unloading by each landing center, sample day and gear. For each gear unloading at a landing center on a sampling day, there is information for one or many individual vessels unloading (dbo_vessel_unload), which contain information on the total effort expended on the vessel trip, the total catch, and the amount of catch sampled. For each vessel unloading record, there may be one or many individual species catch records for that vessel unloading (dbo_vessel_catch) – this entity stores the total catch and total sampled catch for this species. For each species catch record, there may be one or many individual size measurement records for that species (dbo_sample_length).



Figure 5. NSAP-DB user login screen

User login, entry screen and Menu system (integration of subsystems)

Figure 5 shows the User login screen displayed when the NSAP system is started. The entry screen of NSAP database is also shown in Figure 4. The ordering of the menu buttons has been assigned based on the chronology, frequency and importance of each type of data source. The status contains the user’s login initials,

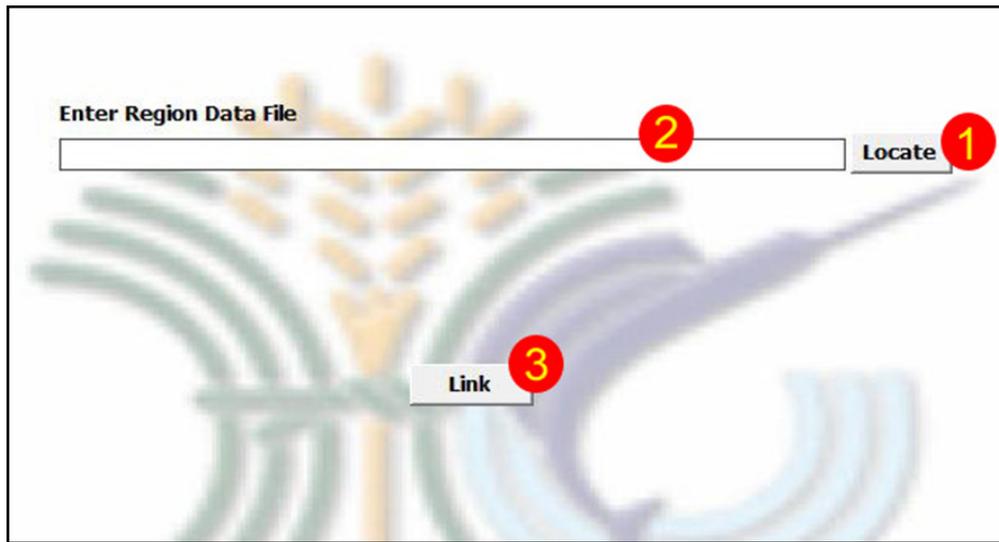


Figure 6. Change Region Screen

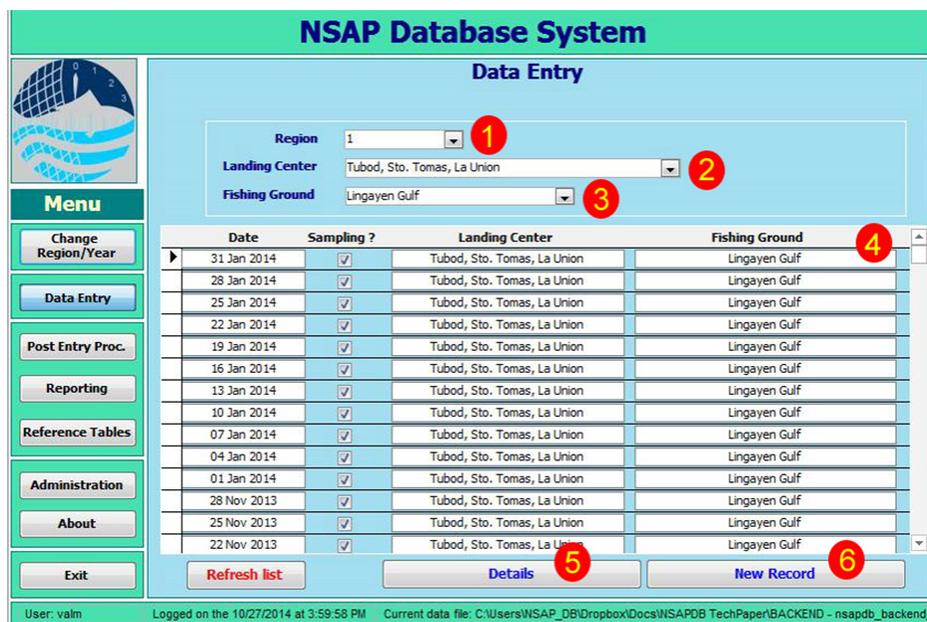


Figure 7. Data Entry Screen

the time being logged in and the name of the region's data file (i.e. designated by region and calendar year) that is currently linked to that session.

The following sections provide a description of subsystems initiated by each of the menu buttons.

Change Region/ Year

To work with data sets for a different region, or data for different time frames within the same region, select Change Region/ Year form on the left side of the entry screen. The components of the form is shown in Figure 7 which include:

1. The user can select LOCATE button to navigate to the directory and to locate data files. Once the correct data file has been found, the user can select it by double-clicking the file.
2. After selecting the file, the file name with directory extensions will automatically be displayed in the field.
3. The user then select the LINK button which establishes a link to the region's data file specified. A pop-up window will display, "Tables linked successfully", and the user can proceed to work with the selected region's data files.

Data Entry

Upon selecting the Data Entry button, the “Region/ Landing Center/ Fishing Ground List” screen will be displayed (Figure 8).

The following are the features of the screen: Region/ Landing Center/ Fishing Ground List Screen
This screen is used to select the region/ landing center/ fishing ground for data viewing and input.

1. A drop-down menu of existing REGIONS is displayed. The user can select the Region for which data are to be entered.
2. A list of LANDING CENTERS within that REGION is displayed.
3. A list of FISHING GROUNDS, which is independent of the REGIONS tab, is displayed.
4. Each time a selection is made in points 1., 2. or 3., the list of data entered will be displayed. The information displayed include the sampling date, the Landing Center and the Fishing Ground. Note that total catch and total number of vessels can be entered for a day

when sampling does not occur – for example, the total unloaded catch and vessels unloading for each gear may be obtained from the port authority and entered into the database for a day when sampling did not occur.

5. If the user requires to view data entered, then they can select the date/landing/center/fishing ground combination in the list, and then press the DETAILS button.

6. If the user requires to enter new data for this region/ landing/center/fishing ground combination selected, press the NEW RECORD button, which will take you to the NSAP Data Entry Form. It is very important to note that for sampling days with no unloading, zero (0) vessels unloading and catch should be indicated.

NSAP Data Entry Form

Figure 9 shows the NSAP Data Entry form which displays the total catch unloaded and total number of vessels unloaded for the selected landing center/ fishing ground on a particular day; and a list of the vessels and the total catch that was sampled for the selected landing center/ fishing ground on a particular day.

The screenshot shows the NSAP Data Entry Form interface. At the top, there are three dropdown menus for 'Region' (set to 1), 'Fishing Ground' (set to Lingayen Gulf), and 'Landing Center' (set to Tubod, Sto. Tomas, La Union). Below these is a 'Date:' field set to 31-Jan-2014 and a checkbox labeled 'This day was a sampling day'. A table on the left shows 'Fishing Gear' (Trawl) with 'Number of vessel(s)' (5) and 'Catch Landed (kg.)' (476.8). A table on the right shows 'Trawl' details with columns for 'Vessel name', 'Total Sample Catch (kg.)', and 'Total Boat Catch (kg.)', listing vessels like Jerex-TST (T), Anton-TST (T), JHL-TST (T), Tinnulong-TST (T), and Jacqueline-TST (T) with their respective catch values. A 'Remarks' field is at the bottom, and a navigation bar contains buttons for 'Details', 'New Record', 'Save and Close', and 'Cancel'. Red callout numbers 1 through 8 are placed over various elements: 1 on the Region dropdown, 2 on the Date field, 3 on the 'This day was a sampling day' checkbox, 4 on the Fishing Gear dropdown, 5 on the Trawl table header, 6 on the Jerex-TST row, 7 on the Remarks field, and 8 on the New Record button.

Figure 8. NSAP Data Entry Form

The screenshot shows a software interface for entering vessel sample data. It includes a header section with vessel and gear information, a table for species and catch data, and a summary section with buttons for navigation and saving.

Species	Sample Wt (kg)	Raised Wt (kg)	Length Type	Length Units
Atule mate	0.500	0.500	Total Length	cm
Gymnocranius frenatus	1.400	1.400	Total Length	cm
Nemipterus furcosus	0.800	0.800	Total Length	cm
Rastrelliger kanagurta	1.200	1.200	Total Length	cm
Selar crumenophthalmus	0.500	0.500	Total Length	cm
Sphyaena jello	2.100	2.100	Total Length	cm
Upeneus vittatus	1.800	1.800	Total Length	cm
*	0.000	0.000	Total Length	cm
TOTALS :		8.300	8.300	

Figure 9. Vessel sample form

The components of the NSAP data entry form are as follows:

1. The title block provides information on the Region, Fishing Ground and Landing Center for which the unloaded vessels/catch information is to be added/modified/viewed. Note: If the relevant REGION, LANDING CENTER OR FISHING GROUND has not yet been created, the user is directed to “Reference Tables” to create the new file.
2. In Add mode (i.e. NEW RECORD), the user is required to enter the date for which total catch and vessels unloading information is to be added. Otherwise, in View DETAILS Mode, the date of the data already entered is displayed.
3. This field indicates whether the particular date for which information is to be entered (or has been entered) was a sampling day for this Region/Landing Center/ Fishing Ground combination. This is used to highlight where total unloaded vessels and total unloaded catch data are available only (i.e. not sampling data were collected).
4. This block is used to ADD NEW information regarding the total number of vessels unloading and the total catch by gear on that day, and DISPLAY data that have already been entered, which is also available for

modification. Note that, if the day was not a sampling day, then there will be no “sampling” data to be entered.

5. This field matches the gear type (i.e. line in the table) selected in the block described in (4).
6. This block displays the details (total sample catch and total boat catch) for each sampled vessel according to the gear type selected in the block described in (4). This block is for displaying information only. Note that, if the day was not a sampling day, then there will be no “sampling” data in this block.
7. Any remarks related to this sampling date can be entered here.
8. A series of buttons which allows the user to view existing sampling data or add new sampling data.
 - a. DETAILS – will display a new screen (VESSEL SAMPLE FORM) showing the details of the vessel sample that is currently selected in the block described in 6.
 - b. NEW RECORD – will display a new screen (VESSEL SAMPLE FORM), ready for data entry.
 - c. SAVE AND CLOSE – will save any newly entered data, or modifications and return the user to the

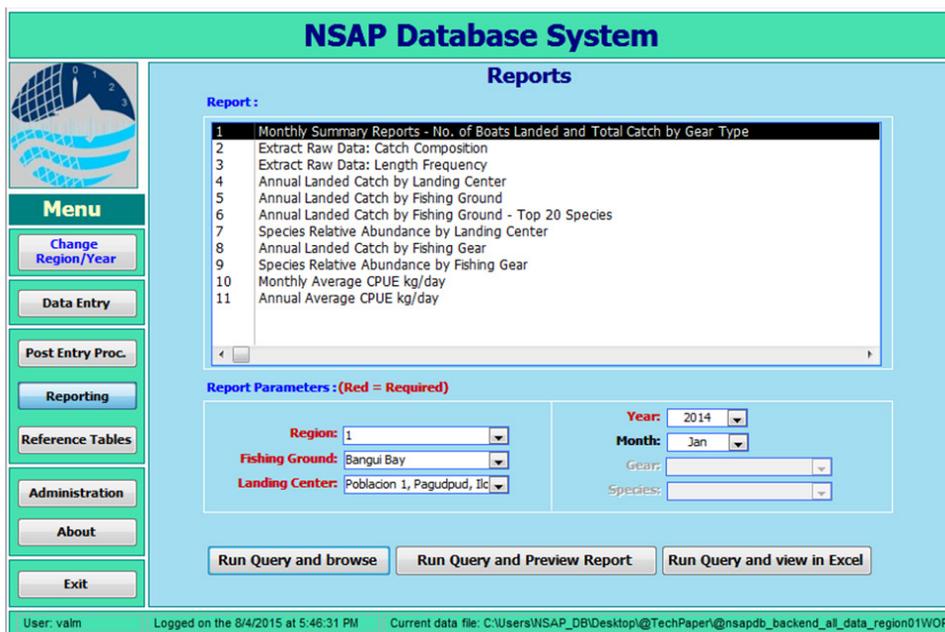


Figure 10. Report generation window of NSAP DB

Region/Landing Center/Fishing Ground List Screen.

d. CANCEL – will reject any newly entered data, or modifications and return the user to the Region/Landing Center/Fishing Ground List Screen.

Note: Similarly, for numbers 3 and 4, sampling days with no unloading, a zero (0) must be entered to vessels unloading and catch.

Database Integration for National Database

All regional databases are synchronized in real-time through the third-party online storage provider, Dropbox, to the NSAP DB server located at NFRDI-DBMS (Database Management Servers). The NFRDI-DBMS is one of the major information repository of the NFRDI which deals with all databases of the office. The regional databases are merged at server consoles using series of Structured Query Language (SQL) scripts and queries making up the NSAP National Database.

DISCUSSION

Report Generation

The NSAP DB contains analytical routines and reporting formats that allow the generation of results including monthly summary reports, catch composition

data, count-number of individual length data, annual landed catch by landing center, annual landed catch by fishing ground, species relative abundance by fishing ground, species relative abundance by landing center, annual landed catch by fishing gear, and monthly and annual CPUE per gear (kg/boat/day) for both commercial and municipal fishing. (Figure 11).

There are three options for report generation: (I) Run query and browse, to view the report as encoded data in Microsoft Access format; (II) Run query and preview report, to view the report as a summarized form which can be viewed in .PDF format; and (III) Run query and view in Excel, for viewing the report in excel format (Figure 11).

Running queries

Before running queries, parameters can be set based on the discretion of the user or viewer. The parameters include Region, Fishing ground, Landing center, Year, Month, Gear and Species. Parameters that are highlighted in red are required to be filled up. Others which are highlighted in gray indicate that the parameter is not applicable to the report that is to be generated (Figure 12). Figures 13, 14 and 15, show the sample query forms for browsing, previewing of reports and data viewing in excel, respectively.

Report Parameters : (Red = Required)

Region: 1

Fishing Ground: Bangui Bay

Landing Center: Poblacion 1, Pagudpud, Ilc

Year: 2014

Month: Jan

Gear:

Species:

Figure 11. Report parameters

region	Fishing Ground	Landing Center	Year	Month	Day	Gear	Boats Landed	Catch in kg
1	Bangui Bay	Poblacion 1, Pagudpud, Ilocos Norte	2014	1	02	Beach seine	4	555
1	Bangui Bay	Poblacion 1, Pagudpud, Ilocos Norte	2014	1	02	Bottom set gillnet	3	5.8
1	Bangui Bay	Poblacion 1, Pagudpud, Ilocos Norte	2014	1	02	Troll line	25	210.7
1	Bangui Bay	Poblacion 1, Pagudpud, Ilocos Norte	2014	1	05	Bottom set gillnet	3	5.3
1	Bangui Bay	Poblacion 1, Pagudpud, Ilocos Norte	2014	1	05	Troll line	16	82.8
1	Bangui Bay	Poblacion 1, Pagudpud, Ilocos Norte	2014	1	08	2 Boat Troll Line	6	105.1
1	Bangui Bay	Poblacion 1, Pagudpud, Ilocos Norte	2014	1	08	Beach seine	4	215
1	Bangui Bay	Poblacion 1, Pagudpud, Ilocos Norte	2014	1	08	Bottom set gillnet	5	10.8
1	Bangui Bay	Poblacion 1, Pagudpud, Ilocos Norte	2014	1	08	Bottom set long line	1	12.45
1	Bangui Bay	Poblacion 1, Pagudpud, Ilocos Norte	2014	1	08	Troll line	31	243.15

Figure 12. Sample query form for browsing

Data access

Data access protocols in NSAP DB, include: (1) restricted-only users with proper authorization (database developer, NSAP coordinators); (2) conditional accessible- processed data forms and other forms which can be accessed by users indicated by the national database coordinator; and (3) fully accessible-data with no restrictions as to their distribution and use by the general public. Authorized users can export the data from the NSAP DB in Microsoft Access (.mdb) format. Reports and data summaries can also be exported in Microsoft Excel (.xls) and Adobe Acrobat (.pdf)- which are also based on the level of access.

Data management and use of NSAP DB to fisheries management

The NSAP DB is composed of the national database, which is maintained by the National Fisheries Research and Development Institute (NFRDI), and regional databases, which are handled by each regional NSAP project and assistant project leaders. The information generated in the NSAP DB, has been incorporated in various presentations and reports to address fisheries management, both in the regional and national level. Moreover, the importance of NSAP DB was showcased when all data from BFAR-NSAP VIII was secured after the storm surge that occurred in Leyte because of typhoon ‘Yolanda’ where all raw data forms

were washed away. The success of the implementation of the sardine closed season in Zamboanga peninsula was also supported by the data from NSAP which was consolidated in the NSAP DB. In BFAR XI, results generated from NSAP DB have shown that the catch rates of both commercial and municipal fishers catching small pelagic fishes in Davao Gulf, hereafter known as the conservation area, are declining. Hence, a Joint DA-DILG Administrative Order which establishes a closed season for the conservation of small pelagic fishes in Davao Gulf was implemented last 2014 to address the issue. Lastly, NSAP DB was utilized in the data integration and utilization for the proposed closure in the Northern Palawan waters for the conservation of roundscads.

Future Directions

The NSAP DB, being the repository of the information gathered from NSAP for nearly two decades, can serve as a core decision support system (DSS) that will enable the BFAR and other attached agencies to ensure the maintenance of long-term fisheries catch data for the formulation and implementation of sound fisheries management policies. One of the major future plans for the NSAP DB will be the upgrading from a standalone application to a web application. Hence, making the data accessible to authorized users easier. Moreover, the availability of information will allow the national government and local government

units (LGUs) to access long-term information on management purposes in a much more efficient and timely manner. The NSAP DB will also eventually be used with biophysical and socioeconomic information,

such as inclusion of different water quality parameters, which will provide a more holistic and an ecosystem-based approach of fisheries management.

Bureau of Fisheries and Aquatic Resources
National Fisheries Research and Development Institute
National Stock Assessment Program Database System

Monthly Summary Reports

Region 1

Fishing Ground Bangui Bay

Landing Center Poblacion 1, Pagudpud, Ilocos Norte

Year	Month
<u>2014</u>	<u>1</u>

Day	Gear	Boats Landed	Catch in kg	remarks
02	Bottom set gillnet	3	5.8	
	Beach seine	4	555	
	Troll line	25	210.7	
05	Troll line	16	82.8	
	Bottom set gillnet	3	5.3	
08	Troll line	31	243.15	
	Bottom set long line	1	12.45	
	2 Boat Troll Line	6	105.1	
	Beach seine	4	215	
	Bottom set gillnet	5	10.8	
11	Beach seine	2	38	
	Bottom set gillnet	7	15.55	
14	Bottom set gillnet	6	28.3	
17	Multiple hook & line	2	2.45	
	Troll line	9	37.85	
	Bottom set gillnet	10	17.5	
	Beach seine	2	45	
20	Bottom set gillnet	9	24.05	
	Beach seine	2	30	
	Multiple hook & line	1	1.1	
	Handline	1	7.3	
	Troll line	6	15	
23	Bottom set gillnet	7	10.75	

Page 1 of 2

Figure 13. Sample query form for previewing reports

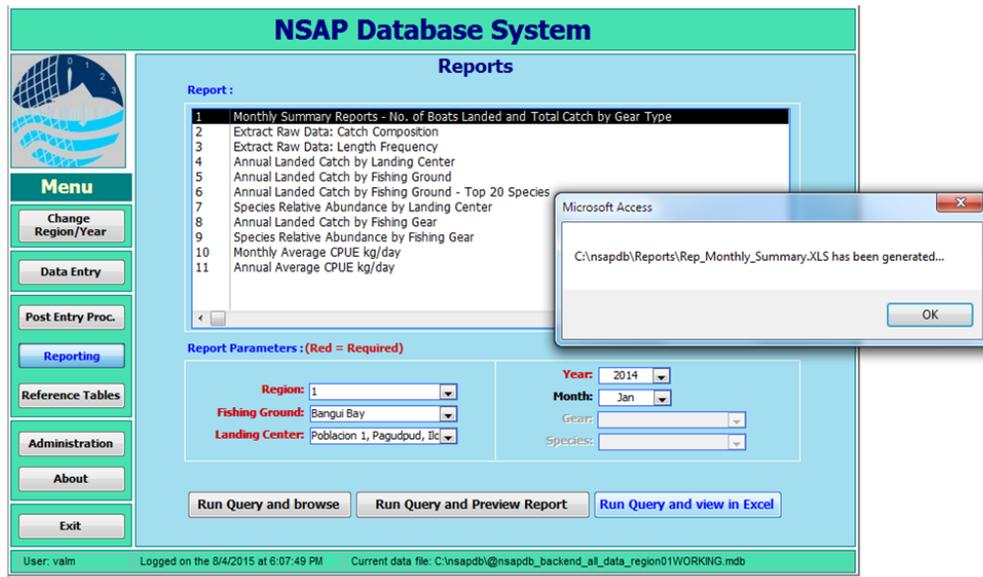


Figure 14. Sample query form for previewing in MS Excel ormat

Acknowledgement

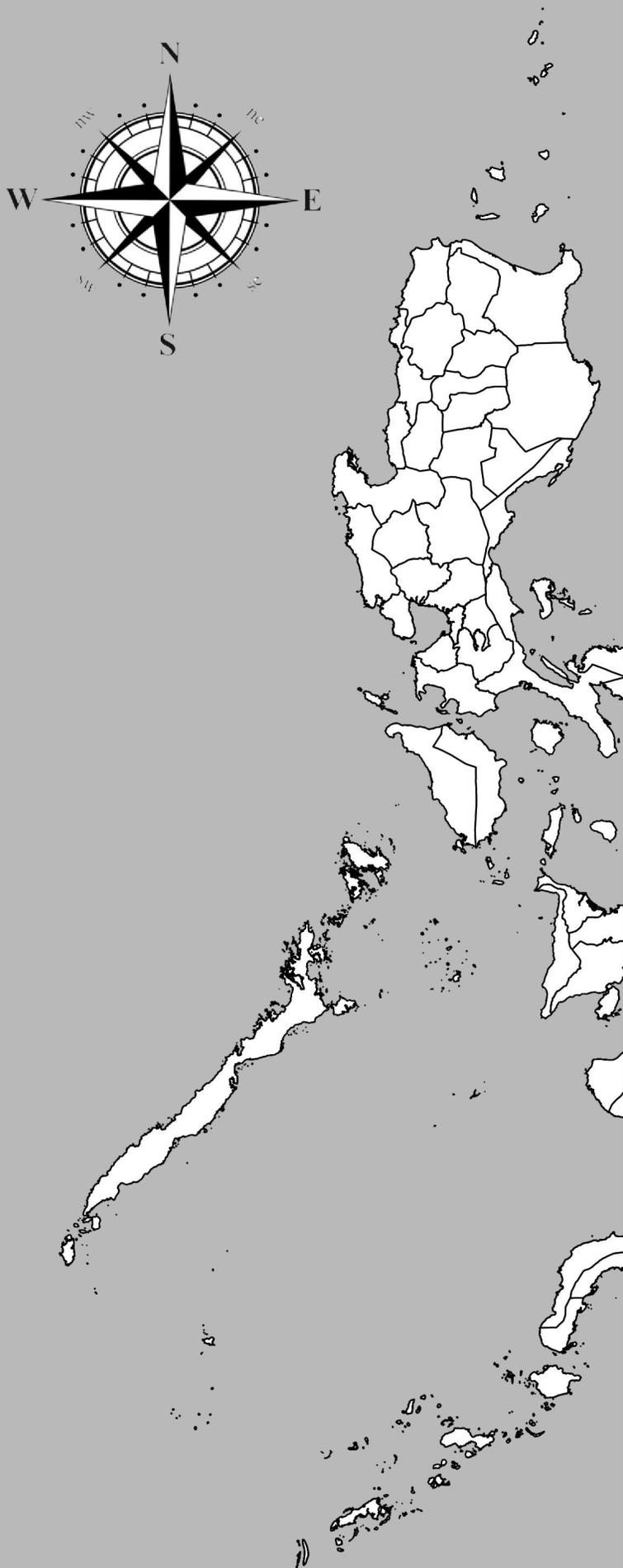
The authors would like to acknowledge the Bureau of Fisheries and Aquatic Resources (BFAR) Director, Atty. Asis G. Perez, for his continuous support and trust to the NSAP family. We would also like to extend our sincerest gratitude to the National Fisheries Research and Development Institute (NFRDI) Interim Executive Director, Drusila Esther E. Bayate for her wisdom and utmost provision to the role of NSAP to fisheries management. Lastly, we would like to recognize the NFRDI-NSAP, administrative and technical team, and regional NSAP, from the enumerators to the Project leaders, for their unparalleled contribution to the development of the NSAP Database system.

Table 2. Gear types with the primary, secondary, and tertiary efforts

GEAR TYPE	Primary	Secondary	Tertiary
Purse seine (PS)	Days or Hours	Haul(s)	
Ringnet (RN)		Haul(s)	
Bagnet (BN)		Haul(s)	
Beach seine (BS)		Haul(s)	
Gillnet (GN) - DriftGN, Surface GN, Bottom GN		Haul(s)	number of panels
Lift Net (LN)		Haul(s)	
Handline (HL) - Multiple HL, Single HL		number of hooks/boat	hook size
Troll line (TL)		number of hours fishing/unit	number of lines/unit
Trawl (T)		Haul(s)	
Danish seine (DS)		Haul(s)	
Jigger (J)		number of hooks/boat	hook size
Spear gun (SG), with or without compressor			
Fish pot (FP)		number of units/day	
Fish corral (FC)		Haul(s)	
Traps and fyke and filter nets		Haul(s)	
Longlines (LL)	number of hooks/boat	hook size	



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2

Chapter

NATIONAL NSAP MAPS

- Catch
- Effort
- CPUE (kg/day/boat)
- Exploitation values

Introduction

Chapter 2 presents for reference the GIS map of the landing centers monitored by NSAP in 2015 (Fig 1.), the Philippine Statistical Fishing Grounds by BFAR (Fig. 2) and an unofficial map of the 15 km Municipal Water Boundary pursuant to RA 8550 as amended by RA 10654) (Fig. 3).

This Chapter also shows the actual total catch, actual total effort, and catch per unit effort (CPUE) sampled from the monitored landing centers by NSAP and illustrated in GIS maps with corresponding symbols based on collected and estimated data.

The actual total catch production was only based on the consolidated NSAP catch baseline matrix for CY 2014. This was generated using the reporting function of the NSAP-Database and validated by the Regional NSAPs. The data obtained was used to map the actual total catch. The aquatic species included in the dataset were clustered into the following groups: oceanic tuna, neritic tuna, small pelagic fishes, other pelagic fishes, other large pelagic fishes, demersal fishes, sharks and rays and invertebrates. Only the major aquatic species caught are reflected in the legend.

The actual total effort data was based on the consolidated NSAP effort baseline matrix for CY 2014. This was generated using the reporting function of the NSAP-Database and validated by the Regional NSAPs. The data obtained was used to map the number of boats landed as a whole and by types of gears. The gear type dataset includes gillnets, hook and line, trawl, ringnets, drive-in nets, jigger, troll lines, bottom set longlines and miscellaneous gears,

The average CPUE (kg/day/boat) for CY 2014 were generated by NSAP-Database using the embedded series Structured Query Language (SQL) scripts, with RINGNET as the representative fishing gear.

To generate the Exploitation Values, the NSAP landed catch, effort and length data for 2015 and the FAO-ICLARM Stock Assessment Tool (FiSAT) were utilized for analysis and computations.

Fig. 1. Fish landing centers (in red dots) monitored by the National Stock Assessment Program in 2015.

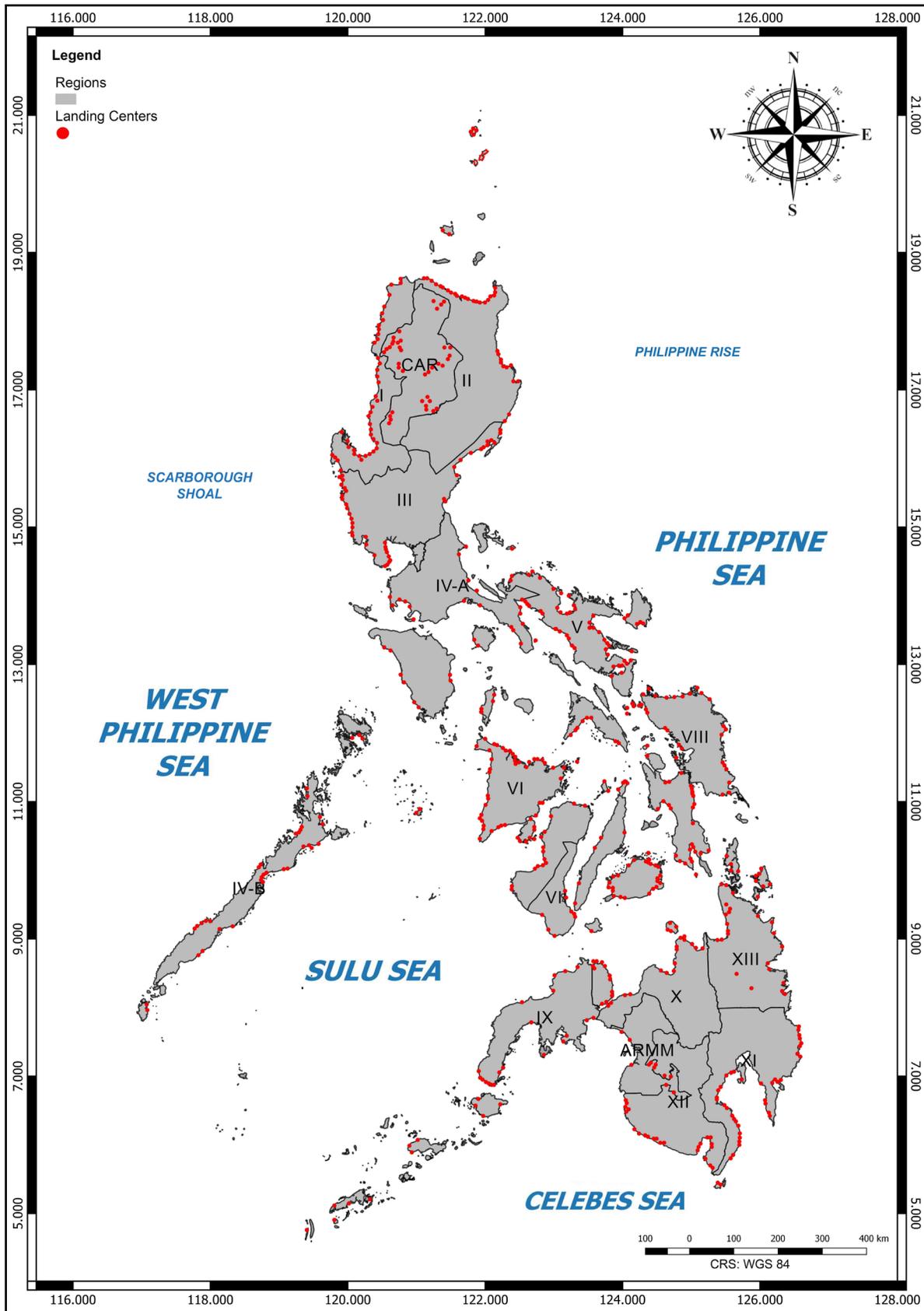


Fig. 2. Philippine Statistical Fishing Ground

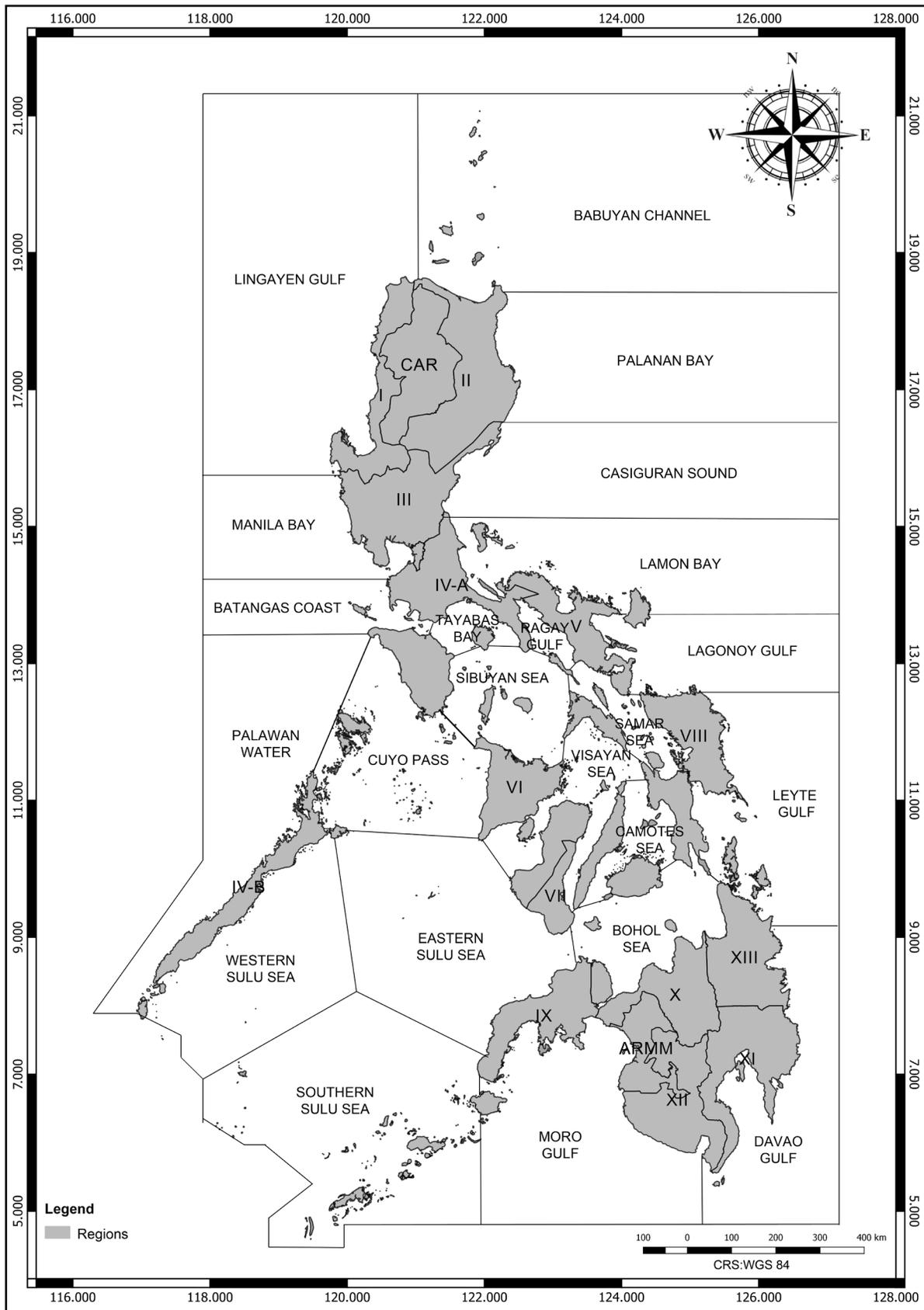
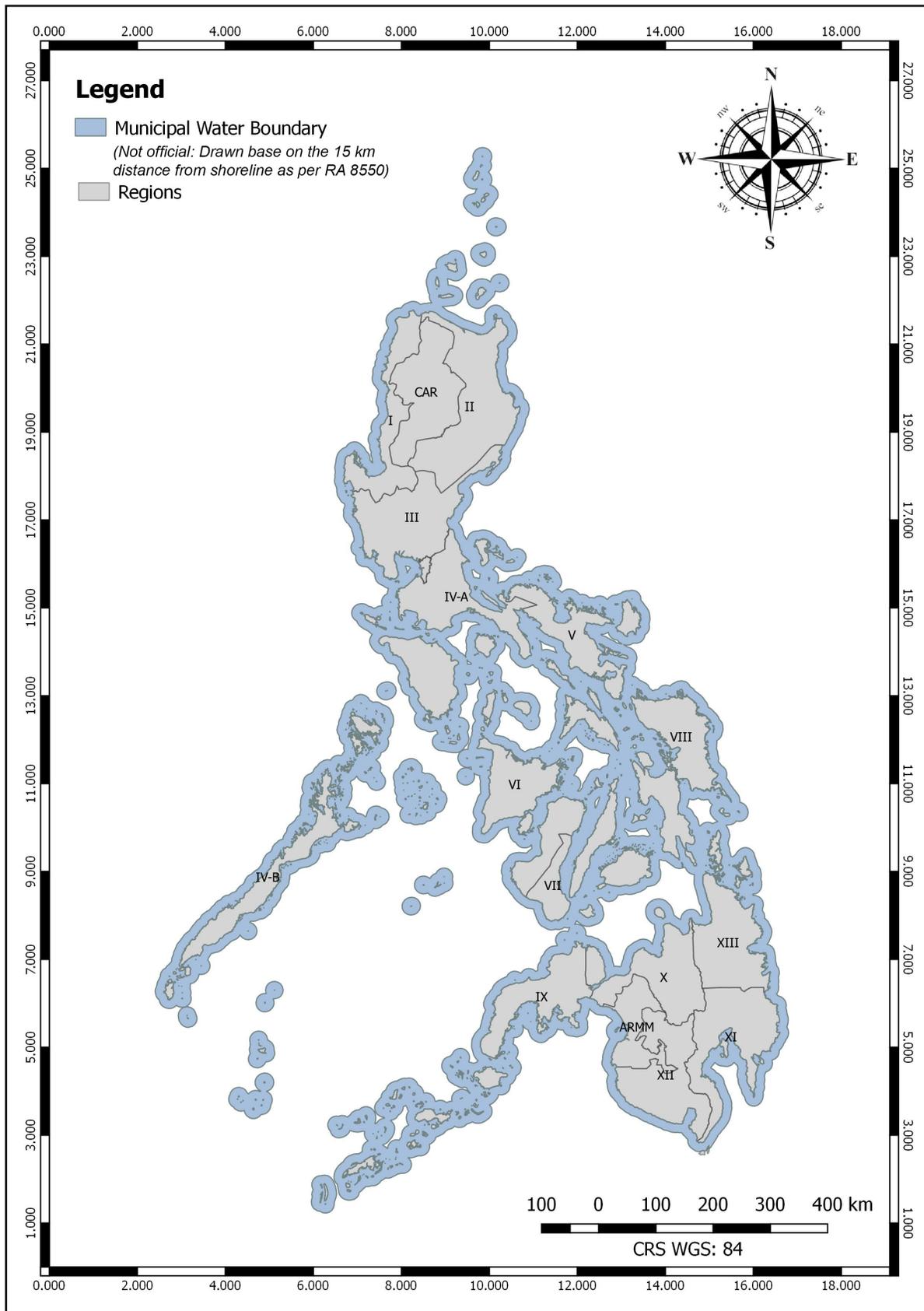


Fig. 3. Municipal Water Boundary

(Not official map: Drawn based on the 15km distance from shoreline as per RA 8550 as amended by RA 10654)



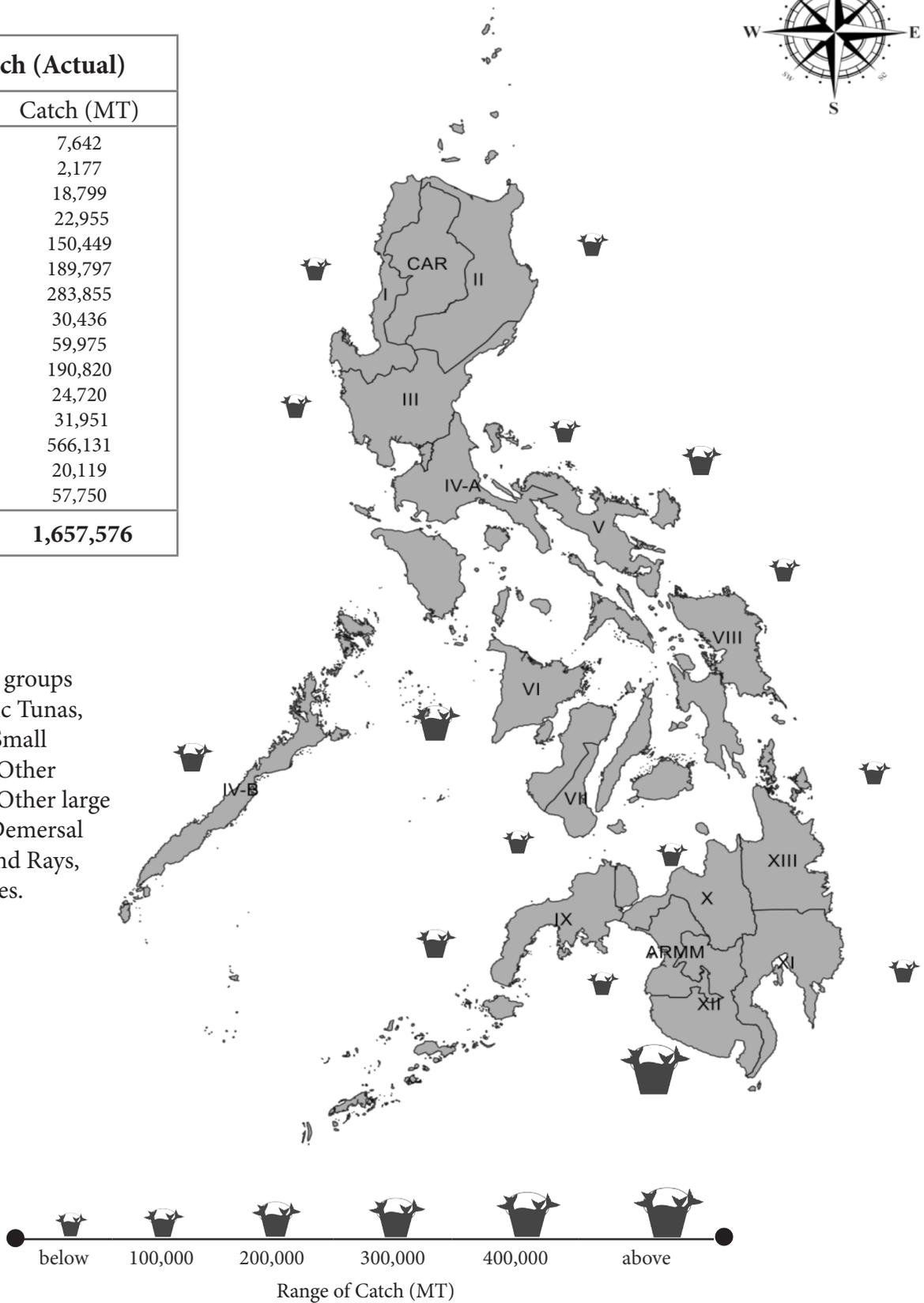
Chapter 2.1: Catch



Total Catch (Actual)	
Region	Catch (MT)
I	7,642
II	2,177
III	18,799
IV-A	22,955
IV-B	150,449
V	189,797
VI	283,855
VII	30,436
VIII	59,975
IX	190,820
X	24,720
XI	31,951
XII	566,131
CARAGA	20,119
ARMM	57,750
TOTAL	1,657,576

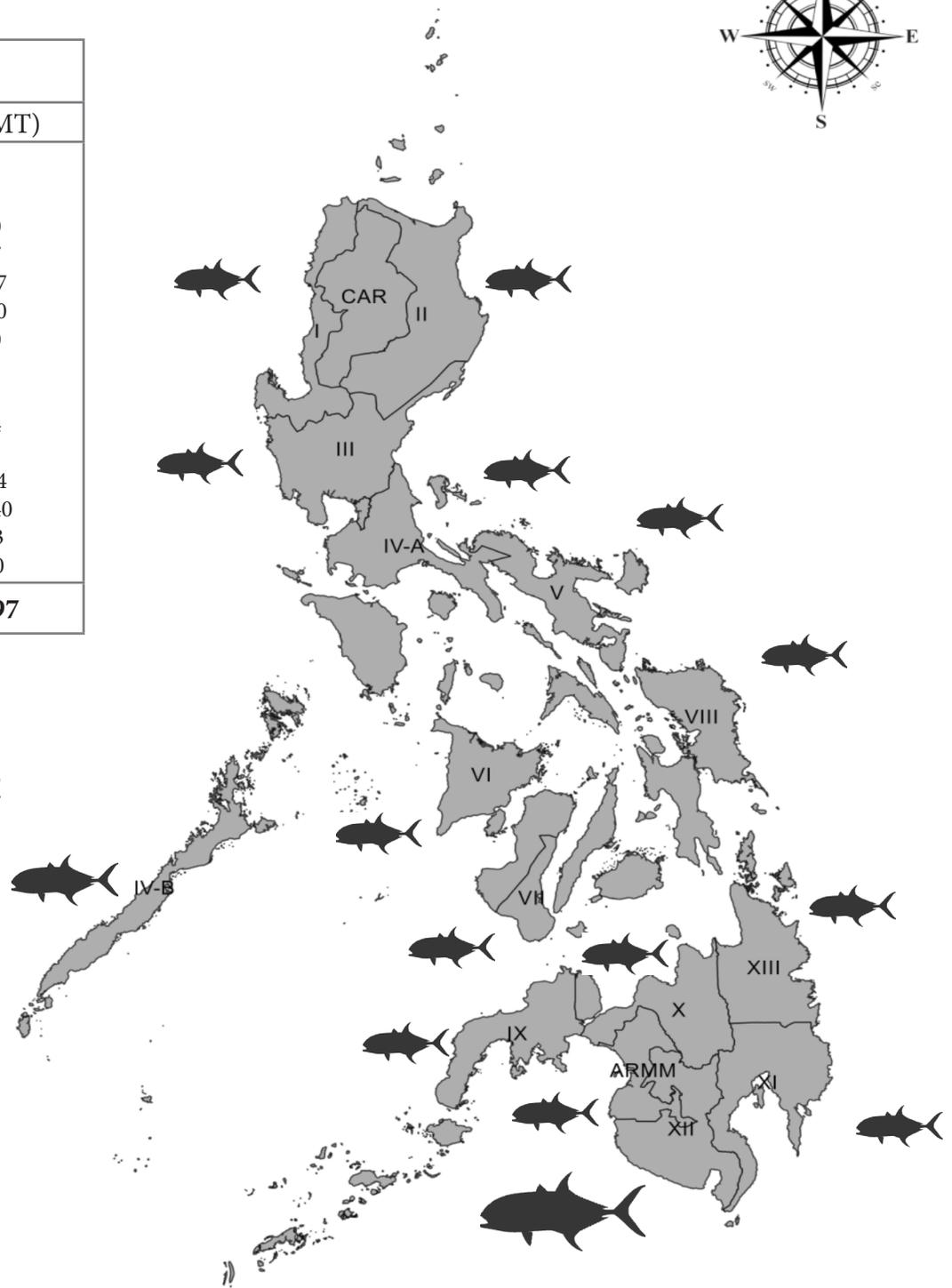
Total Catch

Aquatic species groups include: Oceanic Tunas, Neritic Tunas, Small pelagic fishes, Other pelagic fishes, Other large pelagic fishes, Demersal fishes, Sharks and Rays, and Invertebrates.





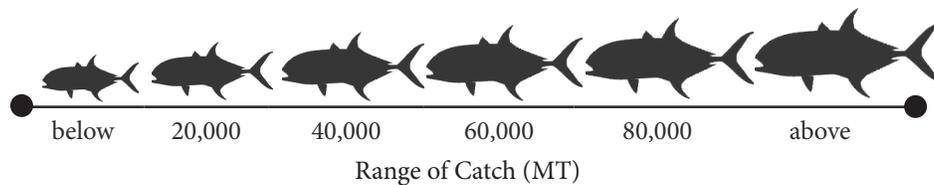
Oceanic Tunas	
Region	Catch (MT)
I	2,174
II	59
III	8,640
IV-A	4,067
IV-B	31,527
V	11,520
VI	1,460
VII	540
VIII	36
IX	8,544
X	964
XI	14,434
XII	113,540
CARAGA	9,623
ARMM	11,690
TOTAL	209,197



Oceanic Tunas

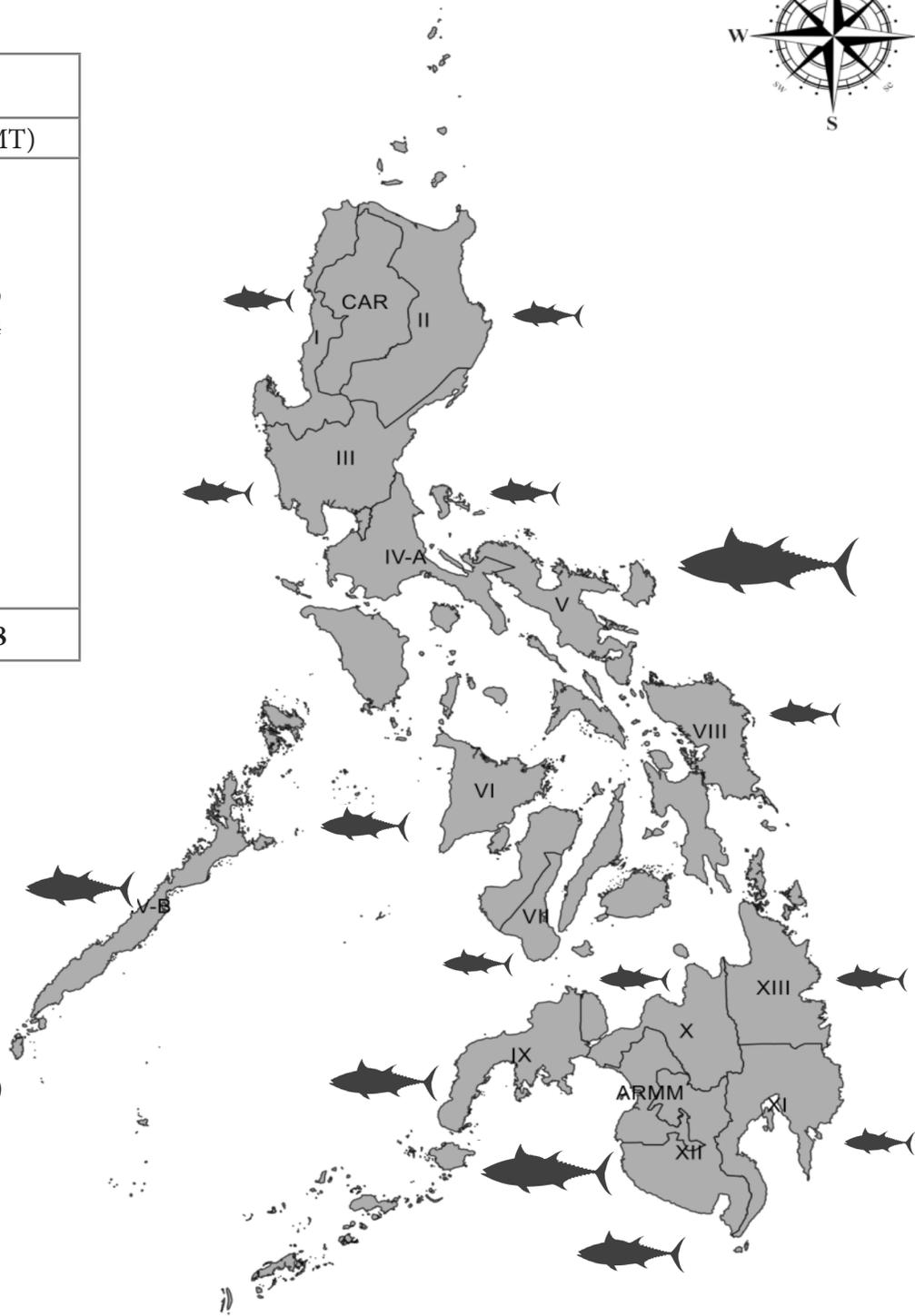
Species Included:

Yellowfin Tuna (*Thunnus albacares*), Bigeye Tuna (*T. obesus*), Albacore Tuna (*T. alalunga*), Bluefin Tuna (*T. orientalis*), Skipjack (*Katsuwonus pelamis*).



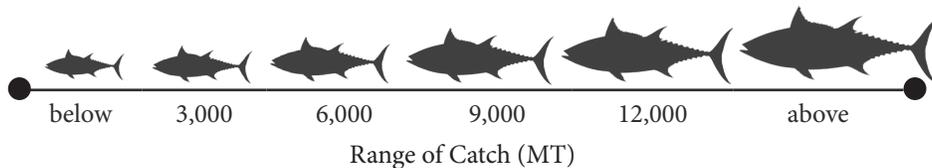


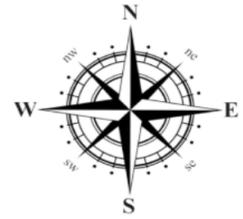
Neritic Tunas	
Region	Catch (MT)
I	228
II	379
III	429
IV-A	2,462
IV-B	11,859
V	18,994
VI	4,707
VII	2,370
VIII	70
IX	6,063
X	2,082
XI	2,086
XII	8,005
CARAGA	321
ARMM	12,825
TOTAL	72,558



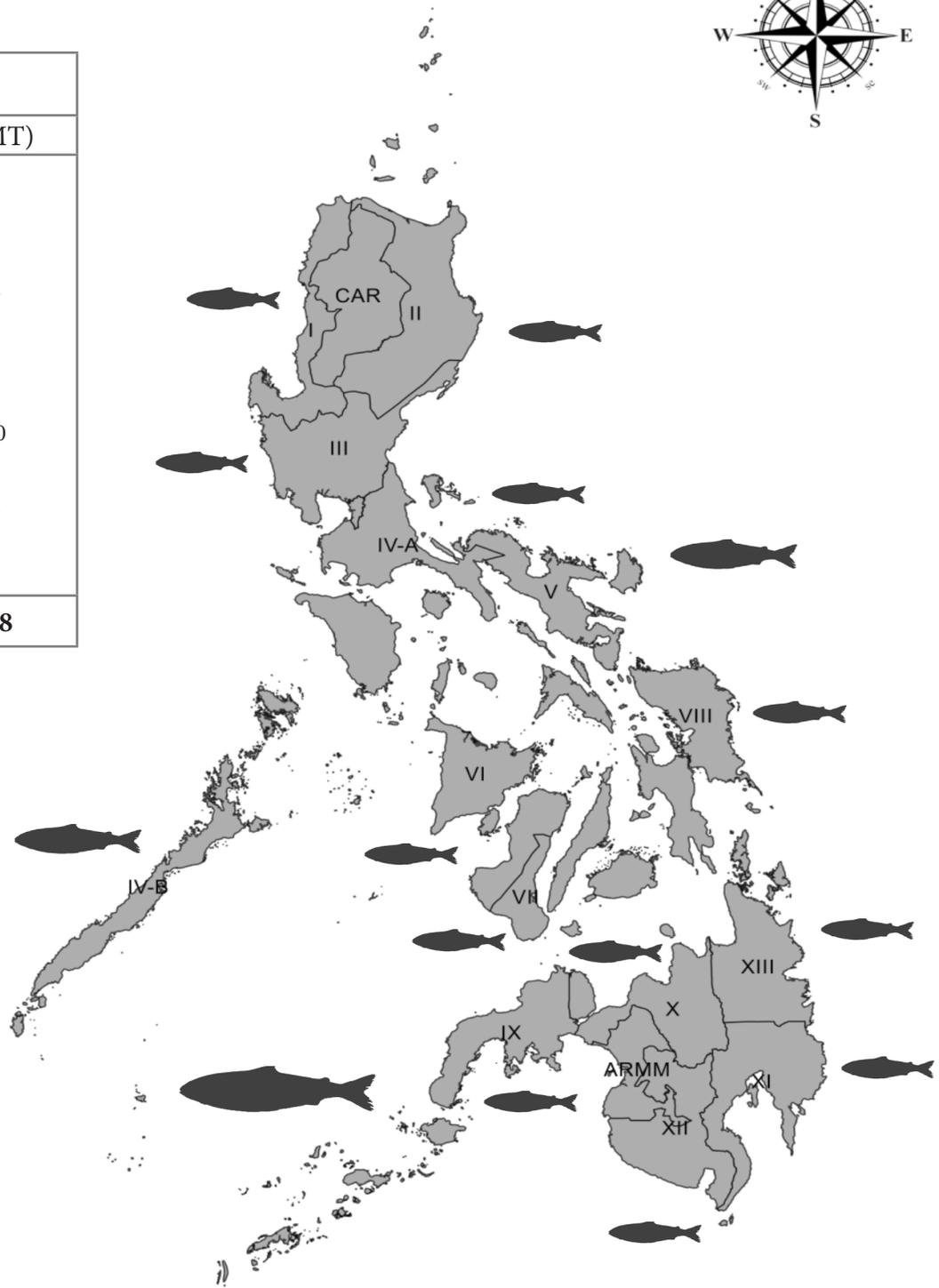
Neritic Tunas

Species included:
 Bullet Tuna (*Auxis rochei*), Frigate Tuna (*A. thazard*), Kawakawa (*Euthynnus affinis*), Longtail Tuna (*Thunnus tonggol*), Striped Bonito (*Sarda orientalis*), Spanish Mackerel (*Scomberomorus commerson*), Indo-Pacific King Mackerel (*S. guttatus*)



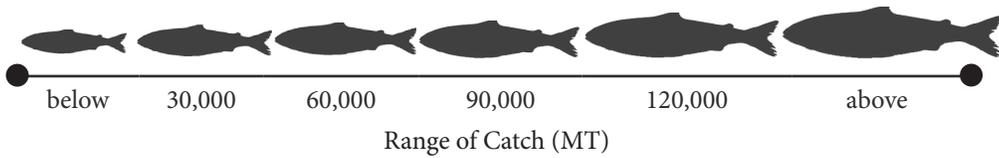


Small Pelagics	
Region	Catch (MT)
I	2,366
II	2,224
III	6,509
IV-A	11,598
IV-B	64,184
V	82,288
VI	29,938
VII	20,158
VIII	3,660
IX	184,800
X	17,853
XI	9,752
XII	12,127
CARAGA	7,617
ARMM	8,772
TOTAL	456,228



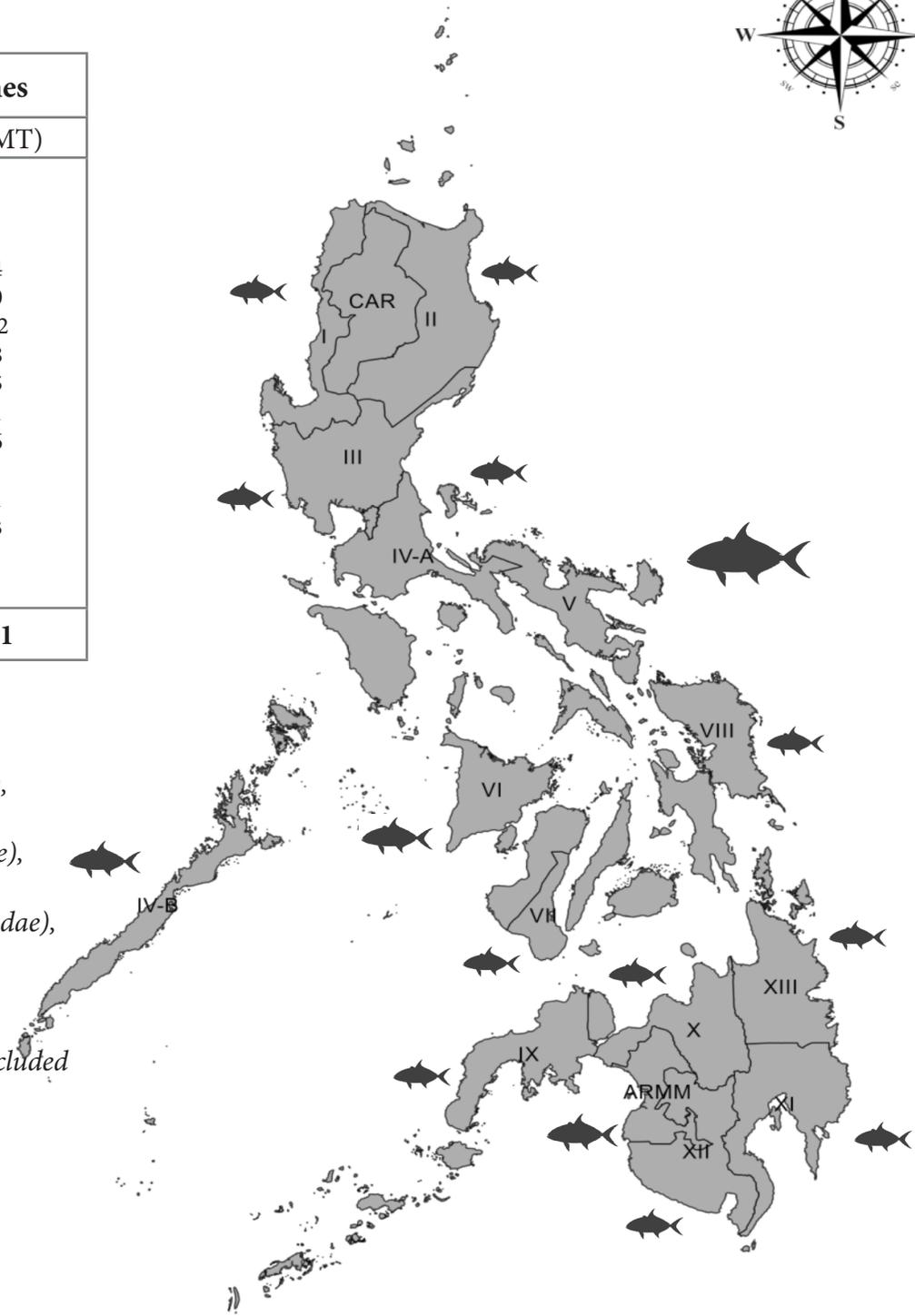
Small Pelagic Fishes

Species included:
Anchovies (Engraulidae),
Sardines/Herrings (Clupeidae), Scads (Carangidae), Indian Mackerels (Scombridae),
Fusiliers (Caesionidae),
Flying fishes (Exocoetidae).





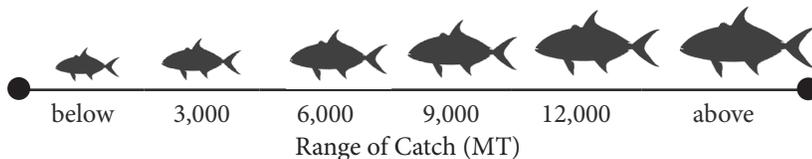
Other Pelagic Fishes	
Region	Catch (MT)
I	712
II	390
III	332
IV-A	1,604
IV-B	8,190
V	18,462
VI	4,698
VII	2,975
VIII	1,081
IX	1,316
X	652
XI	1,111
XII	1,083
CARAGA	708
ARMM	6,485
TOTAL	49,091



Other Pelagics

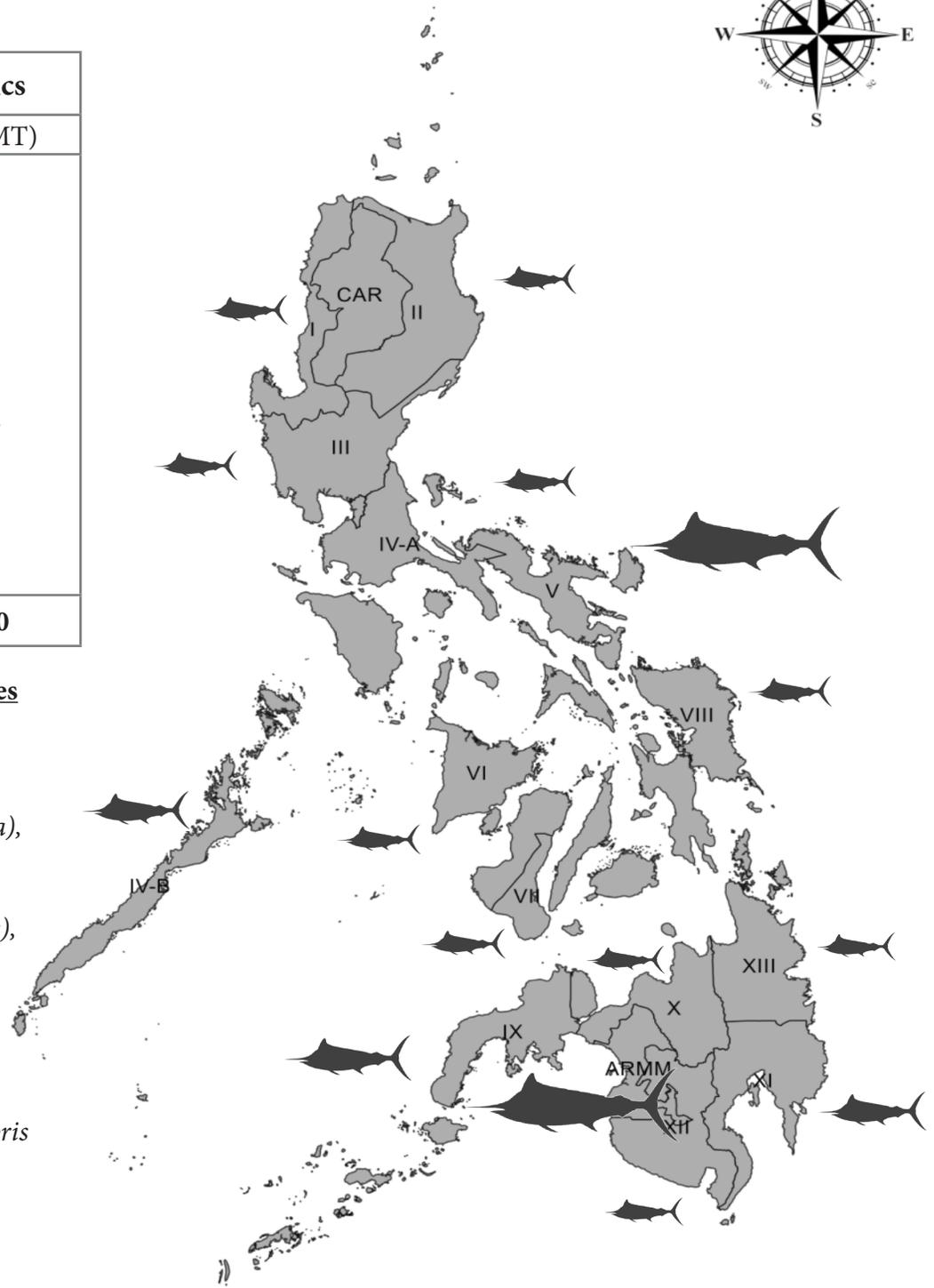
Species included:

- Barracuda (*Sphyraenidae*),
- Needlefish (*Belonidae*),
- Halfbeak (*Hemiramphidae*),
- Cutlassfish (*Trichiuridae*),
- Snake mackerel (*Gempylidae*),
- Milkfish (*Chanidae*),
- Tarpon (*Megalopidae*),
- Cobia (*Rachycentridae*),
- Jacks (*Carangidae*) (see included genera in speciescomplist),





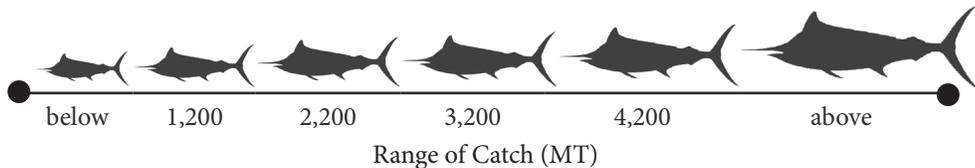
Other Large Pelagics	
Region	Catch (MT)
I	399
II	164
III	632
IV-A	80
IV-B	1,550
V	6,982
VI	205
VII	85
VIII	4
IX	2,247
X	106
XI	1,779
XII	703
CARAGA	763
ARMM	5,965
TOTAL	20,900



Other Large Pelagic Fishes

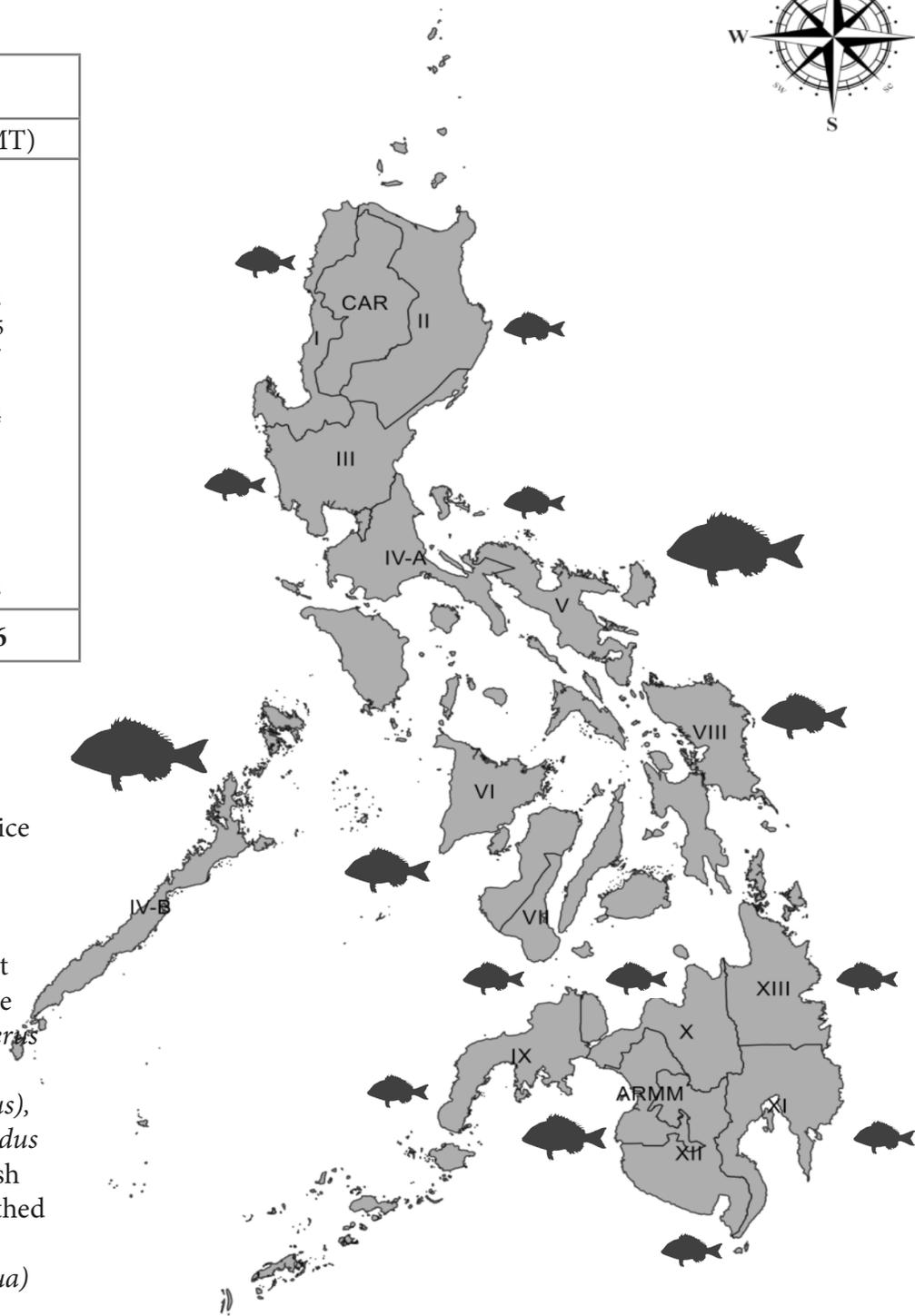
Species included:

- Black Marlin (*Makaira indica*), Indo-Pacific Blue Marlin (*Istiomplax mazara*), Indo-Pacific sailfish (*Istiophorus platypterus*), Swordfish (*Xiphias gladius*), Mahi-mahi (*Coryphaena hippurus*), Pompano dolphinfish (*C. equiselis*), Wahoo (*Acanthocybium solandri*), Ocean sunfish (*Mola mola*), Opah (*Lampris guttatus*), Striped marlin (*Kajikia audax*)



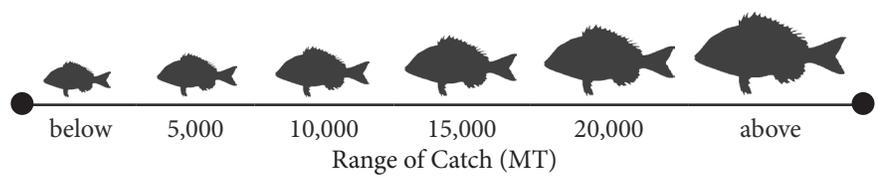


Demersal Fishes	
Region	Catch (MT)
I	1,159
II	363
III	1,232
IV-A	2,808
IV-B	27,182
V	21,855
VI	12,257
VII	4,219
VIII	10,384
IX	892
X	1,895
XI	524
XII	343
CARAGA	888
ARMM	12,012
TOTAL	97,126



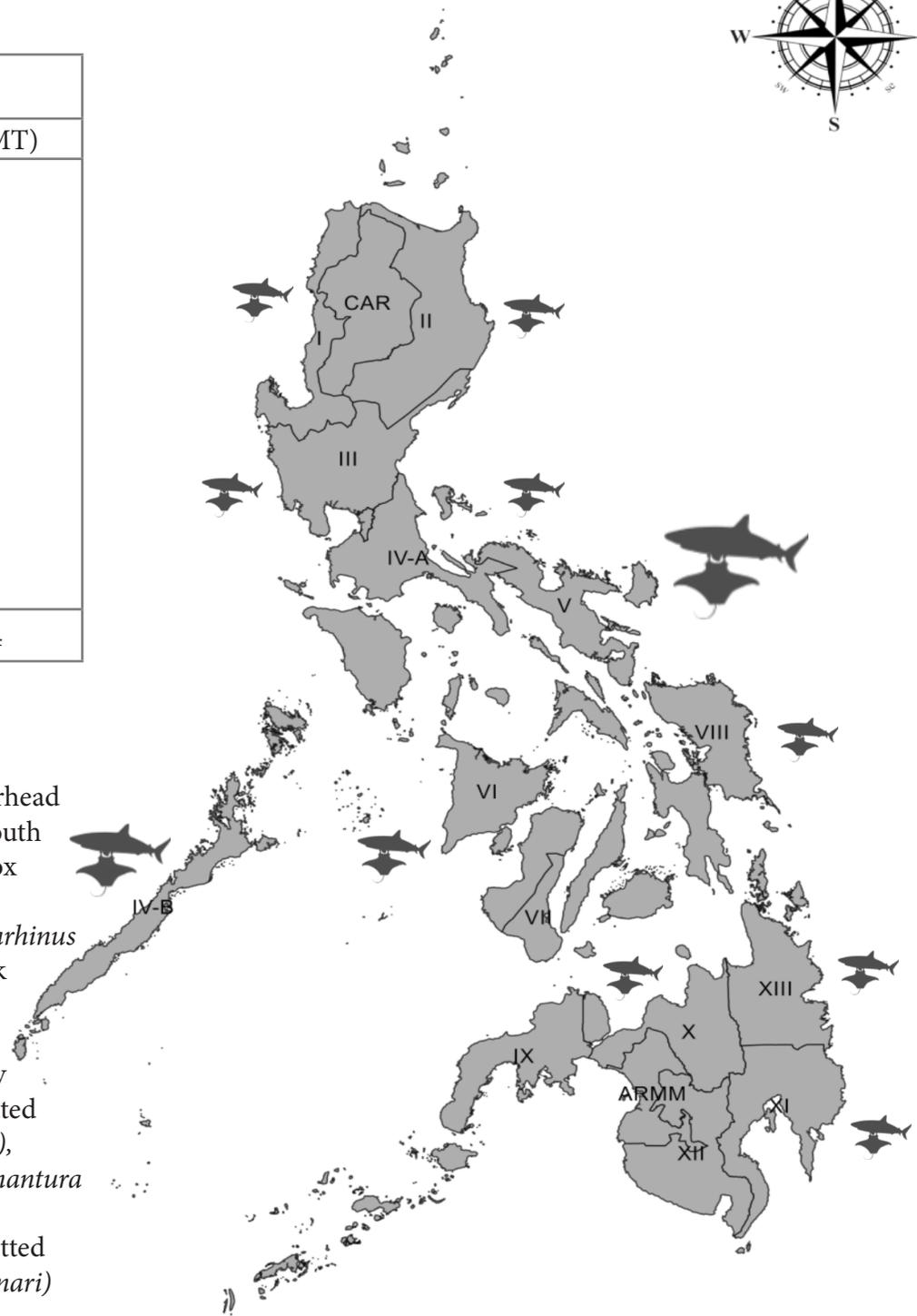
Demersal Fishes

Species included:
 Unicorn leatherjacket (*Aluterus monoceros*), Lattice monocle bream (*Scolopsis taeniopterus*), Splendid ponyfish (*Leiognathus splendens*), Bluespot mullet (*Valamugil seheli*), Japanese Threadfin Bream (*Nemipterus japonicus*), Purple-spotted bigeye (*Priacanthus tayenus*), Butterfly whiptail (*Pentapodus setosus*), Orangefin Ponyfish (*Leiognathus bindus*), Toothed Ponyfish (*Gazza minuta*), Tiger Perch (*Terapon jarbua*)





Sharks and Rays	
Region	Catch (MT)
I	4
II	12
III	28
IV-A	36
IV-B	485
V	854
VI	163
VII	-
VIII	62
IX	0
X	7
XI	12
XII	-
CARAGA	5
ARMM	-
TOTAL	1,664

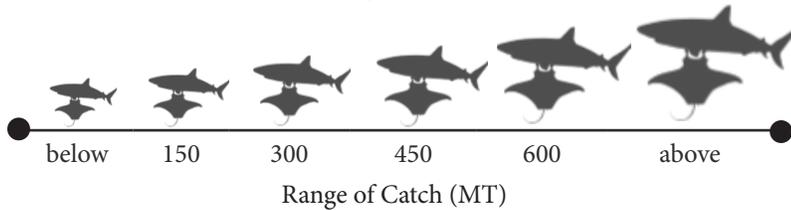


Sharks and Rays

Species included:

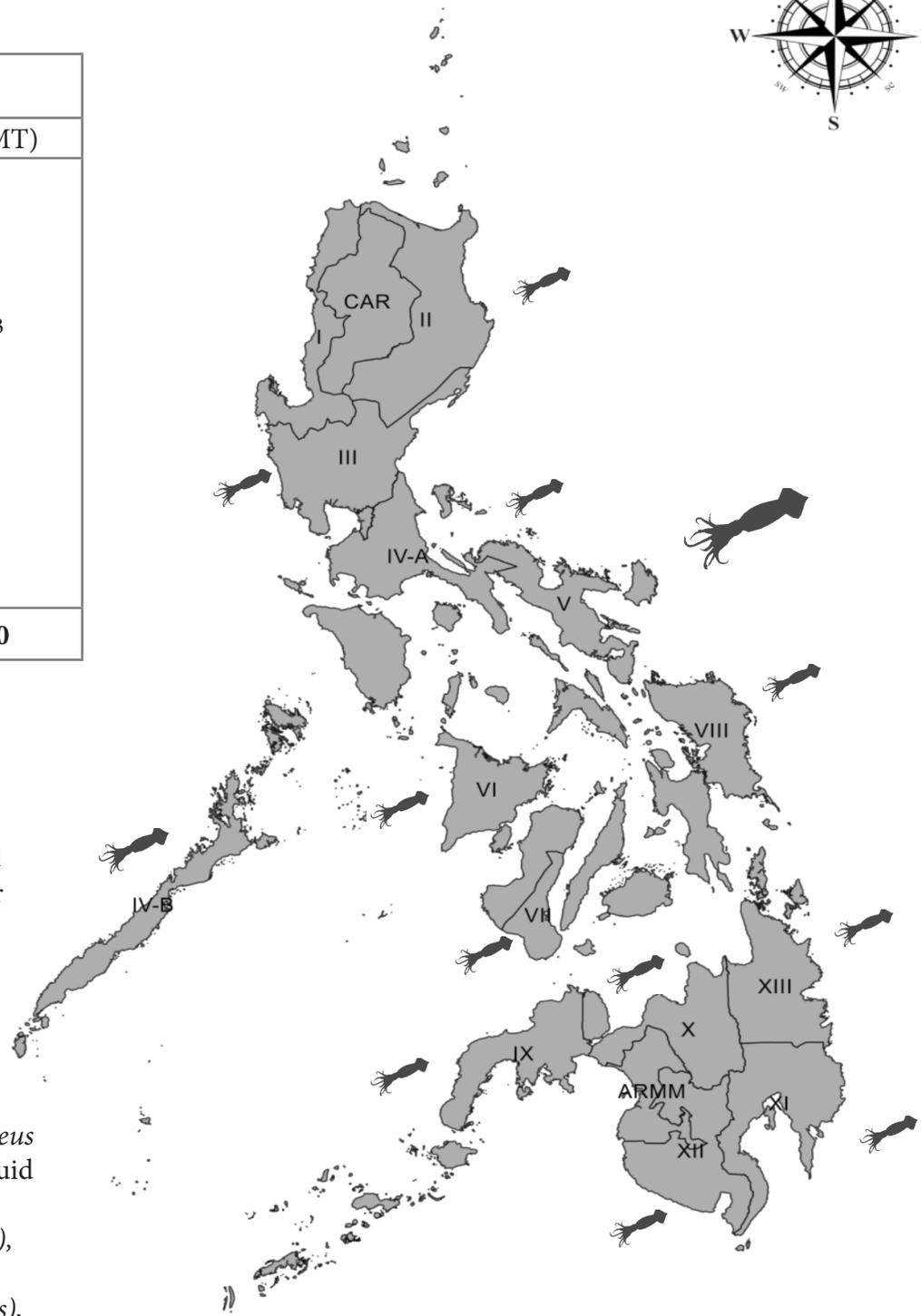
Sharks: Scalloped hammerhead (*Sphyrna lewini*), Megamouth (*Megachasma pelagios*), Fox Shark (*Alopias pelagicus*), Whitecheek shark (*Carcharhinus dussumieri*), Spottail Shark (*Carcharhinus sorrah*)

Rays: Bluespotted maskray (*Dasyatis kuhlii*), Bluespotted stingray (*Neotrygon kuhlii*), Honeycomb stingray (*Himantura uarnak*), Brown Stingray (*Neotrygon annotata*), Spotted Eagle Ray (*Aetobatus narinari*)





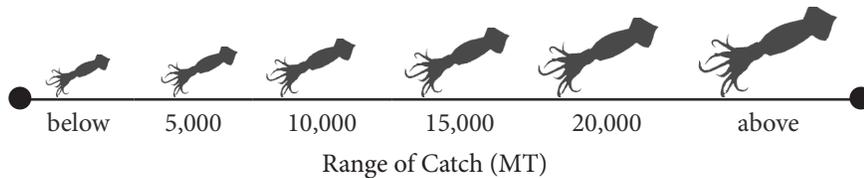
Invertebrates	
Region	Catch (MT)
I	-
II	1,286
III	985
IV-A	299
IV-B	5,472
V	28,843
VI	3,233
VII	163
VIII	498
IX	242
X	1,156
XI	2,275
XII	227
CARAGA	191
ARMM	-
TOTAL	44,680



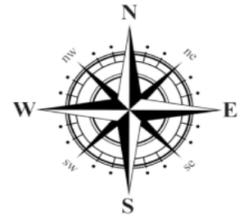
Invertebrates

Species included:

Flower crab (*Portunus pelagicus*), Swordtip Squid (*Photololigo edulis*), Spider Prawn (*Nematopalaemon tenuipes*), Indian Squid (*Loligo idulis*), Hawaiian arrow squid (*Nototodarus hawaiiensis*), Oval squid (*Sepioteuthis lessoniana*), Indian white prawn (*Penaeus indicus*), Indian Ocean Squid (*Photololigo duvaucelii*), Cuttlefish (*Sepia kobeensis*), Purpleback flying squid (*Sthenoteuthis oualaniensis*),

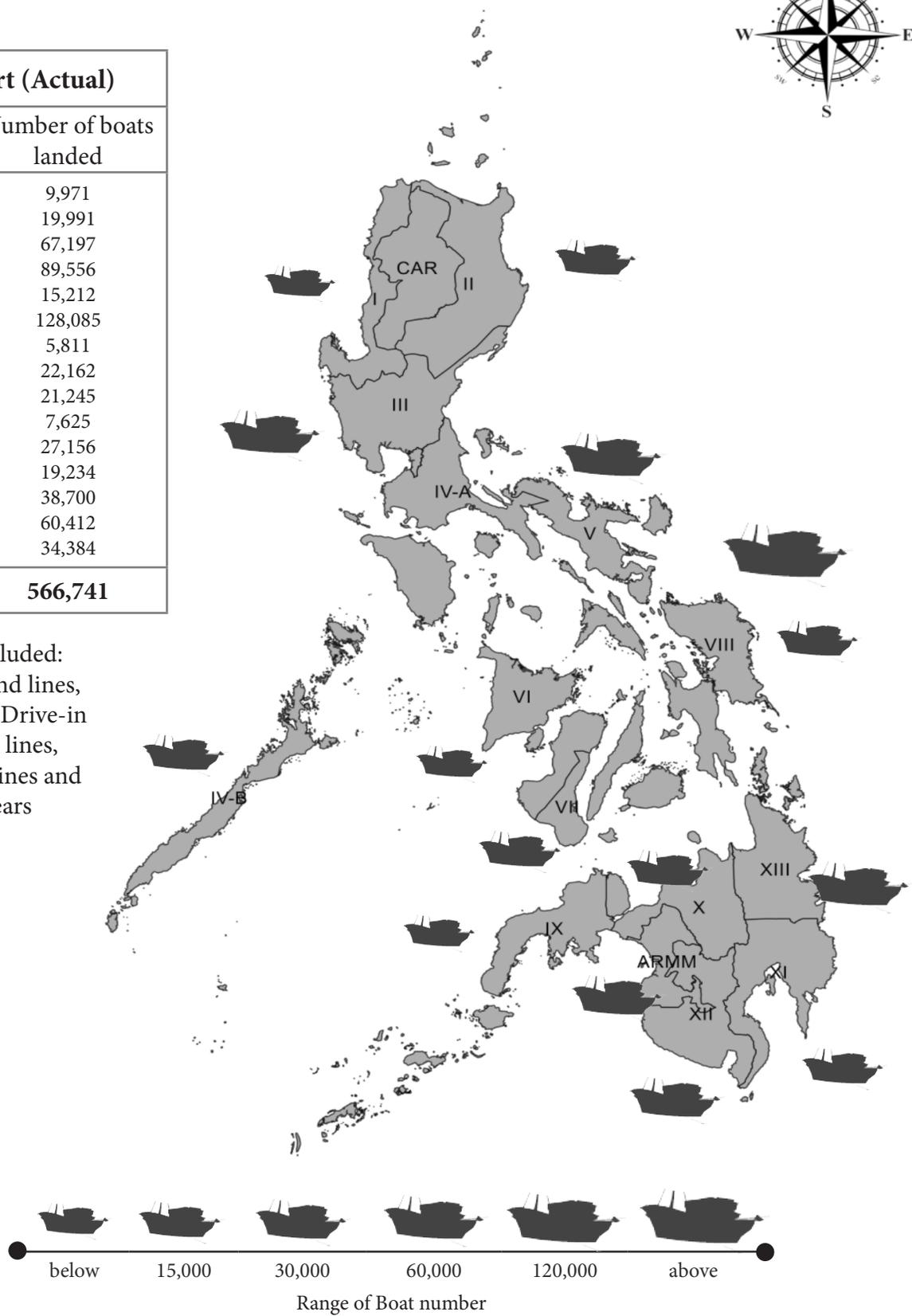


Chapter 2.2: Effort



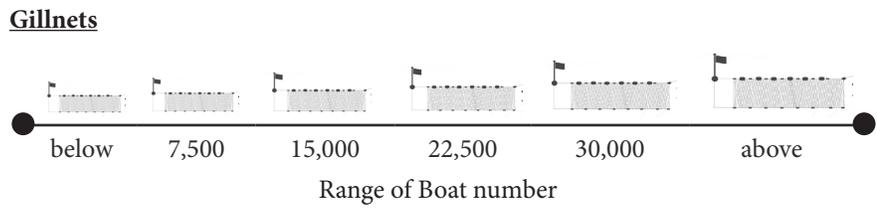
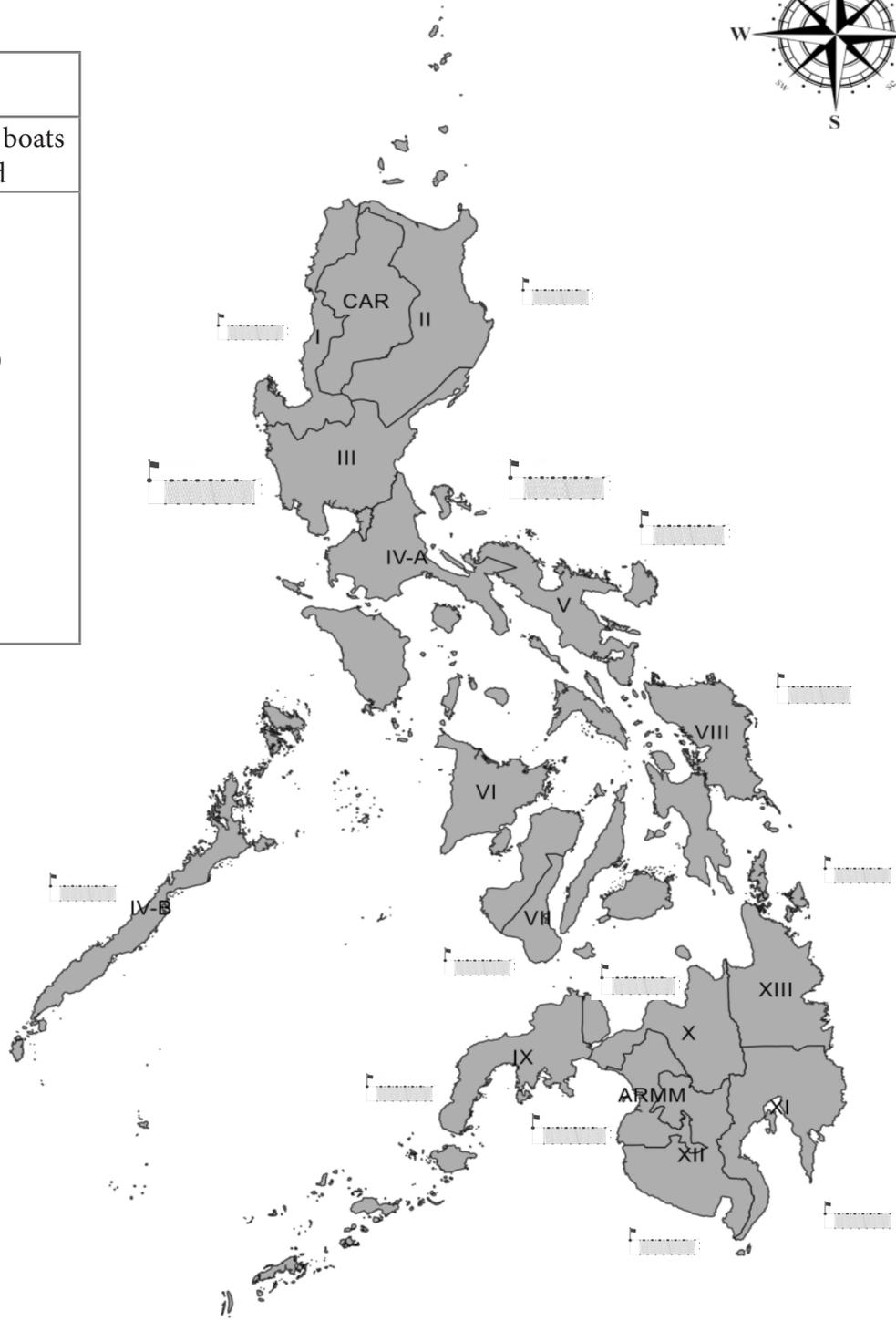
Total Effort (Actual)	
Region	Number of boats landed
I	9,971
II	19,991
III	67,197
IV-A	89,556
IV-B	15,212
V	128,085
VI	5,811
VII	22,162
VIII	21,245
IX	7,625
X	27,156
XI	19,234
XII	38,700
CARAGA	60,412
ARMM	34,384
TOTAL	566,741

Fishing gears included:
 Gillnets, Hook and lines,
 Trawl, Ringnets, Drive-in
 nets, Jigger, Troll lines,
 Bottom set longlines and
 Miscellaneous gears



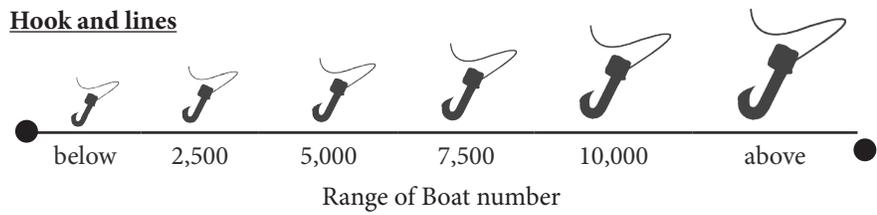
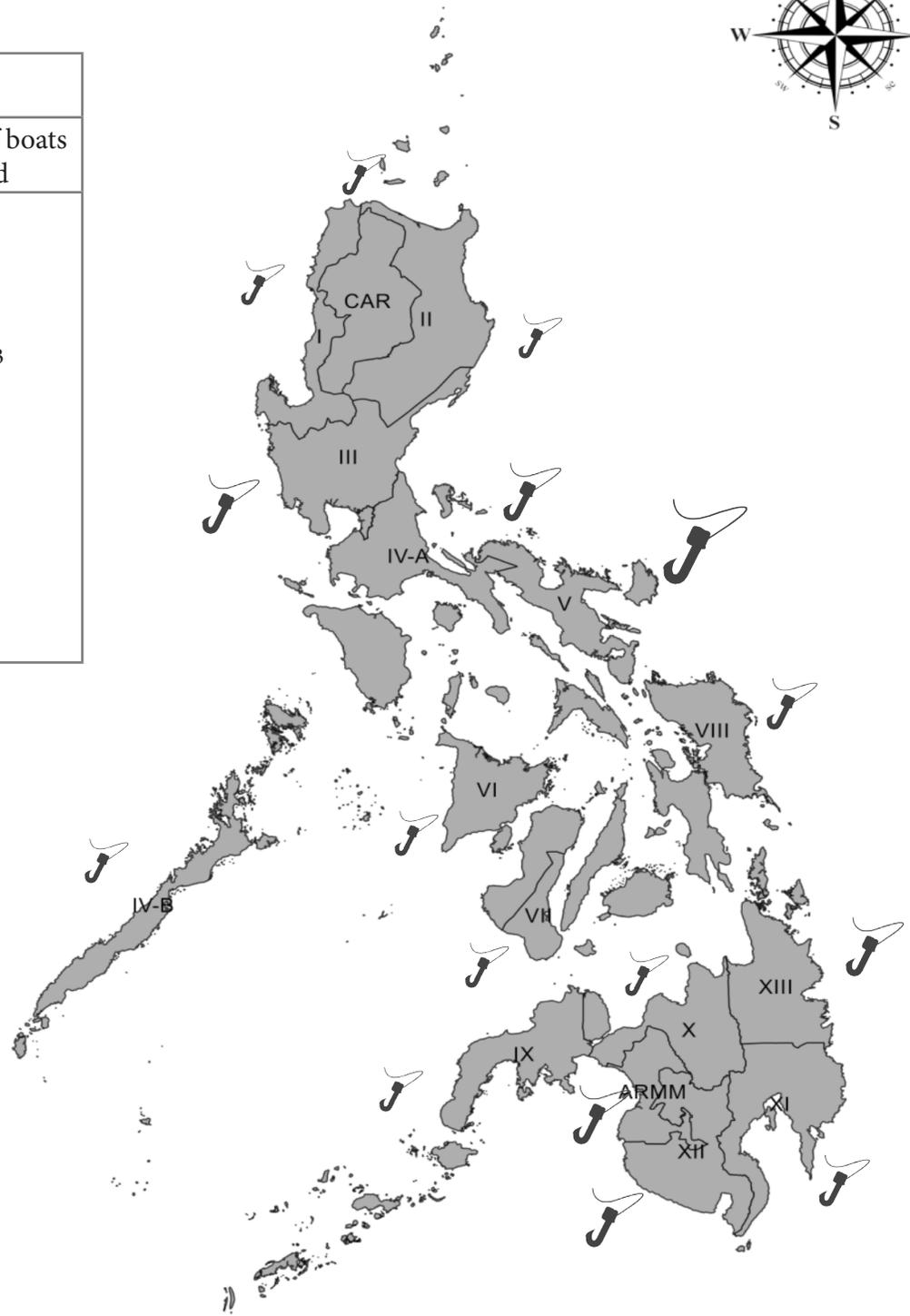


Gillnets	
Region	Number of boats landed
I	592
II	5,018
III	38,478
IV-A	24,779
IV-B	1,626
V	21,770
VI	802
VII	5,414
VIII	9,582
IX	1,820
X	8,430
XI	1,790
XII	5,246
CARAGA	4,515
ARMM	8,802





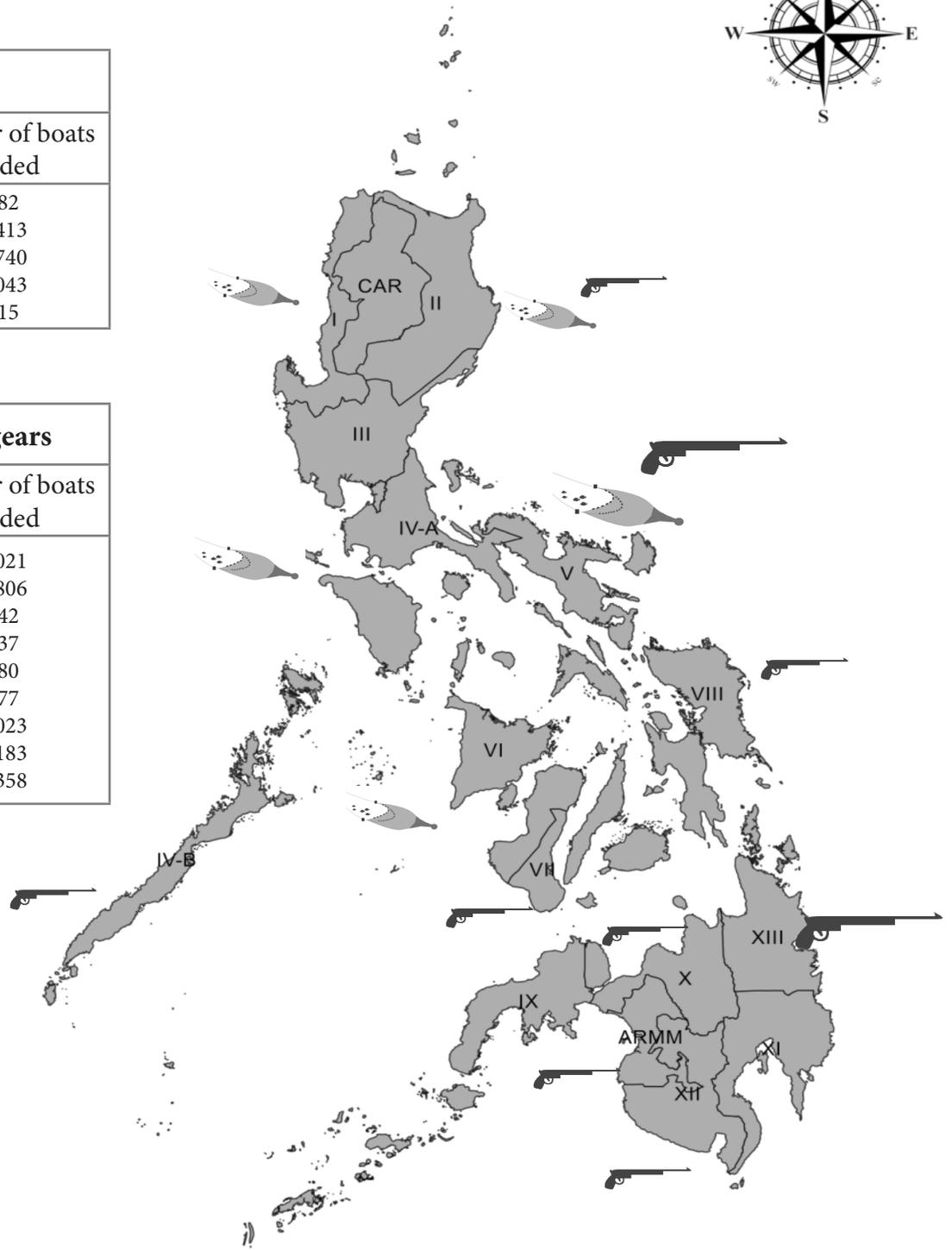
Hook and Lines	
Region	Number of boats landed
I	1,599
II	1,158
III	5,970
IV-A	5,751
IV-B	1,888
V	15,633
VI	721
VII	1,801
VIII	3,412
IX	985
X	2,029
XI	3,145
XII	5,486
CARAGA	6,256
ARMM	5,669
CAR	830



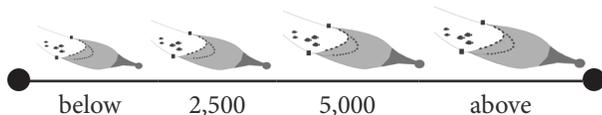


Trawl	
Region	Number of boats landed
I	782
II	1,413
IV-A	4,740
V	9,043
VI	415

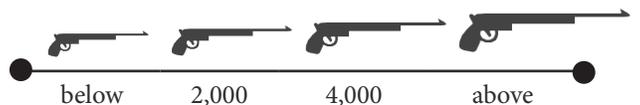
Miscellaneous gears	
Region	Number of boats landed
II	1,021
IV-A	5,806
IV-B	642
VII	437
VIII	580
X	377
XII	1,023
CARAGA	6,183
ARMM	1,358



Trawl



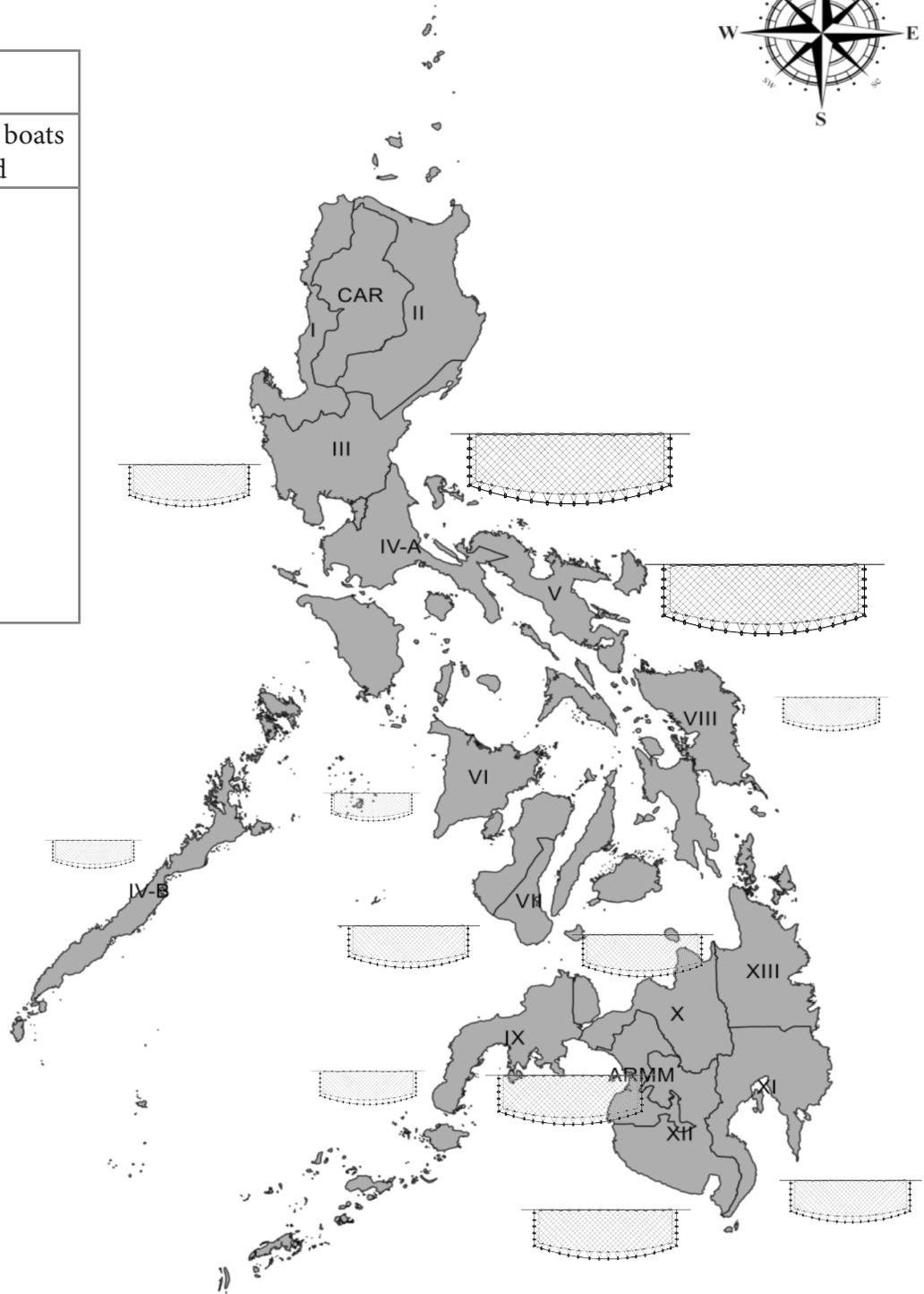
Miscellaneous gears



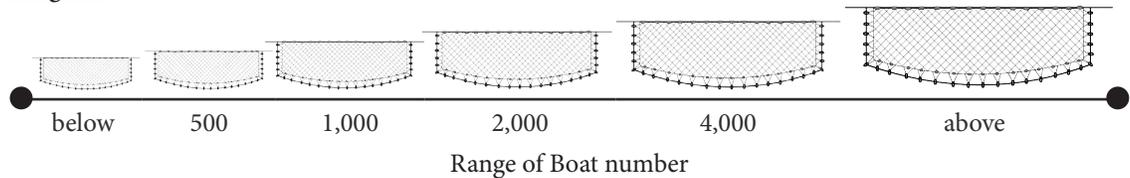
Range of Boat number



Ring net	
Region	Number of boats landed
I	-
II	-
III	1,607
IV-A	6,707
IV-B	300.48
V	5,667
VI	207
VII	1,517
VIII	920
IX	651
X	1,172
XI	1,560
XII	2,635
CARAGA	-
ARMM	2,402



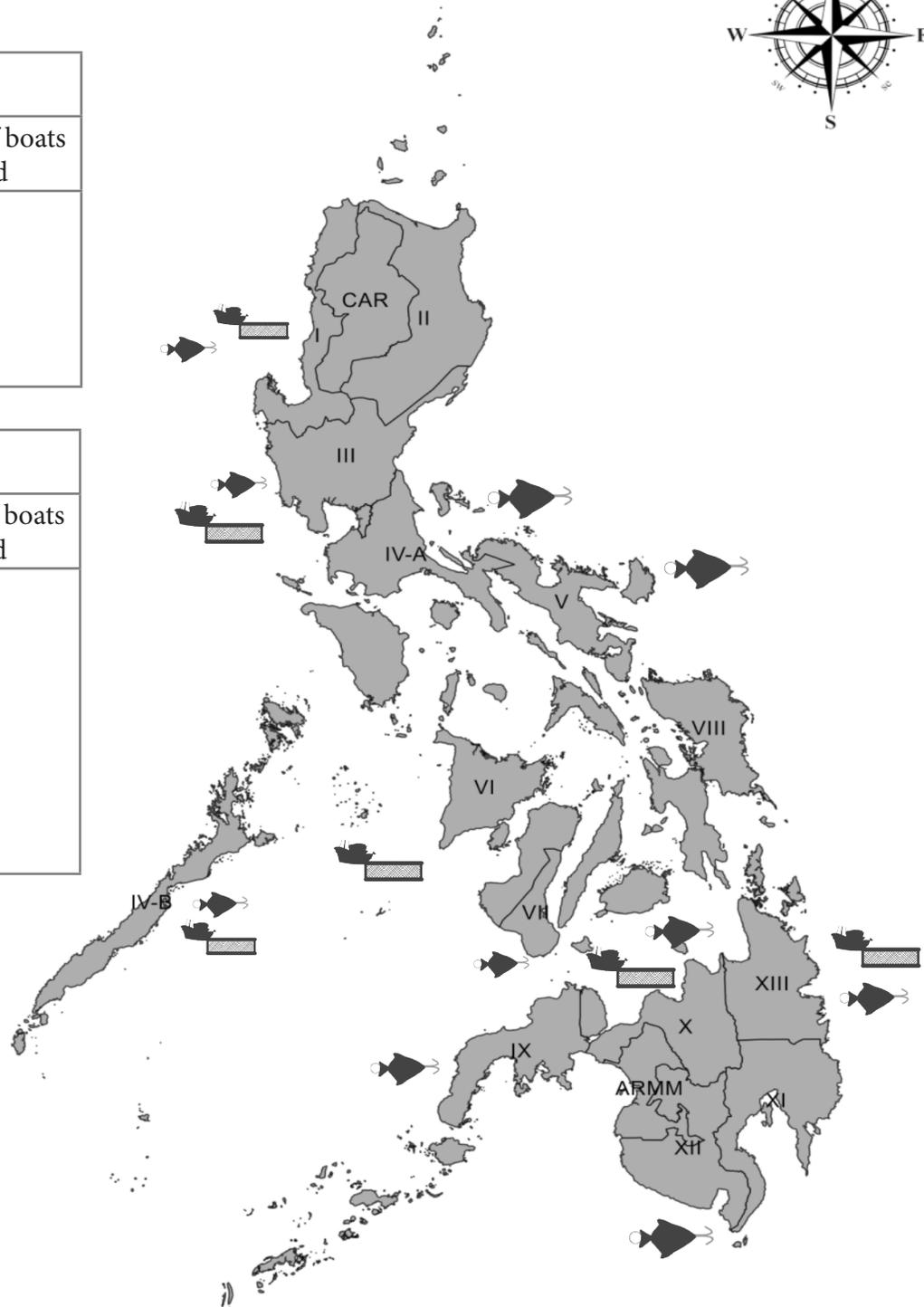
Ring net



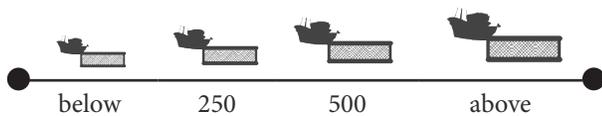


Drive-in net	
Region	Number of boats landed
I	423
III	526
IV-B	434
VI	867
X	587
CARAGA	546

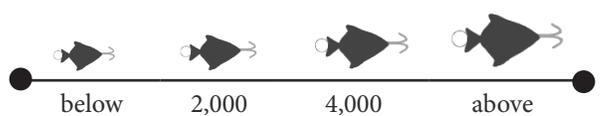
Jigger	
Region	Number of boats landed
I	397
III	819
IV-A	4,346
IV-B	596
V	4,343
VII	1,170
X	3,213
XI	2,334
XII	4,178
CARAGA	3,691



Drive-in net



Jigger

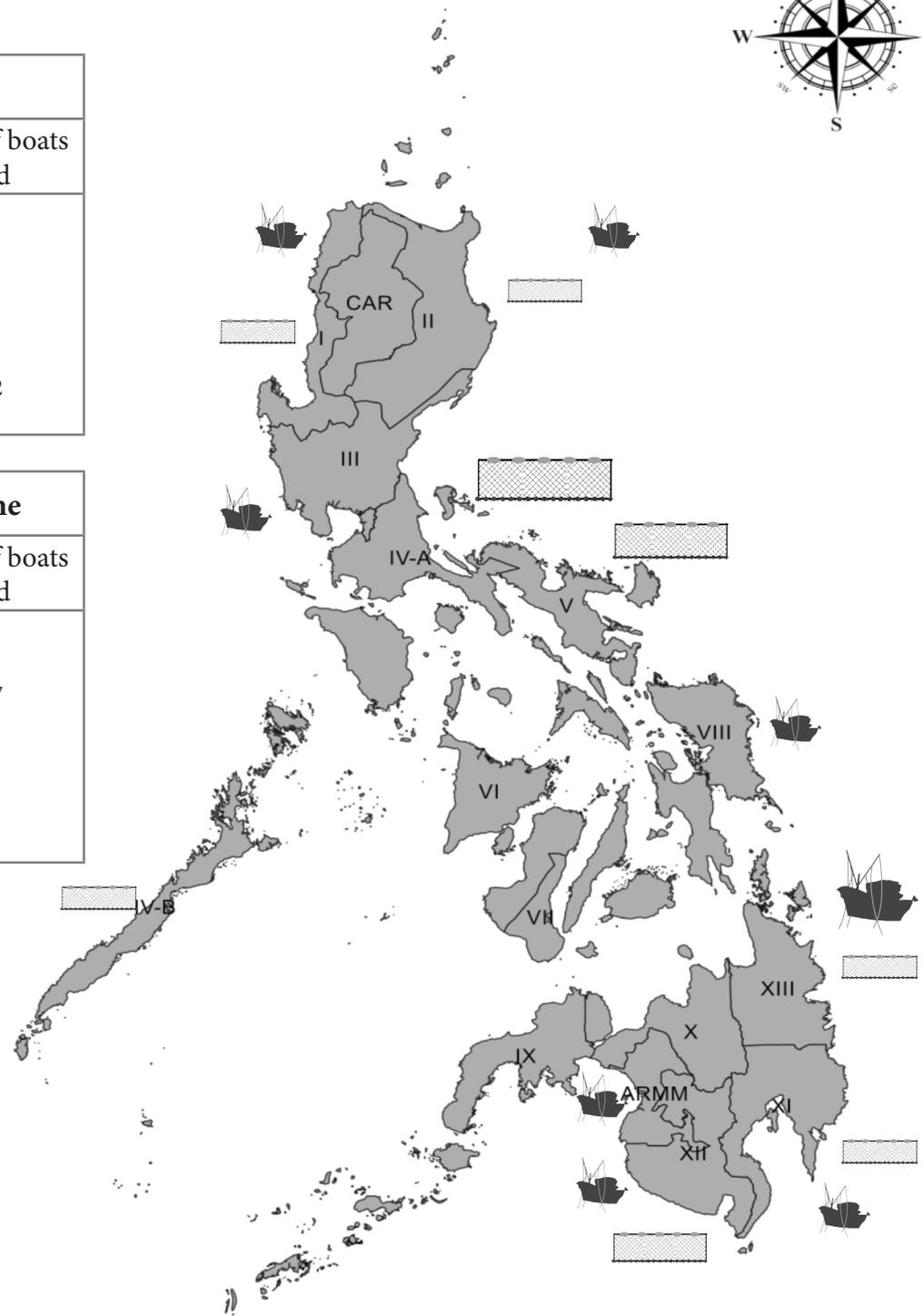


Range of Boat number

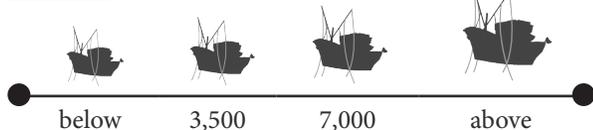


Troll line	
Region	Number of boats landed
I	874
II	1,932
III	632
VIII	444
XI	1,911
XII	1,687
CARAGA	14,852
ARMM	3,363

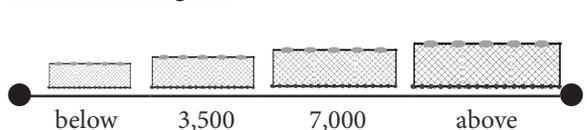
Bottom set longline	
Region	Number of boats landed
I	578
II	1,767
IV-A	16,147
IV-B	1,381
V	7,673
XI	505
XII	4,591
CARAGA	1,844



Troll line

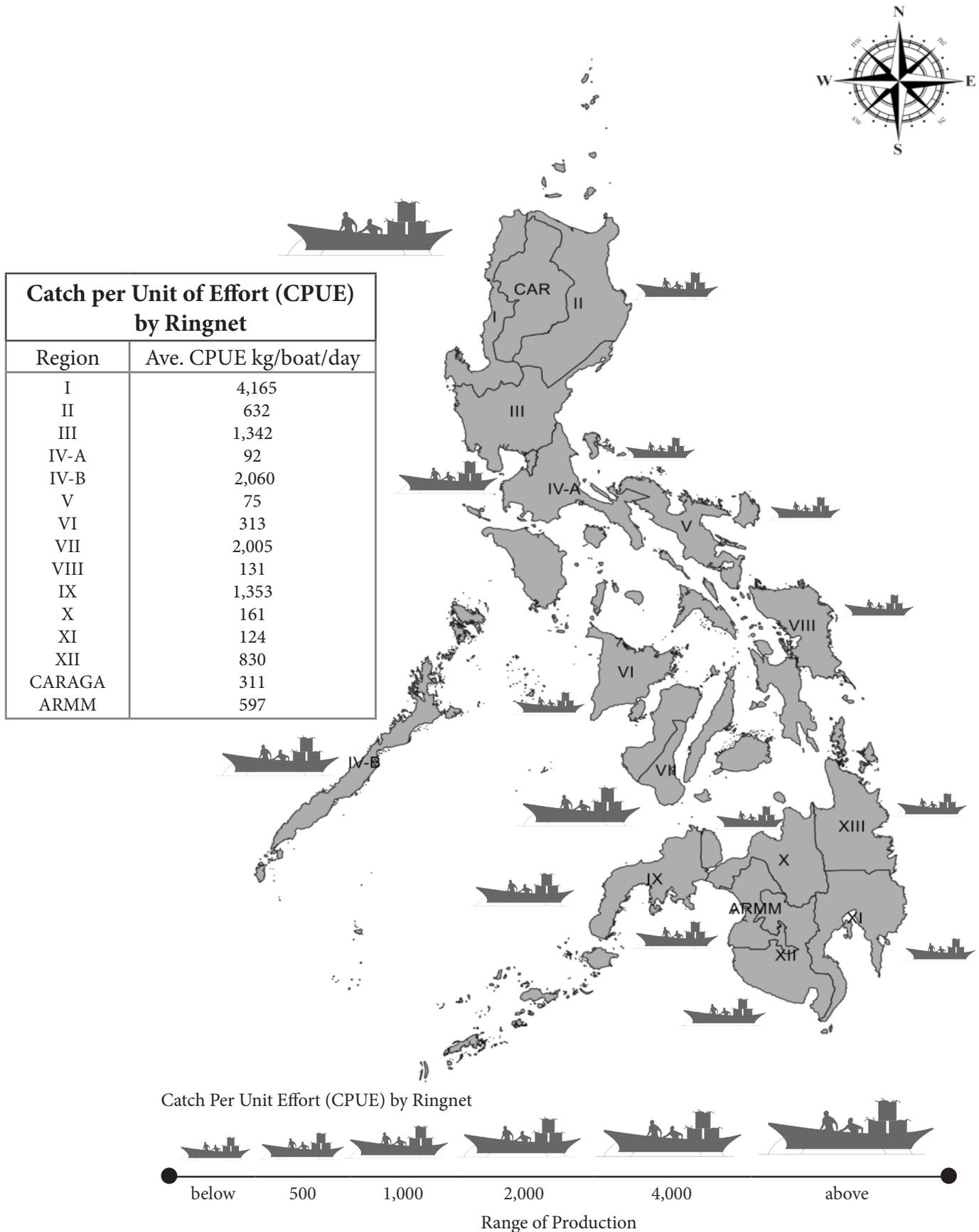


Bottom set longline



Range of Boat number

Chapter 2.3: CPUE



Chapter 2.4: Exploitation Values

National Stock Assessment Program: Exploitation Rates of Selected Fish Species in Various Fishing Grounds in the Philippines using 2015 Baselines

Noel C. Barut¹, Francisco Torres Jr.¹, Valeriano Manlulu¹, Grace V. Lopez¹, Eunice Bognot¹, Rosario Segundina P. Gaerlan², Angel B. Encarnacion², Romina V. Yutuc², Maribeth H. Ramos², Myrna Candelario², Virginia Olano², Sheryll V. Mesa², Prudencio Belga, Jr. 2, Nancy Dayap², Romeo C. De Guzman², Gena Babanto², Jose Villanueva², Laila Emperua², Romeo C. Deligero², Macmod Mamalangkap², Francis Greg C. Buccat², Melanie Calicdan², Jenelyn Vallejo², Lenie Gonzales², Johnson Paran², Lea Tumabiene², Pedling Munap², Gigi Albor², Joyce Baclayo², Sammy Ayub², Graceous Von Yip¹, Nicko Amor Flores¹, Roselyn Aguila¹ and Mudjekeewis D. Santos^{1*}

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*Corresponding Author: mudjiesantos@gmail.com

INTRODUCTION

The Philippines has one of the largest fisheries in the world (Barut *et al.*, 2003) and is host to the highest number of marine organisms per square area (Carpenter and Springer, 2005; Sanciangco *et al.*, 2011). However, it is also a global marine biodiversity hotspot right at the apex of the Coral Triangle of the Indo-Pacific Region (Carpenter *et al.*, 2011). This is primarily due to a number of threats including overfishing-particularly illegal, unregulated and unreported fishing (IUUF), habitat degradation, pollution, alien and invasive species and even climate change (Sulu Sulawesi Marine Ecoregion Tri-National Committee, 2013).

The Philippine Fisheries Code of 1998 or the Republic Act 8550 as amended by RA 10654 and its Implementing Rules and Regulations (IRR) as well as the Comprehensive National Fisheries Industry Development Plan (CNFIDP) (BFAR, 2016) mandated the implementation of science-based conservation and management measures for the

fisheries sector in the country. In particular, Reference Points (RPs) and corresponding Harvest Control Rules (HCRs) have been identified as key strategies to achieve these goals.

The BFAR National Stock Assessment Program (NSAP), spearheaded by the National Fisheries Research and Development Institute (NFRDI), has been tasked to implement the provisions of RA 8550 as amended by RA 10654 and strategies under the CNFIDP on RPs including Limit, Target and Trigger RPs. NSAP, which was conceptualized and started by the Bureau of Fisheries and Aquatic Resources (BFAR) in 1996, has the primary function of developing standardized, specific and time-series information on capture fisheries for the management of the country's marine resources in major fishing grounds (Santos and Barut, 2017). Among the possible RPs, the Exploitation Rate (E) has been selected by NSAP as one of the RPs to be used in assessing, monitoring and evaluation of the status of fish stocks in the country relative to fishing pressure.

Exploitation rate (E) is computed by getting the ratio of fishing mortality over total mortality (Z), with which the condition of the fishing area can be determined. Based on Pauly and Ingles (1984), the optimum fishing mortality of an exploited stock should be equal to its natural mortality ($F_{opt} = M$); thus, optimum exploitation should equate to $E = 0.50$ (Pauly, 1984).

In the Philippine setting, Exploitation rate at $E = 0.50$, the estimated optimum exploitation, has been set by NSAP as the Limit Reference Point (LRP) for most commodity fish stocks except for small pelagics where the optimum E value was decided to be at 0.60 based on its high fecundity and relatively short life cycle of about 3 years and $E = 0.40$ for oceanic tunas, which are long lived with a life cycle of about 10-12 yrs. E rates higher than the LRPs, therefore, would suggest unsustainable harvest of the fish stocks.

Here we present the status of selected fish stocks by fishing ground in the country through the computation of actual E values using 2015 length frequency data, compared with the set LRPs and projected in color-coded maps.

MATERIALS AND METHODS

Study Sites and Sampling

A total of 840 landing centers were monitored by NSAP in 2015 for landed catch and effort (Table 1 and Fig. 1 *see. page 39*). Sites were identified as either Commercial or Municipal based on the gross tonnage (GT) of fishing boats landing; 3 GT or below are classified as Municipal while above 3 GT are classified as Commercial.

Data collection on selected landing sites was conducted every other two days including weekends and holidays. Commercial landing sites were sampled on the first day while the municipal landing sites were sampled on the second day. Sampling was done throughout the month for a total of 20-21 sampling days, ten days for each type of fishery. For months that have 31 calendar days, the commercial landing sites were sampled for eleven days. All pertinent data on the landed catch were recorded in NSAP Forms such

as date of sampling, actual fishing operation (time), fish landing center, name of boat, type of gear used, name of fishing ground, total catch by boat (number of boxes/bañeras or weight by kg), length measurements (fish length and frequency), and name and signature of enumerators/recorders (Santos and Barut, 2017).

Length frequency data

The identified top commodity species were monitored for their length measurements per sampling day per month. The accumulated length frequencies were raised in order to get an estimate number of individuals in the entire population of a particular species landed per day using a weighted value.

Computation of length frequency with raising factor uses the formula:

$$\text{Raising factor} = \frac{\text{Total weight of species landed}}{\text{Weight of sample}}$$

$$\text{Raised length frequency} = \frac{\text{Frequency per mid-length} \times \text{Raising factor}}$$

The raised length frequencies were used in the FAO-ICLARM Stock Assessment Tools (FiSAT) software to determine its population parameters and to assess the stock status of the species.

Population parameters

Population parameters of the top commodity species were processed using FiSAT software version 1.2.2 or FiSAT II (Gayanilo et al 1997). The following are included in the software routines to estimate the parameters of the von Bertalanffy Growth Function (VBGF): the Electronic Length Frequency Analysis (ELEFAN) routine is used to estimate the length infinity (L_{∞}) and growth constant (k) from the k-scan; the Powell-Wetherall plot estimates the ratio of mortality and k.

The natural mortality (Z) divided by the fishing mortality (F) obtained a quotient of the exploitation rate (E). Growth parameters were determined first by estimating L_{∞} (asymptotic length) using Powell-Wetherall method (Gayanilo and Pauly, 1997) based on the equation of Beverton and Holt (1956):

$$Z = k((L_{\infty} - L) / (L - L'))$$

where Z is the total instantaneous mortality, k is the growth coefficient, L is the mean length, L_{∞} is the asymptotic length, and L' is the initial length of sample.

The estimated value of L_{∞} was further processed in ELEFAN I (Gayanilo and Pauly, 1997) for the verification of the value for L_{∞} and k. Analysis of the estimation of growth parameters and mortality used in the von Bertalanffy (1934) growth equation of:

$$L_t = L_{\infty}(1 - e^{-k(t-t_0)})$$

where L_t is the length of fish at age t, e is the base of the Naperian logarithm, t_0 is the hypothetical age the fish would attain at length zero.

Mortality parameters constitute the total mortality (Z) which is the summation of natural mortality (M) and fishing mortality (F). Natural mortality is caused by predation, disease and deaths due to aging, while fishing mortality is the reduction of stock due to fishing. The values of Z and F are used to obtain the exploitation rate (E) from the ratio of F over Z.

Mortalities and exploitation rate were then calculated using the equation;

$$Z = M + F$$

where Z is the instantaneous total mortality, M is the instantaneous natural mortality due to predation, aging and other environmental causes, and F is the instantaneous fishing mortality caused by fishing. Furthermore, M was estimated using Pauly's (1984) empirical formula of:

$$\log M = 0.654 \log k - 0.28 \log L_{\infty} + 0.463 \log T$$

where L_{∞} and k are the von Bertalanffy Growth Function (VBGF) growth parameters and T is the annual mean habitat temperature ($^{\circ}$ C) of the water in which the stock in question lives.

Expanding the equation for mortality would

lead us to the computation of exploitation rate using:

$$E = F/Z$$

where E is the exploitation rate. Using the equation from growth parameters and mortalities, prediction of recruitment patterns and virtual population analysis could be estimated using routines found in FiSAT programs (Gayanilo and Pauly 1997).

Fishing ground and Exploitation Rate Maps

For purposes of this study, fishing grounds were arbitrarily demarcated following land contours. Exploitation (E) rate for dominant small pelagic, demersal, neritic and oceanic tunas was then projected to corresponding fishing grounds where the group of fishes was collected as indicated in the NSAP landed catch and effort monitoring data. Maps were constructed using QGIS 2.14.3 Essen, an open access mapping software. E rates were represented in colors (Legend). Map of monitored fish landing centers was also prepared using this software.

RESULTS AND DISCUSSION

Exploitation (E) rates of dominant small pelagic, demersal, neritic and oceanic tuna species assessed in 2015 across 51 fishing grounds identified by the NSAP (Fig. 2) are presented in Tables 2-5 and represented in maps in Figures 3-6, respectively. Data for fish species are available but only those that have been analyzed at the time of this writing have been completed.

In Lingayen Gulf and Northwest Philippine Sea, majority of the dominant fish stocks experienced increased fishing pressure, indicated by high exploitation values. In Lingayen Gulf, small pelagic species like *Decapterus macrosoma*, *Decapterus maruadsi*, *Rastrelliger brachysoma* and *Selar crumenophthalmus* have E values beyond the optimum level registering 0.59, 0.76 0.77 and 0.59 respectively. *D. macrosoma*, and *S. crumenophthalmus* in the Northwest Philippine Sea resulted in E values that are likewise high at 0.52 and 0.75, respectively. Similar trends are observed in dominant demersal species in both fishing grounds, like *Nemipterus bathybius* and *Saurida tumbil* having high E values at 0.68 –0.81 and 0.66, respectively.

The Babuyan Channel is quite intriguing in that the three dominant pelagic species exhibit varying exploitation rates. *D. macrosoma* has high E value = 0.87, in contrast to *Coryphaena hippurus* with an estimated E value = 0.36. Meanwhile, *Trichiurus lepturus* has an E value = 0.60 which is equal to the proposed limit reference point value, suggesting that the species is being fished at its capacity.

In Region 3, results of analysis from abundant species monitored in the West Philippine Sea shows consistent high E values for all. The average E value for small pelagics (*Cypselurus naresii*, *Decapterus macarellus*, and *S. crumenophthalmus*) is at E = 0.62, for demersals (*Ctenochaetus strigosus*, *Nemipterus virgatus*, *Parasclopsis eriomma*, *Siganus canaliculatus* and *Upeneus vittatus*) at an average E = 0.71 and the lone large pelagic (*Euthynnus affinis*) has the highest E value at E = 0.80. The results could very well be indicative of growth and recruitment overfishing caused by several factors such as reduction of spawning stocks, IUU fishing committed by foreign poachers, and coastal habitat degradation which affects the quality and size of the spawning and nursery areas.

The CALABARZON region has a number of highly productive fishing grounds, but results of the length frequency analysis show high E values for the most number of examined species in all monitored sites. *Sardinella lemuru* in both Balayan and Tayabas Bays have high E values at E = 0.87 and E = 0.86, respectively. Meanwhile, *S. crumenophthalmus* in Balayan Bay, Tayabas Bay and Lamongan Bay have consistently high E values with E = 0.87, E = 0.78 and 0.67 respectively. The same is true for the three species of Decapterus (*D. macrosoma* in Lamongan Bay and *D. tabl*, and *D. kurroides* in Tayabas Bay) which have E values of 0.74, 0.76 and 0.69, respectively. The dominant demersal species also exhibit E values beyond the limit reference point. The nemipterids (i.e. *N. hexodon* in Balayan Bay, *N. nemurus*, *N. bathybius* and *N. tambuloides* in Lamongan Bay) registered E values at 0.60, 0.50, 0.61 and 0.76, respectively; while *Upeneus vittatus* and *Siganus canaliculatus* registered E values at 0.65 and 0.74, respectively. With E values at such high rates, it is suggested that the waters in the CALABARZON area are subjected to exploitation by target fishing that utilizes numerous target-specific gear types such that

overfishing would most probably happen on all fronts or should be across all water strata.

In the MIMAROPA region, two fishing grounds (i.e. Green Island Bay in Roxas, Palawan and Ulugan Bay in Puerto Princesa) have dominant species exhibiting high values of E. The three small pelagics in Ulugan Bay have an average E value of 0.62, while the two demersal species in Green Island Bay has a much higher average at 0.75. The current results are comparable to the previous study by Gonzales (2004) in Honda Bay where both groups of species are subject to increased fishing pressure because of the growing population in Palawan as evidenced by its high rate of population increase mainly due to migration.

In the Bicol region, important pelagic species in all three fishing grounds assessed have high E values. Both *Auxis rochei* and *Auxis thazard* in Lagonoy Gulf have E values at E = 0.86, while the dominant small pelagics (i.e. *Sardinella fimbriata* and *Escualosa thoracata*), in Sorsogon Bay have E values of 0.64 and 0.67, respectively. The most dominant pelagic fish in San Miguel Bay, *S. fimbriata* registered the highest E value at E = 0.91. The traditional fishing grounds of the Bicol region continue to experience overfishing, despite the area's natural closed seasons during the onset of southwest monsoon.

The sardines from the Visayan Sea, monitored by Regions 6 and 7 (*Sardinella gibbosa* and *Sardinella lemuru*) have almost similar values of E, with *S. gibbosa* having values of E = 0.75 and E = 0.70, and with *S. lemuru* at E = 0.74 and E = 0.71, respectively. Despite the annual closure of the Visayan Sea since the implementation of FAO 167 in 1989, the intense fishing pressure is still very evident in the results of the length-frequency analysis. The neighboring Samar Sea has E value for *S. fimbriata* slightly lower at E = 0.64, though still above the limit reference point.

Going down South, fishes from Camiguin and Macajalar Bay in Region 10 have almost similar E values, with neritic tunas, *Auxis rochei* and *A. thazard*, registering values at E = 0.59 and E = 0.58; while the sardines *S. fimbriata* and *S. lemuru* are at similar levels of E = 0.67. Sardines from Sarangani Bay in Region 12 (*S. gibbosa* and *S. lemuru*) have even higher E values

skyrocketing at $E = 0.85$ and $E = 0.98$, respectively. In contrast, sardines (*S. lemuru* and *Amblygaster sirm*), caught off Illana Bay and Sulu Sea in the Autonomous Region in Muslim Mindanao (ARMM) registered much lower E values at $E = 0.63$, $E = 0.57$ and $E = 0.53$, respectively.

Data on the exploitation rates of tuna and tuna-like species were also presented in Tables 3 and 4, and Figures 5 and 6. The scombrid family was grouped into oceanic, highly represented by *Katsuwonus pelamis*, and neritic species, as represented by *Auxis spp* and *Euthynnus affinis*. Exploitation of *K. pelamis* have exceeded the limit reference point value with a mean $E = 0.61$ across fishing grounds of which exploitation data are available. Similarly, the neritic tunas also exhibit high exploitation rates at an average of $E = 0.65$.

The overall view presented by these maps suggests that most of the Philippine traditional fishing grounds continue to be subjected to unsustainable fishing activities. In 2008, length-frequency analysis of 129 commodity species across major Philippine fishing grounds pointed to predominantly high E values, particularly suggesting high extraction patterns (*i.e.* fishing mortalities) observed in Lingayen Gulf, the

Babuyan Channel, Northern Zambales, Lagonoy Gulf, Sorsogon Bay, Visayan Sea, Camotes Seas, Honda Bay, Hinatuan Passage and Davao Gulf (DENR et. al., 2009). These findings also suggest continuous fishing pressures, brought about by increasing fishing effort and the availability of more efficient fishing gears, have posed major threats to the country's fishery stocks. Similarly, fisheries stock assessment reports at the regional level including that of Western and Central Visayan Sea (Guangco, et al., 2009), Sorsogon Bay (Olaño et al., 2009), Lagonoy Gulf (Olaño et al., 2009). Honda Bay (Ramos et al., 2009) and Northern Zambales Coast (Rueca et al., 2009) indicated a similar scenario.

It is important to note that typhoon path areas such as Northern Philippines (Batanes) and the Pacific seaboard, areas where there are armed conflicts (Jolo-Sulu), and areas with existing management strategy such as seasonal fishing closures implemented in Northern Palawan, Davao Gulf and Zamboanga Peninsula generally show "better" stock status than the rest of fishing grounds in the country. This suggests that fishing grounds in the country could be utilized sustainably if proper management is in place and implemented effectively.

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Table 1 Fish landing centers monitored by the National Stock Assessment Program by Region in 2015.

REGION	Number of Landing Centers Monitored
I	60
II	83
III	45
4A-CALABARZON	39
4B-MIMAROPA	66
V	87
VI	105
VII	63
VIII	56
IX	35
X	40
XI	49
XII	27
XIII-CARAGA	54
ARMM	31
Total Landing Centers	840

Table 2. Exploitation rates of dominant pelagic species by fishing ground based on National Stock Assessment Program length-frequency data in 2015.

REGION	FISHING GROUND	SPECIES	Average E- value	Actual E-value
1	Bangui Bay	<i>Selar crumenophthalmus</i>	0.60	0.60
	Ilocos Coast/NWPS	<i>Decapterus macrosoma</i>	0.64	0.52
		<i>Selar crumenophthalmus</i>		0.75
	Lingayen Gulf	<i>Decapterus macrosoma</i>	0.68	0.59
		<i>Decapterus maruadsi</i>		0.76
		<i>Rastrelliger brachysoma</i>		0.77
		<i>Selar crumenophthalmus</i>		0.59
	Pasaleng Bay	<i>Decapterus macrosoma</i>	0.72	0.72
2	Babuyan Channel	<i>Coryphaena hippurus</i>	0.61	0.36
		<i>Trichiurus lepturus</i>		0.60
		<i>Decapterus macrosoma</i>		0.87
3	Aurora Waters	<i>Decapterus macarellus</i>	0.46	0.35
		<i>Elagatis bipinnulata</i>		0.44
		<i>Rastrelliger brachysoma</i>		0.60
		<i>Selar crumenophthalmus</i>		0.52
		<i>Trichurus lepturus</i>		0.41

	West Philippine Sea	<i>Cypselurus naresii</i>	0.62	0.60
		<i>Decapterus macarellus</i>		0.59
		<i>Selar crumenophthalmus</i>		0.67
4A-CALABARZON	Calatagan/Balayan Bay	<i>Sardinella lemuru</i>	0.79	0.87
		<i>Selar boops</i>		0.64
		<i>Selar crumenophthalmus</i>		0.87
	Lamon Bay	<i>Decapterus macrosoma</i>	0.71	0.74
		<i>Selar crumenophthalmus</i>		0.67
	Tayabas Bay	<i>Decapterus kurroides</i>	0.77	0.69
		<i>Decapterus tabl</i>		0.76
		<i>Sardinella lemuru</i>		0.86
		<i>Selar crumenophthalmus</i>		0.78
4B-MIMAROPA	Brooke's Point	<i>Decapterus russelli</i>	0.61	0.66
		<i>Rastrelliger kanagurta</i>		0.39
		<i>Selar crumenophthalmus</i>		0.77
	Coron Bay	<i>Encrasicholina devisi</i>	0.56	0.58
		<i>Selar crumenophthalmus</i>		0.54
	Cuyo Pass	<i>Rastrelliger kanagurta</i>	0.52	0.67
		<i>Selar crumenophthalmus</i>		0.37
	Green Island Bay	<i>Atule mate</i>	0.43	0.43
	Honda Bay	<i>Selar crumenophthalmus</i>	0.58	0.58
	Imuruan Bay	<i>Decapterus russelli</i>	0.67	0.78
		<i>Rastrelliger kanagurta</i>		0.63
		<i>Selar crumenophthalmus</i>		0.59
	Malanut Bay	<i>Decapterus macrosoma</i>	0.59	0.63
		<i>Rastrelliger kanagurta</i>		0.54
		<i>Selar crumenophthalmus</i>		0.59
	San Antonio Bay	<i>Rastrelliger kanagurta</i>	0.60	0.60
	Sulu Sea Narra	<i>Decapterus russelli</i>	0.59	0.66
		<i>Rastrelliger kanagurta</i>		0.51
	Tablas Strait	<i>Selar crumenophthalmus</i>	0.64	0.72
		<i>Rastrelliger kanagurta</i>		0.69
		<i>Decapterus macarellus</i>		0.70
		<i>Decapterus kurroides</i>		0.82
		<i>Rastrelliger faughnii</i>		0.67
		<i>Selar boops</i>		0.24
	Taytay Bay	<i>Rastrelliger kanagurta</i>	0.55	0.55
	Ulugan Bay	<i>Decapterus macrosoma</i>	0.62	0.61
		<i>Decapterus russelli</i>		0.67
		<i>Rastrelliger kanagurta</i>		0.59
	WPS Rizal	<i>Decapterus macrosoma</i>	0.68	0.68

5	Albay Gulf	<i>Selar boops</i>	0.75	0.88
		<i>Decapterus macrosoma</i>		0.88
		<i>Rastrelliger faughni</i>		0.79
		<i>Decapterus macarellus</i>		0.78
		<i>Decapterus russelli</i>		0.63
		<i>Atule mate</i>		0.52
	Asid Gulf	<i>Selaroides leptolepis</i>	0.72	0.69
		<i>Rastrelliger brachysoma</i>		0.79
		<i>Sardinella fimbriata</i>		0.67
	Lagonoy Gulf	<i>Selar crumenophthalmus</i>	0.61	0.62
		<i>Decapterus macarellus</i>		0.58
		<i>Decapterus russelli</i>		0.69
		<i>Atule mate</i>		0.53
		<i>Decapterus macrosoma</i>		0.59
		<i>Rastrelliger faughni</i>		0.65
	Lamon Bay	<i>Atule mate</i>	0.69	0.75
		<i>Selar boops</i>		0.65
		<i>Rastrelliger kanagurta</i>		0.66
		<i>Selar crumenophthalmus</i>		0.67
		<i>Decapterus macrosoma</i>		0.78
		<i>Rastrelliger faughni</i>		0.61
	Ragay Gulf	<i>Decapterus kurroides</i>	0.72	0.61
		<i>Sardinella gibbosa</i>		0.67
		<i>Decapterus macrosoma</i>		0.56
		<i>Selar crumenophthalmus</i>		0.74
		<i>Decapterus maruadsi</i>		0.87
		<i>Decapterus macarellus</i>		0.69
		<i>Sardinella lemuru</i>		0.90
		<i>Rastrelliger kanagurta</i>		0.70
	San Miguel Bay	<i>Caranx ignobilis</i>	0.84	0.90
		<i>Trichiurus lepturus</i>		0.72
		<i>Sardinella fimbriata</i>		0.91
	Sorsogon Bay	<i>Atule mate</i>	0.62	0.70
		<i>Alepes djedaba</i>		0.46
		<i>Escualosa thoracata</i>		0.67
		<i>Sardinella fimbriata</i>		0.64
6	Cuyo East Pass	<i>Selar crumenophthalmus</i>	0.74	0.74
	Southern Sibuyan Sea	<i>Encrasicholina punctifer</i>	0.72	0.73
		<i>Sardinella gibbosa</i>		0.70
	Visayan Sea	<i>Sardinella gibbosa</i>	0.73	0.75
		<i>Sardinella lemuru</i>		0.74

		<i>Rastrelliger kanagurta</i>		0.69
7	Bohol Sea	<i>Sardinella gibbosa</i>	0.64	0.61
		<i>Rastrelliger kanagurta</i>		0.67
	Camotes Sea	<i>Sardinella lemuru</i>	0.72	0.78
		<i>Decapterus kurroides</i>		0.71
		<i>Decapterus macrosoma</i>		0.75
		<i>Decapterus tabl</i>		0.69
		<i>Rastrelliger kanagurta</i>		0.68
		<i>Selar crumenophthalmus</i>		0.71
	Cebu Strait	<i>Decapterus macrosoma</i>	0.57	0.57
	Tanon Strait	<i>Decapterus macrosoma</i>	0.65	0.61
		<i>Selar crumenophthalmus</i>		0.68
	Visayan Sea	<i>Sardinella gibbosa</i>	0.71	0.70
		<i>Sardinella lemuru</i>		0.71
		<i>Rastrelliger kanagurta</i>		0.76
8	Samar Sea	<i>Sardinella fimbriata</i>	0.73	0.64
		<i>Selar crumenophthalmus</i>		0.84
		<i>Rastrelliger kanagurta</i>		0.73
		<i>Rastrelliger brachysoma</i>		0.69
		<i>Decapterus macrosoma</i>		0.75
9	South Sulu Sea	<i>Sardinella lemuru</i>	0.51	0.51
10	Camiguin Waters	<i>Sardinella fimbriata</i>	0.67	0.67
	Macajalar Bay	<i>Sardinella lemuru</i>	0.67	0.67
11	Davao Gulf	<i>Decapterus macrosoma</i>	0.58	0.60
		<i>Decapterus tabl</i>		0.57
		<i>Rastrelliger faughni</i>		0.56
		<i>Rastrelliger kanagurta</i>		0.57
		<i>Selar crumenophthalmus</i>		0.69
		<i>Mene maculata</i>		0.47
	Mayo Bay	<i>Decapterus macarellus</i>	0.45	0.45
	Pujada Bay	<i>Atule mate</i>	0.53	0.64
		<i>Decapterus macrosoma</i>		0.42
12	Moro Gulf	<i>Decapterus macarellus</i>	0.64	0.63
		<i>Decapterus macrosoma</i>		0.61
		<i>Rastrelliger kanagurta</i>		0.57
		<i>Selar boops</i>		0.66
		<i>Selar crumenophthalmus</i>		0.73
	Sarangani Bay	<i>Sardinella gibbosa</i>	0.75	0.85
		<i>Sardinella lemuru</i>		0.78
		<i>Decapterus kurroides</i>		0.69
		<i>Decapterus macarellus</i>		0.69

		<i>Decapterus macrosoma</i>		0.85
		<i>Rastrelliger faughni</i>		0.75
		<i>Rastrelliger kanagurta</i>		0.72
		<i>Selar crumenophthalmus</i>		0.69
		<i>Mene maculata</i>		0.75
CARAGA	Butuan Bay	<i>Sardinella lemuru</i>	0.74	0.74
	Surigao Sea	<i>Decapterus macarellus</i>	0.63	0.63
ARMM	Illana Bay	<i>Sardinella lemuru</i>	0.63	0.63
	Sulu Sea	<i>Amblygaster sirm</i>	0.53	0.53
		<i>Sardinella lemuru</i>		0.57
		<i>Decapterus macrosoma</i>		0.50
		<i>Rastrelliger kanagurta</i>		0.55
		<i>Selar crumenophthalmus</i>		0.50
		Average	0.64	0.66

Table 3. Exploitation rates of dominant demersal species by fishing ground based on National Stock Assessment Program length-frequency data in 2015.

REGION	FISHING GROUND	SPECIES	Average E- value	Actual E-value
1	Ilocos Coast/NWPS	<i>Nemipterus bathybius</i>	0.68	0.68
	Lingayen Gulf	<i>Nemipterus bathybius</i>	0.74	0.81
		<i>Saurida tumbil</i>		0.66
3	West Philippine Sea	<i>Ctenochaetus strigosus</i>	0.71	0.64
		<i>Nemipterus virgatus</i>		0.64
		<i>Parascolopsis eriomma</i>		0.76
		<i>Siganus canaliculatus</i>		0.75
		<i>Upeneus vittatus</i>		0.76
4A-CALABARZON	Calatagan/Balayan Bay	<i>Nemipterus hexodon</i>	0.63	0.60
		<i>Upeneus vittatus</i>		0.65
	Lamon Bay	<i>Nemipterus bathybius</i>	0.62	0.61
		<i>Nemipterus nemurus</i>		0.50
		<i>Nemipterus tambuloides</i>		0.76
	Tayabas Bay	<i>Siganus canaliculatus</i>	0.74	0.74
4B-MIMAROPA	Bacuit bay	<i>Nemipterus hexodon</i>	0.42	0.42
	Green Island Bay	<i>Gazza minuta</i>	0.75	0.76
		<i>Leiognathus splendens</i>		0.74
5	Asid Gulf	<i>Leiognathus splendens</i>	0.7	0.82
		<i>Nemipterus hexodon</i>		0.56
		<i>Sillago aeolus</i>		0.78
		<i>Sillago sihama</i>		0.64

	San Miguel Bay	<i>Johnius borneensis</i>	0.76	0.76
		<i>Dendrophysa russelli</i>		0.75
		<i>Otolithes ruber</i>		0.82
		<i>Arius maculatus</i>		0.72
	Sorsogon Bay	<i>Leiognathus splendens</i>	0.55	0.52
		<i>Sillago ingenuua</i>		0.6
		<i>Nemipterus furcosus</i>		0.48
		<i>Gerres oyena</i>		0.59
6	Southern Sibuyan Sea	<i>Mugil cephalus</i>	0.7	0.66
		<i>Upeneus sulohureus</i>		0.75
	Visayan Sea	<i>Sillago sihama</i>	0.67	0.77
		<i>Scolopsis taenioptera</i>		0.64
		<i>Upeneus sulphureus</i>		0.55
		<i>Nemipterus hexodon</i>		0.73
7	Bais Bay	<i>Siganus canaliculatus</i>	0.68	0.68
	Visayan Sea	<i>Scoplosis taeniopterus</i>	0.63	0.75
	Bohol Sea	<i>Upeneus moluccensis</i>	0.51	0.51
8	Samar Sea	<i>Saurida tumbil</i>	0.66	0.76
		<i>Nemipterus hexodon</i>		0.54
		<i>Leiognathus splendens</i>		0.68
12	Moro Gulf	<i>Lethrinus ornatus</i>	0.55	0.44
		<i>Nemipterus nematopus</i>		0.65
		<i>Siganus canaliculatus</i>		0.57
	Sarangani	<i>Brama orcini</i>	0.46	0.73
		<i>Lutjanus rufolineatus</i>		0.40
		<i>Nemipterus bathybius</i>		0.50
		<i>Nemipterus peronii</i>		0.41
		<i>Nemipterus nematopus</i>		0.33
		<i>Nemipterus zysron</i>		0.51
		<i>Priacanthus sagittarius</i>		0.21
		<i>Priacanthus hamrur</i>		0.60
Caraga	Butuan Bay	<i>Gerres filamentosus</i>	0.39	0.39
	Hinatuan Passage	<i>Epinephelus fasciatus</i>	0.6	0.60
		<i>Gazza minuta</i>		0.64
		<i>Lethrinus semicinctus</i>		0.71
		<i>Nemipterus tambuloides</i>		0.67
		<i>Pentaprion longimanus</i>		0.71
		<i>Priacanthus tayenus</i>		0.54
		<i>Saurida undosquamis</i>		0.44
		<i>Siganus canaliculatus</i>		0.38
		<i>Upeneus sulphureus</i>		0.71
		Average	0.62	0.62

Table 4. Exploitation rates of dominant neritic tuna species by fishing ground based on National Stock Assessment Program length-frequency data in 2015.

REGION	FISHING GROUND	SPECIES	Average E- value	Actual E-value
3	Aurora Waters	<i>Auxis rochei</i>	0.42	0.42
	West Philippine Sea	<i>Auxis rochei</i>	0.8	0.79
		<i>Euthynnus affinis</i>		0.80
5	Albay Gulf	<i>Auxis rochei</i>	0.78	0.78
	Lagonoy Gulf	<i>Auxis rochei</i>	0.86	0.86
		<i>Auxis thazard</i>		0.86
	Lamon Bay	<i>Euthynnus affinis</i>	0.46	0.59
		<i>Scomberomorus commerson</i>		0.33
	Ragay Gulf	<i>Auxis rochei</i>	0.53	0.38
		<i>Euthynnus affinis</i>		0.67
	San Miguel Bay	<i>Euthynnus affinis</i>	0.64	0.69
		<i>Scomberomorus commerson</i>		0.59
6	Cuyo East Pass	<i>Auxis rochei rochei</i>	0.63	0.63
7	Cebu Strait	<i>Auxis rochei</i>	0.62	0.62
8	Samar Sea	<i>Euthynnus affinis</i>	0.84	0.84
10	Camiguin Waters	<i>Auxis rochei</i>	0.59	0.59
		<i>Auxis thazard</i>		0.58
11	Davao Gulf	<i>Auxis rochei</i>	0.56	0.56
12	Moro Gulf	<i>Auxis rochei</i>	0.67	0.72
		<i>Auxis thazard</i>		0.76
		<i>Euthynnus affinis</i>		0.52
		Average	0.65	0.65

Table 5. Exploitation rates of dominant oceanic tuna species by fishing ground based on National Stock Assessment Program length-frequency data in 2015.

REGION	FISHING GROUND	SPECIES	Average E- value	Actual E-value
2	Isabela Waters	<i>Katsuwonus pelamis</i>	0.60	0.60
5	Albay Gulf	<i>Katsuwonus pelamis</i>	0.65	0.65
	Lamon Bay	<i>Thunnus obesus</i>	0.35	0.35
12	Moro Gulf	<i>Katsuwonus pelamis</i>	0.63	0.63
ARMM	Sulu Sea	<i>Katsuwonus pelamis</i>	0.54	0.54
		Average	0.55	0.55

Figure 2. Fishing grounds (in light blue shade) monitored by the NSAP in 2015.
Name of fishing ground indicated

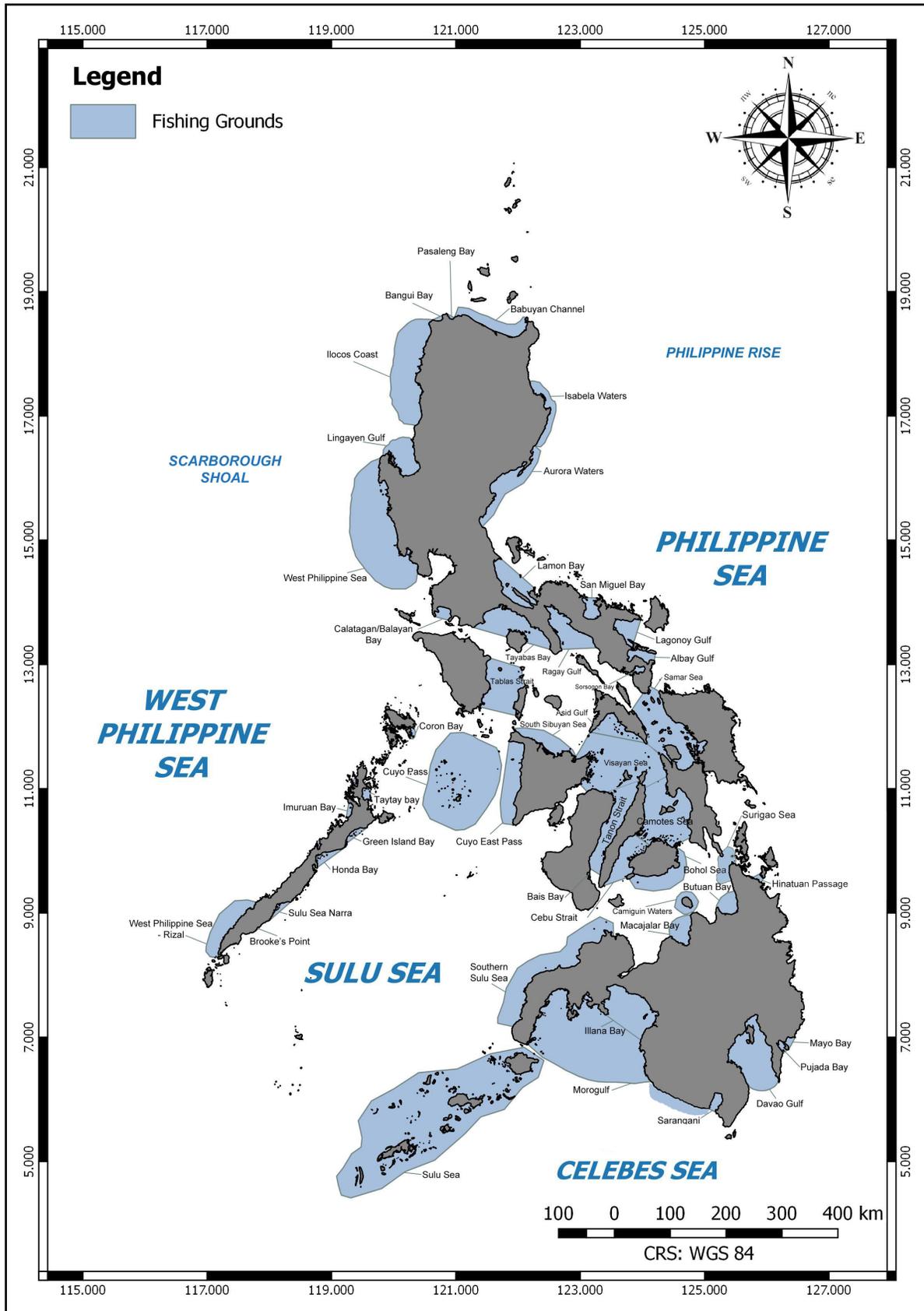


Figure 3. Status of Philippine small pelagic fishes by fishing ground based on Exploitation (E) values using 2015 length frequency data. Limit Reference Point set at E = 0.6.

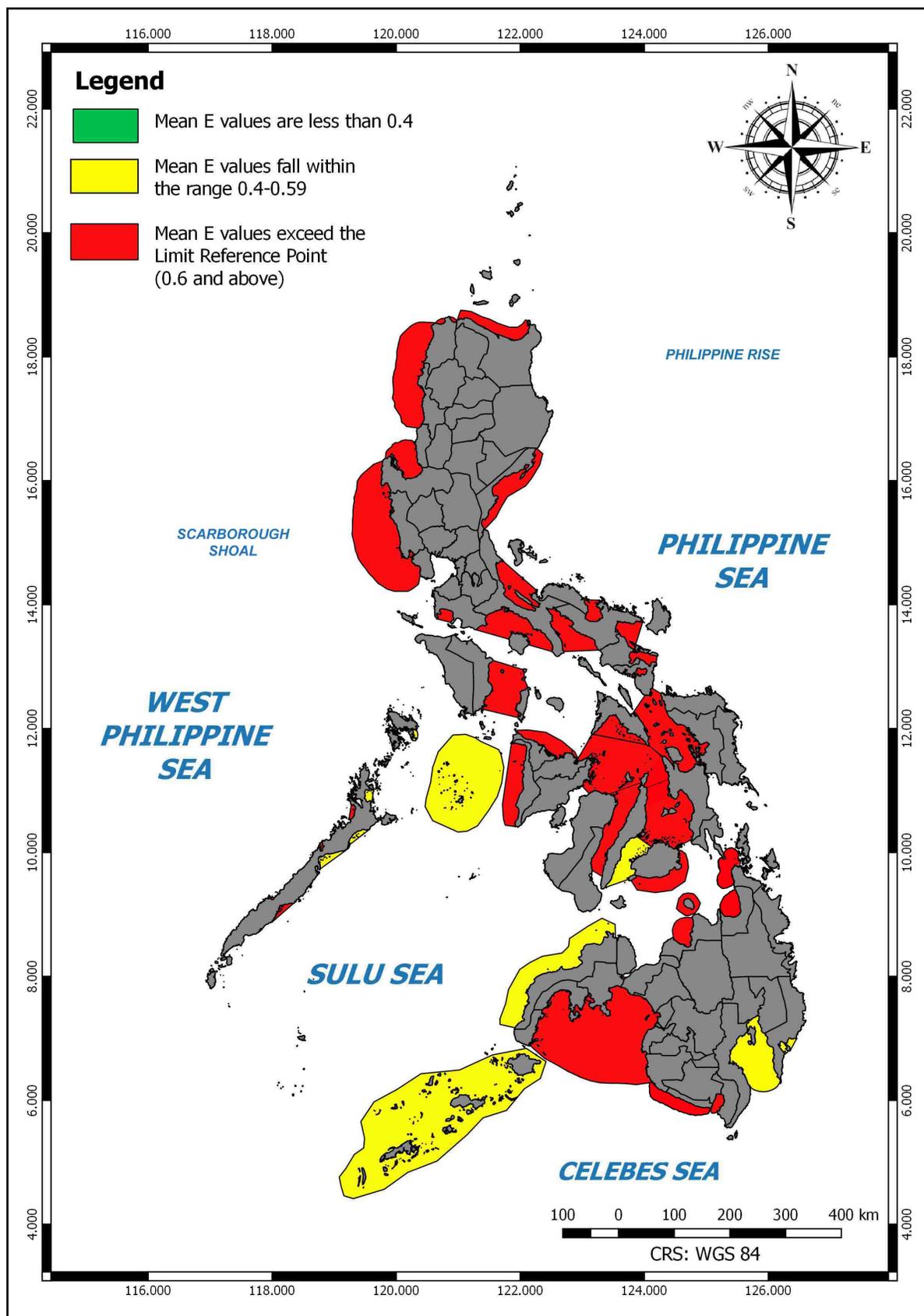


Figure 4. Status of Philippine demersal fishes by fishing ground based on Exploitation (E) values using 2015 length frequency data. Limit Reference Point set at E = 0.5.

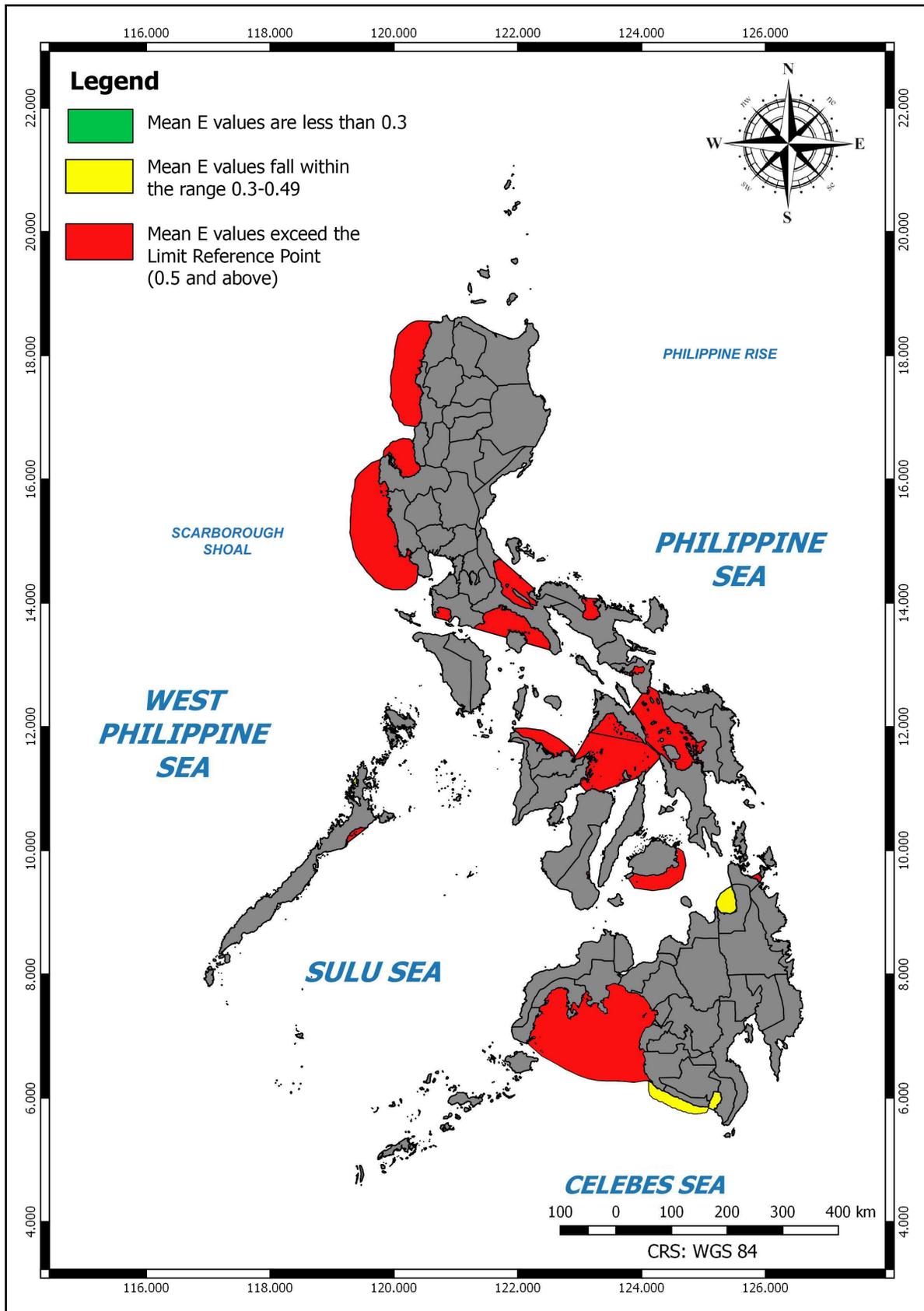


Figure 5. Status of Philippine neritic tuna fishes by fishing ground based on Exploitation (E) values using 2015 length frequency data. Limit Reference Point set at E = 0.5.

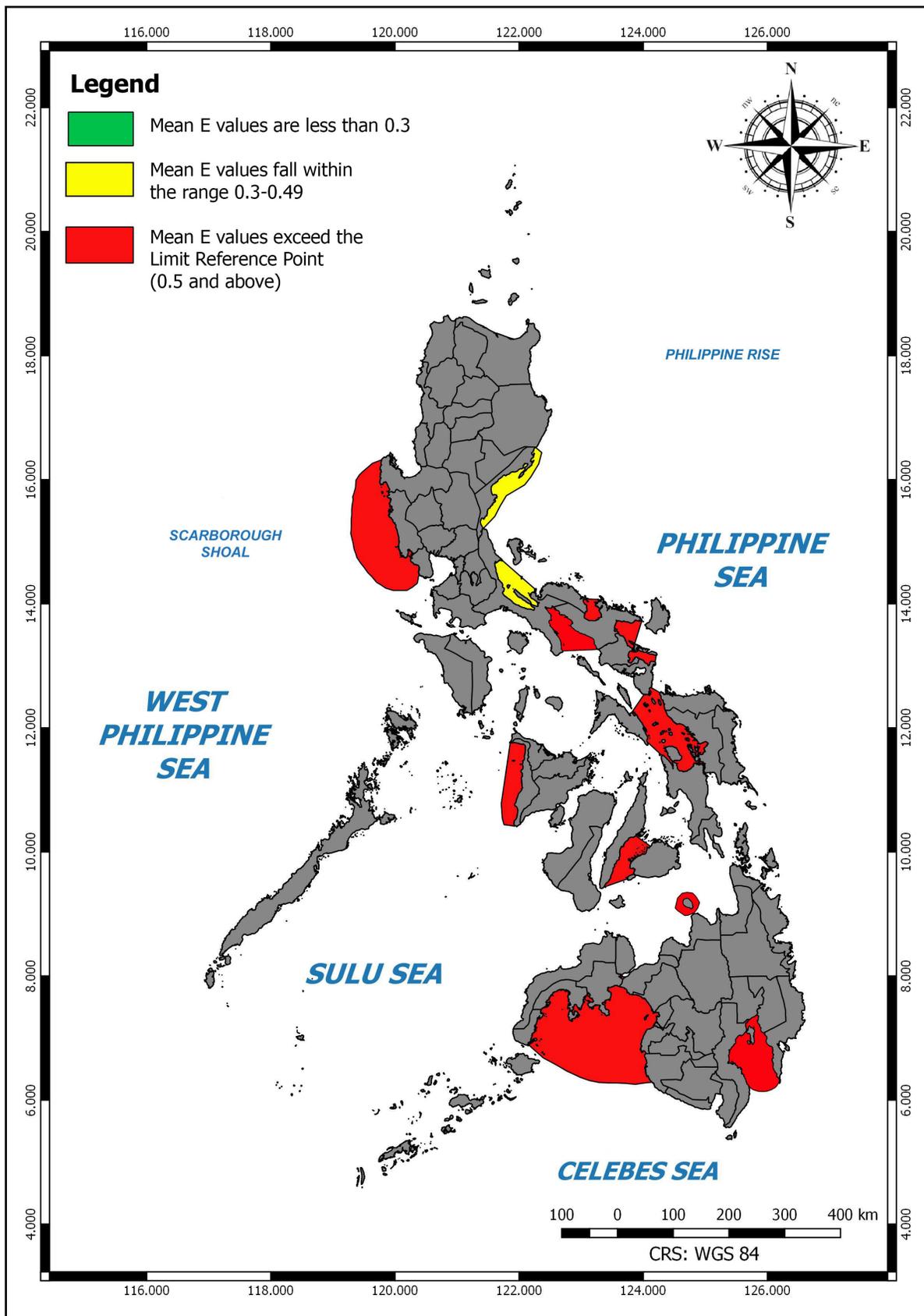
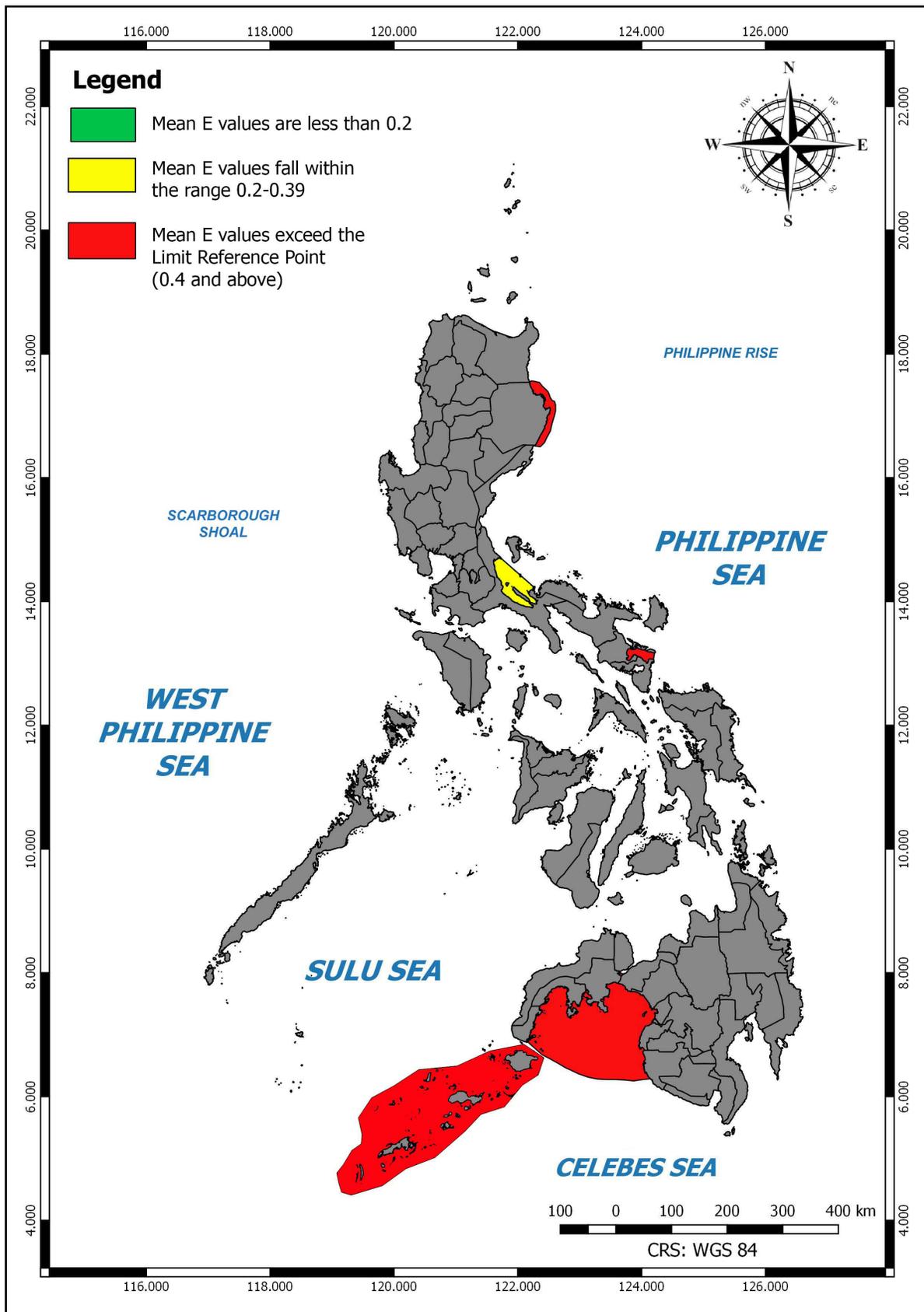


Figure 6. Philippine oceanic tuna fishes by fishing ground based on Exploitation (E) values using 2015 length frequency data. Limit Reference Point set at $E = 0.4$.





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3

Chapter

STATUS OF MARINE FISHERIES

- Region 1 - Ilocos
- Region 2 - Cagayan Valley
- Region 3 - Central Luzon
- Region 4A - CALABARZON
- Region 4B - MIMAROPA
- Region 5 - Bicol
- Region 6 - Western Visayas
- Region 7 - Central Visayas
- Region 8 - Eastern Visayas
- Region 9 - Zamboanga Peninsula
- Region 10 - Northern Mindanao
- Region 11 - Davao
- Region 12 - SOCCSKSARGEN
- Region 13 - CARAGA
- ARMM - Autonomous Region
in Muslim Mindanao

Introduction

Chapter 3 presents the regional NSAP marine fisheries including the Regional fisheries profile, the names and location of the NSAP-monitored landing centers, catch composition and fishing gear data, and pictures of dominant species and fishing gears, and list of enumerators.

The Regional fishery profiles consist of the region's brief history, geographic information, topography and other fishery information, the location of NSAP monitored landing centers shown by Province.

The catch composition by aquatic species group and effort data for CY 2014 was generated using the reporting function of the NSAP – Database. The top 10 landed aquatic species by volume is also shown labeled with scientific name, common name and local name. Moreover, the top 3 commercial and municipal fishing gears are also presented labeled with English and local name.



NSAP REGION 1 - ILOCOS

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Region 1 is located in the northwest part of Luzon Island, bordered on the east by the Cordillera Administrative Region (CAR) and Cagayan Valley, and to the south by Central Luzon. It has direct access to international sea lanes as it is bounded to the west by the West Philippine Sea. It is composed of four provinces, nine cities, 116 municipalities, 3,245 barangays, and 12 districts. San Fernando City is the Regional Capital.

The region has an extensive coastline and seacoast indented with bays and gulf. Its intermittent coastline has a physical length of 708.165 kilometers: Ilocos Norte of 150.18 km (21.21%), Ilocos Sur of 157.63 km (22.26%), La Union of 114.70 km (16.20%) and Pangasinan of 285.66 km (40.34%). The region's total length of coastline constitutes only about 2.08 percent of the total length of coastline in the Philippines.

The National Stock Assessment Program (NSAP) was started in Lingayen Gulf in the year 1997. There were ten landing centers, composed of five major landing centers where catch for commercial fishing

gears landed (Magsaysay, Dagupan; Pantal, Dagupan; Fishport, Sual; Tubod, Santo Tomas and Pagudpud, San Fernando) and five minor landing centers where catch of municipal fishing gears landed (Lucap, Alaminos; Paringao, Bauang; San Nicolas West, Ago; and Tobuan, Labrador).

In 1999, Pagudpud, San Fernando was discontinued because, some of the boats were destroyed by a typhoon. The remaining commercial fishing boats were sold and transferred to Damortis, Santo Tomas, La Union. Since then, Damortis was added as a major landing site for commercial fishery. In 2000, four fishing grounds were added: Pasaleng Bay with 2 landing centers, Bangui Bay with 2 landing centers, Ilocos Coast/NWPS with 6 landing centers, and Dasol Bay with 2 landing centers. There were a total of twenty-two landing centers in five fishing grounds.

In Pasaleng Bay, fishing is an important activity. The three coastal barangays where fish is landed are Balaoi-Gaoa, Pancian and Pasaleng. It is a municipal

fishing ground where numerous fishing boats operate. Species of pelagic species dominated the catch; the demersal species contributed the rest. Specific species caught were squids, lobsters, crabs and *Ranina ranina*, the red frog crab. The pelagic species were the most dominant in terms of catch and in the order of their importance, these are *Katsuwonus pelamis* (skipjack tuna), *Selar crumenophthalmus* (bigeye scad) and *Auxis thazard* (frigate tuna). Among the various gears used for fishing was Baby ring net, Spear Gun, Troll line, Beach Seine, Scoop Net, Multiple Handline, Drive-in-Net, Bottom Set Gillnet, etc.

Banguì Bay is a deep and calm span of sea water where fishing is one of the major industries of the people. Ships of ordinary tonnage can come nearer to the shoreline because of the depth of the bay itself. It is located in the topmost portion of the region beside Pasaleng bay. Fishing gears like Beach seine, Baby Ring Net, Troll line, Multiple Handline, Drive-in-net, and others, were operating in the bay. Numerous fishery resources can be found in the area. Pelagic species like *Encrasicholina puctifer* (buccaneer anchovy), *Selar crumenophthalmus* (bigeye scad), *Katsuwonus pelamis* (skipjack tuna), *Decapterus macrosoma* (shortfin scad) and *Coryphaena hippurus* (common dolphin fish) were landed, together with the demersal fishes (gobies, snappers and siganids) and invertebrates (octopus, squid, shrimp and crabs).

Ilocos Coast/North West Philippine Sea is where fishermen of Ilocos Norte, Ilocos Sur, and some from La Union and Pangasinan operate. The fishing ground is well-endowed with different kinds of fishery resources. Pelagic species like *Decapterus macarellus* (mackerel scad), *Katsuwonus pelamis* (skipjack tuna), *Thunnus albacares* (yellowfin tuna), and *Coryphaena hippurus* (common dolphin fish) dominated the landed catch. While the demersal species were composed of *Upeneus vittatus* (yellow-striped goatfish), *Priacanthus hamrur* (moontail bullseye), *Nemipterus bathybius* (yellow-belly threadfin bream) and Goby species. The fishing gears operating in the fishing ground are Purse Seine, Handline, Drive-in-Net, Multiple Handline, Troll line, Ring Net, etc.

The Lingayen Gulf is a large gulf at the lower part of the region, stretching 56 km (35 mi). It is framed

by the provinces of Pangasinan and La Union and sits between the Zambales Mountains and the Cordillera Central. The Agno River drains into it. The gulf has numerous islands, the most famous of which is in the Hundred Islands National Park. Waters are murky due to its sandy bottom. Coral reefs were all but destroyed by dynamite fishing, although efforts are made to restore some, especially inside the Hundred Islands National Park. Fishing and salt-making are the primary industries on Lingayen Gulf. In fact, the name Pangasinan literally means “place where salt is made”. Salt is collected from seawater through evaporation, leaving the crystalline salt behind (www.revolvvy.com). The Gulf caters to a variety of fishing gears like Danish seine, Trawl, Bottom Set Gillnet, Bottom Set Longline, Handline and Fish corral/Fyke Nets. There is also an abundance of pelagic, demersal, and invertebrate species in the fishing ground. Pelagic species is dominated by *Decapterus macrosoma* (shortfin scad), *Decapterus maruadsi* (japanese scad), *Selar crumenophthalmus* (bigeye scad), *Rastrelliger kanagurta* (indian mackerel) and *Rastrelliger brachysoma* (short mackerel). *Saurida tumbil* (greater lizardfish), *Leiognathus bindus* (orange-fin ponyfish), *Priacanthus tayenus* (purple-spotted bigeye), *Nemipterus bathybius* (yellow-belly threadfin bream) and *Gazza minuta* (toothpony) were the numerous demersal species.

Dasol Bay occupies the whole coastline of Dasol. It lies in the lowest part of the region. Six hundred twenty-eight sustenance fishermen fish along the bay, of which 610 (97.13%) are full-time and 18 (2.87%) are part-time (Boat and Gear Inventory, 2008). It is very rich in pelagic, demersal and invertebrate fishery resources. *Katsuwonus pelamis* (skipjack tuna) is the most numerous species landed in the bay, followed by *Thunnus albacares* (yellow-fin tuna) and *Coryphaena hippurus* (common dolphin fish). The fishing gears operated in Dasol Bay were Bottom Set Gillnet (BSGN), Drift Gillnet (DGN), Handline (HL), Multiple Handline (MHL), Scoop net (SN) and Tuna Drift Longline (TDLL).

Currently, there are 60 landing centers in the region. Out of the 60, three are located in Pasaleng Bay, three in Banguì Bay, 33 in Ilocos Coast/NWPS, 18 in Lingayen Gulf, and three in Dasol Bay.

Landing Centers, Catch Composition, and Gear Data

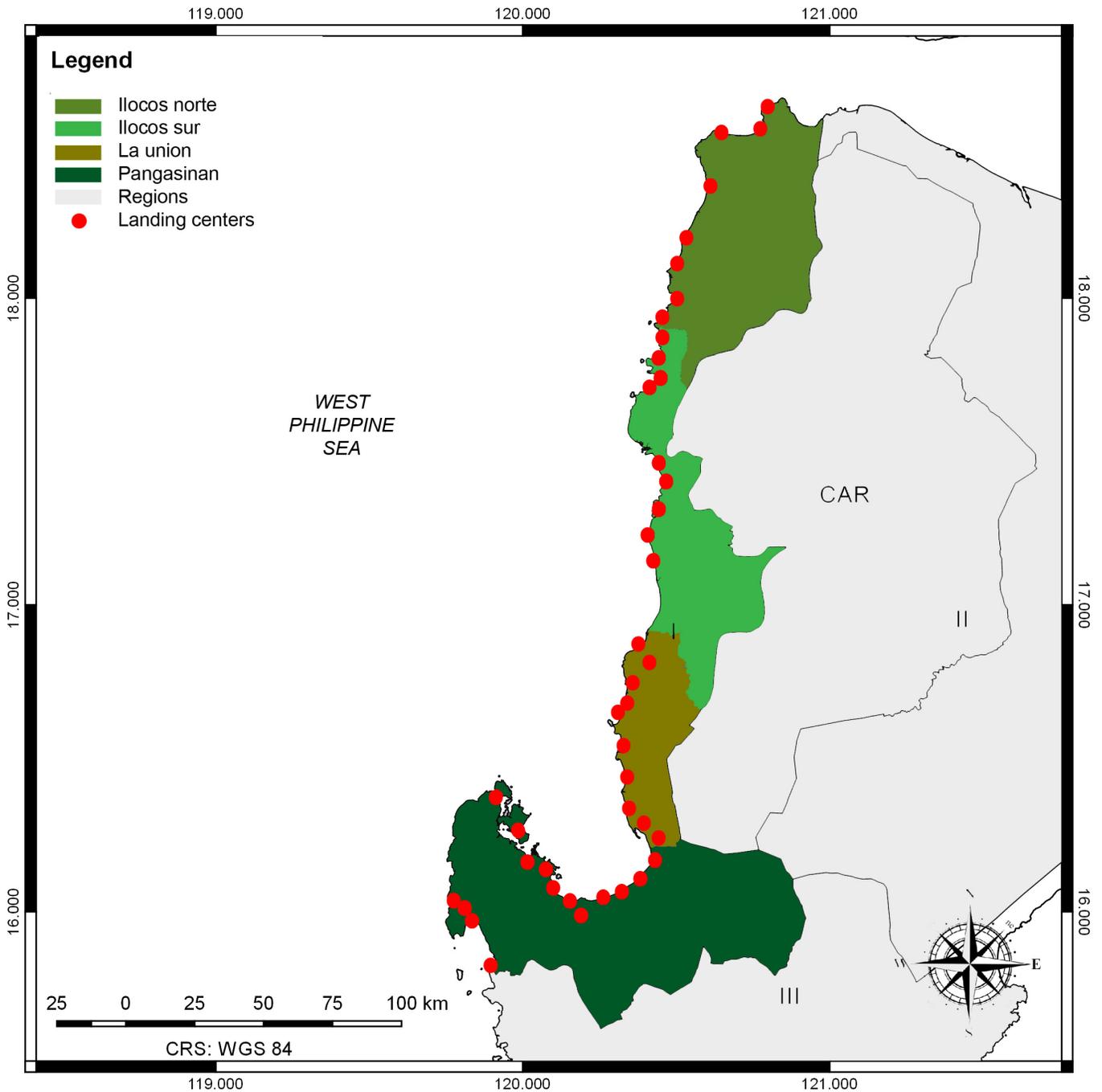


Figure 15 : GIS map of Region 1

A. Region 1 - Ilocos Landing Centers.

ILOCOS NORTE

San Lorenzo/Abaca, Bangui
 Poblacion 1, Pagudpud
 Bobon, Burgos
 Balaoi-Gaoa, Pagudpud
 Pasaleng, Pagudpud,

Pancian, Pagudpud
 Gaang, Currimao
 Gabu, Laoag
 Gabut Norte, Badoc
 La Paz, Laoag

Sitio Tulnagan, Caruan
 Victoria, Currimao
 Sitio Dirique, Davila 2
 Sitio Nagabungan, Davila 1

LA UNION

Catbangan, SFC
Paringao, Bauang
Baroro, Bacnotan
Taverna, Bauang,
Santiago Sur, Caba

San Julian West, Agoo
San Nicolas West, Agoo
Casantaan, Sto. Tomas
Tubod, Sto. Tomas

Damortis, Sto. Tomas
Darigayos, Luna
Paraair, Balaoan

ILOCOS SUR

Apatot, San Esteban
Dili, Sta. Cruz
Bia-o, Sta. Maria
Libtong, Tagudin
Nangalisan, Sta. Lucia

Pilar, Sta. Cruz
Puro, Magsingal
Sabang, Cabugao
San Perdro, Narvacan
San Pedro, Vigan City

Tamurong 1st, Candon
Teppeng, Sinait
Villamar, Caoayan
Salomague, Cabugao

PANGASINAN

Tambobong, Dasol
Petal, Dasol
Cato, Infanta
Luciente, Bolinao
Arosan, Bolinao
Balingasay, Bolinao
Victoria, Alaminos City

Lucap, Alaminos City
Dacap Sur, Bani
Poblacion East, Agno
Baruan, Agno
Ilio-ilio, Burgos
Nibaliw West, San Fabian
Salapingao/Pugaro, Dagupan City

Magsaysay, Dagupan City
Pantal, Dagupan City
San Isidro, Binmaley
Capandanan, Lingayen
Tobuan, Labrador
Fishport Sual

B. Catch composition by fish groups.

Fish Group	No. of Catch by (MT)	Fish Group	No. of Catch by (MT)
 Oceanic tuna	2,174	 Large Pelagics	399
 Neritic Tuna	228	 Demersal Fishes	1,159
 Pelagics	712	 Sharks and Rays	4
 Small Pelagics	2,366	 Invertebrates	0

C. Gear data

Fishing Gear	No. of Boats Landed	Fishing Gear	No. of Boats Landed
 Bottom set gillnet	2,130	 Multiple hook and line	648
 Scoop net	1,948	 Gill net	592
 Hook and line	1,599	 Bottom set longline	578
 Troll line	874	 Drive-in net	423
 Trawl	782	 Jigger	397

Top 10 Landed Aquatic Species by Volume



1 *Sthenoteuthis oualaniensis*
Purpleback flying squid
“Patawan”, “Pusit”



2 *Thunnus albacares*
Yellowfin Tuna
“Bariles”, “Oriles”

3 *Decapterus macarellus*
Mackerel scad
“Baraniti”, “Bulilit”



4 *Katsuwonus pelamis*
Skipjack tuna
“Simmanja”, “Buslogan”, “Gulyasan”



5 *Acetes spp*
Bubok Shrimp
“Aramang/Ar-mang”



6 *Coryphaena hippurus*
Common Dolphin Fish
“Durado”



7 *Trichiurus gangeticus*
Ganges Hairtail
“Bulong-unas”, “Pingka”



8 *Decapterus maruadsi*
Japanese scad baraniti
“Bulilit”



9 *Saurida tumbil*
Lizardfish
“Bukto-Bukto”, “Dalag-baybay”

10 *Trichiurus lepturus*
Largehead Hairtail
“Bulong-unas”, “Pingka”



Top 3 Fishing Gears in Region 1

Commercial



Danish Seine
“Hulbot hulbot”, “Bira-bira”



Purse Seine
“Pangulong”, “Kubkuban”



Trawl
“Karkar”

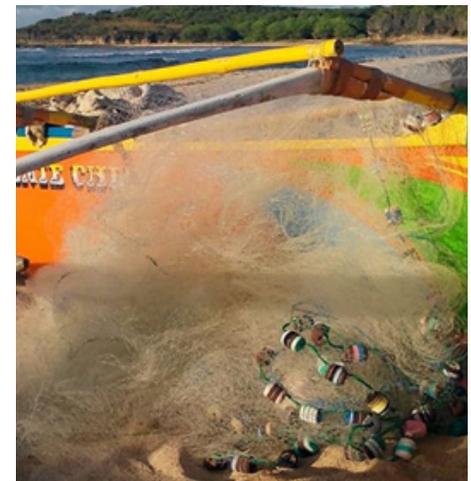
Municipal



Scoop net
“Karwas”, “Dusdus”, “Salap” or
“Sibit-sibit”



Handline
“Baniit”



Drive-in-Net
“Paaling”, “abog-abog”

Enumerators

Samy T. Aglipay
Chery Ann Baldovi
Laugelyn S. Sanguir
Robyrose Baguindoc
Danny S. Aringay
Chonalyn Tolentino
Nena A. Batulan
Leonafe Garcia
Lovella T. Pascua
Mani Grace Ubasa
Emily V. Bonzo
Jessie B. Corpuz.
Zeny J. Boado

Rodan R. Garcia
May Anne Suerte Gonzales
Florencio Salaan
Al Gattoc
Homer Domingo
Ronelyn Ravelas
Araceli de Leon
Marichelle Caide
Jay Russell Cariño
Lucky Gattoc
Norviel C. Agbuya
Bernaldo V. Bilog
Sylvester R. dela Torre

Nelda Magarro
Ruby Ann Burlas
Reynaldo Cabatu Jr.
Dominic Ian Canosa
Roderick Salaan
Mark Anthony Benabise
Cindy Barola
Kathrina Almazan
Mc Prince Canosa
Jogel C. Faylogna
Leo Paul J. Jucutan
Jacob R. Escosio
Imee B.Sombilon

Armie B. Catapia
Rosemarie B. Catapia
Richard J. Cabutotan
Jason C. Ragos
Michael R. Boado
Mary Jane S. Sison
Jay-r Cabuag
Jesusa C. Cabutotan
Marlon B. Bonzo
Monte O. Marquez
Christie R. Balatico
Jerry P. Boado
Marieta B. Angeles

Ricardo V. Catbagan
Wilson O. Ojano
Victoria M. Bilog
Demetrio S. Agbayani
Marilyn S. Mardo
Ronnie P. Resurreccion
Olivia V. Bilog



© NSAP BFAR Region 2

NSAP REGION 2 - CAGAYAN VALLEY

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Cagayan Valley Region is strategically located at the northernmost tip of the Philippine Archipelago with a land area of 27,333 square kilometers and 872 kilometers coastline (DA-BFAR, 2006; Ayson and Encarnacion, 2008). It is politically divided into five provinces, namely: Cagayan, Batanes, Isabela, Nueva Vizcaya, and Quirino which the last two provinces are completely landlocked. It has three major fishing grounds, the Babuyan Channel, Batanes Waters, and Isabela Waters covering the Palanan and Divilacan Bay. The region has a total of seventy six (76) established NSAP observation sites located in the three fishing grounds.

Babuyan Channel is the major fishing ground in the Cagayan Valley Region covering twelve (12)

coastal municipalities in the Province of Cagayan. It lies approximately between 18 16' 00" and 11 35' 00" North latitude and 121 02' 00" and 121 14' 30" East longitude (Aragon et al., 2008).

It has a coastline length of 154 kilometers and an approximate total area of 477,550 hectares (DA-BFAR R02, 2006; Ayson and Encarnacion, 2008). The Northern part of the channel extends to the islands of Fuga, Camiguin, Dalupiri, Calayan and Babuyan Group of Islands converging with the Pacific Ocean on the East and South China Sea on the West. The center of the channel, within the territorial waters of the Municipality of Aparri, is estuarine in nature where the largest and longest river in the entire archipelago, the Cagayan River, drains to this fishing ground.

In 2000, ten (10) NSAP observation sites in the Province of Cagayan were established and an additional thirty two (32) observation sites in 2014. Observation sites in the Province are:

1. Sta. Ana (San Vicente, Tangatan, Palawig, Centro, Diora-Zinungan, and Casambalangan)
2. Gonzaga (Baua, Tapel, Batangan, Minanga, and Casitan),
3. Buguey (Minanga, Centro, Paddaya Este, and Paddaya Weste)
4. Aparri (Dodan, Paddaya, Punta, and Centro)
5. Abulug (Bagu, Siguiran, and Centro)
6. Ballesteros (Cabaritan East, Ammubuan and Palloc)
7. Pamplona (Allasitan, Bidduang, Nagtupacan, and Nagattatan)
8. Sanchez Mira (Magacan, Tokitoc, Masisit, and Namuac)
9. Claveria (Minanga, Pata, and Taggat)
10. Sta. Praxedes (San Juan and Macatel)
11. Camiguin (Balatubat and Minabel)
12. Calayan (Dadao and Poblacion)

On the other hand, Batanes Waters cover a group of islands consisting of six island municipalities in the Province of Batanes namely: Basco, Sabtang, Itbayat, Uyugan, and Ivana where region's twelve (12) NSAP observation sites were established in 1998 and an additional eleven (11) observation sites in 2014. Observation sites are:

1. Basco (Baluarte port, Valugan, Manichet, and Chanarian)
2. Mahatao (Centro port, Maratay, Shelter Port, and Diura)
3. Ivana (Radiwan port, Tuhel port, and San Vicente port),
4. Uyugan (Centro port, Itbud, and, Imnajbu)
5. Sabtang (Nakanmuan Port, Sumnanga Port, Centro Port, Chavayan Port)
6. Itbayat (Chinapoliran Port, Paganaman Port, Mauyen Port, and Valanga Port)

Geographically, the Province lies at the tip of the country where the center is situated at 121 53' east longitude and 22 20' north latitude. It is bounded by the Bashi Channel on the South, the Pacific Ocean on the East and West Philippine Sea on the West (Aragon et al., 2008).

It has an estimated total land area of 23,000 hectares of approximate marine territorial waters of 450,000 hectares (DENR-R02, 2016) including all its islands and islets.

The territorial waters extend 160 kilometers to the South China Sea on the East and 112 kilometers to the North in the Bashi Channel midway to Taiwan from Mavudi's Island (Aragon et al., 2008).

The fishing ground is teeming with migratory deep sea fish, pelagic and demersal species with high commercial value that is commonly caught by municipal fishermen. Recognising the significance of the fishery information collected and generated from the two fishing grounds and the need to provide information on the status of fishery resources in Isabela Waters, NSAP observation sites were expanded in 2014 covering the four coastal municipalities with eleven (11) established observation sites namely:

1. Dinapigue (Digumased and Dibulo)
2. Palanan (Culasi and Maligaya)
3. Divilacan (Dimasalansan, Bicobian, Dication, Dilakit, and Dipudo)
4. Maconacon (Fely and Minanga)

The Province has a 208 kilometers coastline (DOT-RO2, 2016) and is the home of diverse small and big oceanic species like marlins, dolphin fishes, and billfishes. It is politically bounded on the North by the Province of Cagayan, on the south by Nueva Vizcaya, and Aurora, on the West by the Cordillera Administrative Region (CAR) and on the East by the Pacific Ocean.

Landing Centers, Catch Composition, and Gear Data

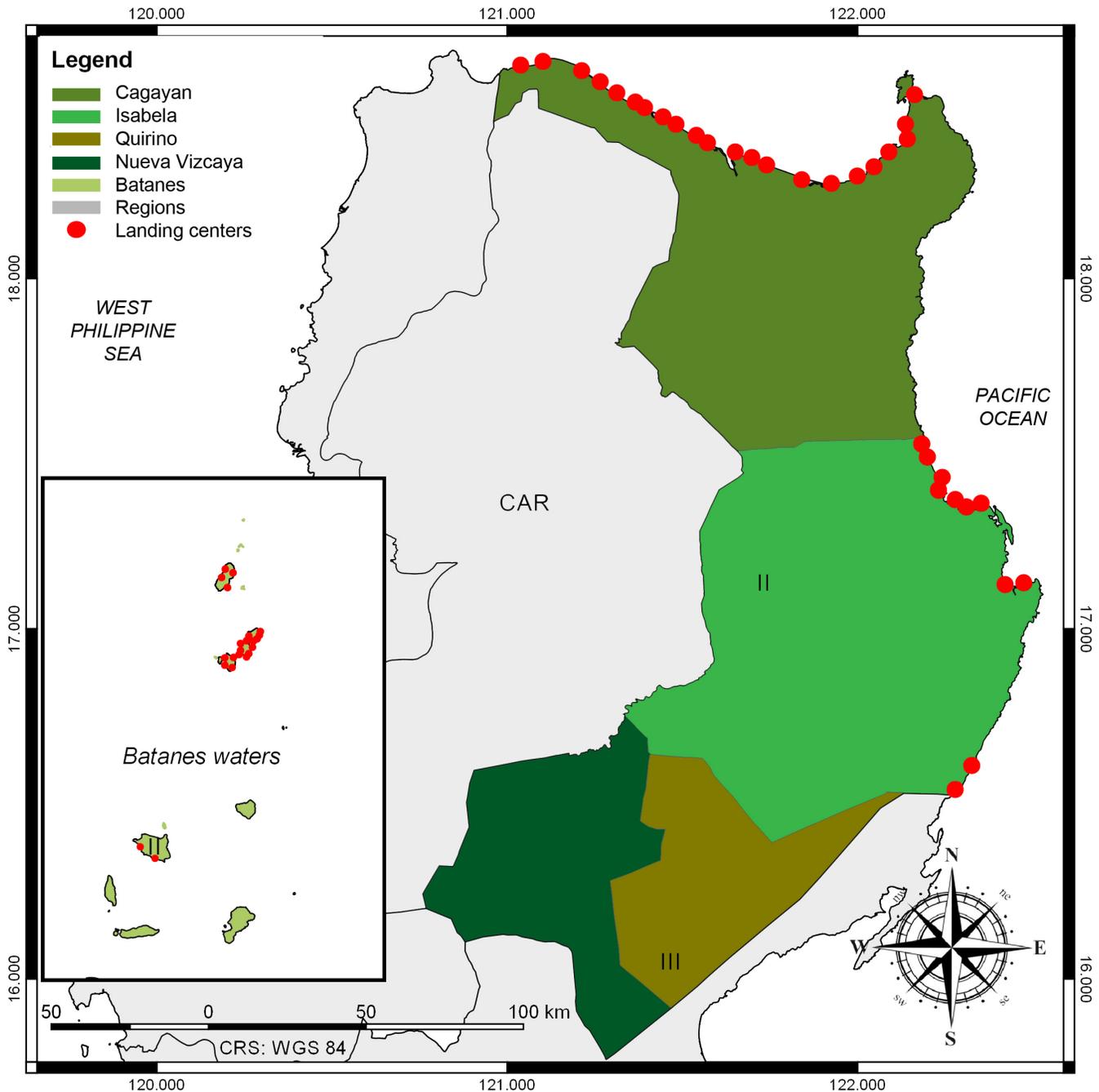


Figure 16 : GIS map of Region 2

A. Region 2 - Cagayan Valley Landing Centers.

BATANES

Chinapolitan Port, Sta.Lucia,Itbayat
 Paganaman Port, Sta.Rosa,Itbayat
 Mauyen Port, Raele,Itbayat
 Valanga Port, Valanga Port, Itbayat
 Chavayan Port, Chavayan,Sabtang
 Centro Port, Sinakan/Makdang Sabtang
 Sumnanga Port, Sumnanga Sabtang
 Nakanmuan Port, Nakanmuan Sabtang

Diura Port, Uvuy Mahatao
 Mahatao Shellter Port, Hanib Mahatao
 Maratay Port, Kaumbakan, Mahatao
 Mahatao Centro Port, Hanib Mahatao
 Radiwan Port, Radiwan, Ivana
 Tuhel Port, Tuhel, Ivana
 San Vicente Port, San Vicente, Ivana
 Imnajbu Port, Imnajbu Port

Itbut Port, ItbudUyugan
 Centro Port, Kayvaluganan Uyugan
 Valugan Port, San Jaquin, Basco
 Chanarian Port, Chanarian, Basco,
 Manichet Port, Sitio Tukon, Basco
 Baluarte Port, Kaychanarian, Basco

CAGAYAN

Punta, Aparri	Masisit, Sanchez Mira	Centro, Sta. Ana
Minanga, Gonzaga	Tokitok, Sanchez Mira	D. Zinungan, Sta. Ana
Batangan, Gonzaga	San Juan Sta. Praxedes	Centro, Abulug
Casambalangan, Sta. Ana	Macatel Sta. Praxedes	Siguiran, Abulug
Palawig, Sta. Ana	Ammobuan, Ballesteros	Allasitan Pamplona
Minanga Este, Buguey	Cabaritan East, Ballesteros	Biduang, Pamplona
Bagu, Abulug	Palloc, Ballesteros	Nagattan, Pamplona
Nagtupacan, Pamplona	Paddaya Este	Cababaan, Dadao, Calayan
Paddaya, Aparri	Paddaya Weste	Poblacion, Calayan
Dodan, Aparri	Centro, Buguey	Camiguin Calayan
Taggat, Claveria	Casitan, Gonzaga	Minabel, Calayan
Centro 6, Claveria	Tapel, Gonzaga	
Pata West Claveria	Baua, Gonzaga	
Namuac, Sanchez Mira	San Vicente, Sta. Ana	
Magacan, Sanchez Mira	Tangatan, Sta. Ana	

ISABELA

Dibulo, Dinapigue	Bicobian, Divilacan	Minanga Purok 6, Maconacon
Culasi, Centro	Dimasalansan, Divilacan	Maligaya, Sabang
Digumased, Dinapigue	Fely, Maconacon	

B. Catch composition by fish groups.

Fish Group	No. of Catch by (MT)	Fish Group	No. of Catch by (MT)
 Oceanic tuna	59	 Large Pelagics	164
 Neritic Tuna	379	 Demersal Fishes	363
 Pelagics	390	 Sharks and Rays	12
 Small Pelagics	2,224	 Invertebrates	1,286

C. Gear data

Fishing Gear	No. of Boats Landed	Fishing Gear	No. of Boats Landed
 Gill net	5,018	 Trawl	1,413
 Multiple hook and line	3,195	 Hook and line	1,158
 Bottom set gill net	2,944	 Speargun	1,021
 Troll line	1,932	 Beach seine	799
 Longline	1,767	 Scoop net	744

Top 10 Landed Aquatic Species by Volume



Nematopalaemon tenuipes 1
Spider shrimp
“Aramang”



Decapterus macrosoma 2
Shortfin scad
“Galunggong”



3 *Encrasicolina punctifer*
Buccaneer anchovy
“Taburkit”, “Billangan”



Auxis thazard 4
Frigate tuna
“Dumadara”, “Tangit”, “Agtun”



5 *Gazza minuta*
Toothed ponyfish
“Sapsap”, “Talibukno”



Coryphaena hippurus 6
Common dolphinfish
“Dorado”, “Arayu”



7 *Trichiurus lepturus*
Largehead hairtail
“Bulung unas”



Auxis rochei 8
Bullet tuna
“Buroboto bilog”



9 *Stolephorus indicus*
Indian anchovy
“Munamun”, “Yuyunu”



Loligo duvauceli 10
Indian squid
“Laki”, “Anus”

Top 3 Fishing Gears in Region 2

Commercial



Drift filter net
“Banuar”



Ring Net
“Sirut”



Pair Trawl
“Saplar”

Municipal



Troll Line
“Paguyod”, “Pauyas”



Multiple Handline
“Pasayad”, “Baniit”, “Kasikas”,
“Panayrin”, “Papasil”



Gill Net
“Sigay”, “Sagap”

Enumerators

Nelson Morales
Josette Antonio
Zaldy Villacillo
Ligaya Villanueva
Girley Calaycay
Henry Kelly Villarao
Jun Bolocon
Ferdinand Teodoro Verso

Muzfa Medrano
Zaiton Gaces
Vevie Lian Guillermo
Edmira Laurente
Meljoy Casafrancisco
Florisa Cabusi
Norma de Peralta
Jerold Sobremontet

Richelle Castillo
Melody Bagasol
Maricon Ridor
Noel Guilalao
Monette Atiga
Leny Banada
Rolando Rodrigo Jr.
Garen Ruiz

Hope Castillo
Jenifer Reconose
Ricardo Neri
Fernando Alcantara
Marly Figuro
Juana Carzon
Samuel Castillo
Edgar Castillo



NSAP REGION 3 - CENTRAL LUZON

Romina V. Yutuc*, Rachele A. Mendoza and Laila V. Parido

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Central Luzon occupies the central portion of the Luzon and strategically located between Northern Luzon and National Capital region. It is a combination of towering mountains, extinct and active volcanoes, lush, verdant farmlands, and natural sea harbors. It is one of the leading growth regions in the Philippines, strategically located at the heart of Asia. It is composed of seven provinces, fourteen cities and 116 municipalities. Its 7 provinces are Aurora, Bataan, Bulacan, Nueva Ecija, Pampanga, Tarlac and Zambales. Its 14 cities are Balanga from Bataan, Malolos and San Jose del Monte, Meycauyan from Bulacan, Cabanatuan, Gapan, Muñoz, Palayan and San Jose from Nueva Ecija; Angeles, Mabalacat and San Fernando from Pampanga, Tarlac from Tarlac; and Olongapo from Zambales.



© NSAP BFAR Region 3

The National Stock Assessment Program was started in Central Luzon in 1998. Three major fish landing sites along Zambales Coast/West Philippine Sea (located in Subic, Masinloc and Sta. Cruz) and one minor fish landing site (at Candelaria) were established as sampling stations back then. In 2012, the program added two sampling station in Bataan covering Manila Bay and six in Aurora Province covering Pacific Ocean, Casiguran waters, Dingalan Bay and Baler Bay.

Zambales Coast, which is part of the West Philippine Sea, is an important marine fishing ground both for demersal and pelagic fisheries resources in the province. It has a narrow coastline of more than 110 km, and lies on the northwestern part of the region. The whole municipal coast is generally deep with 900 meters as the deepest part.

The bottom is generally characterized as sandy and muddy. The coastal habitats of the Zambales Province include reefs, seagrass beds, and mangrove forests, which provide shelter to various finfishes and aquatic invertebrates.

Manila Bay, as a marine estuary, is specified as the semi-enclosed body of water with an area of 1,994 km²(769.9 sq mi), and a coastline of 190 km (118.1 mi), is situated in the western part of Luzon and is bounded by Cavite and Metro Manila on the east, Bulacan and Pampanga on the north, and Bataan on the west and northwest. Manila Bay drains approximately 17,000 km² (6,563.7sq mi) of watershed area, with the Pampanga River contributing about 49% of the freshwater influx. With an average depth of 17 m (55.8 ft), it is estimated to have a total volume of 28.9 billion cubic metres (28.9 cubic km). Entrance to the bay is 19 km (11.8 mi) wide and expands to a width of 48 km (29.8 mi). However, width of the bay varies from 22 km (13.7 mi) at its mouth and expanding to 60 km (37.3 mi) at its widest point (Jacinto et al; 2006).

Aurora waters has an abundant source of both pelagic and demersal fisheries resources. Its coastal landscape shaped by tidal processes is characterized by mixed coarse and fine alluvial deposits. It forms

an almost level terrain of beaches, swamps and mangroves, rising to only a few meters above sea level and represents around 2 percent of province's total land area. It is surrounded by various bays like Dingalan Bay, Casiguran Sound, and Baler Bay which contributes to a significant volume of catch, generating income and employment to most of the fisherfolks. The Casiguran waters, namely Casiguran sound and Bay is enclosed by the Sierra Madre mountain range and the 12,000 San Ildefonso Peninsula where it provides protection from the typhoons that seasonally ravage most of the province. The sound and bay stretches to around a kilometer-wide where it connects itself to the sea. The Baler Bay and Dingalan Bay which are part of the great Pacific Ocean serves as a marine fishing ground that supports the local marginal fishermen.

At present, BFAR- NSAP 3 covers 46 landing centers, nineteen of which were found in Zambales, 12 in Bataan, 2 in Bulacan, and 14 in Aurora and are being monitored regularly by 52 field enumerators.



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Landing Centers, Catch Composition, and Gear Data

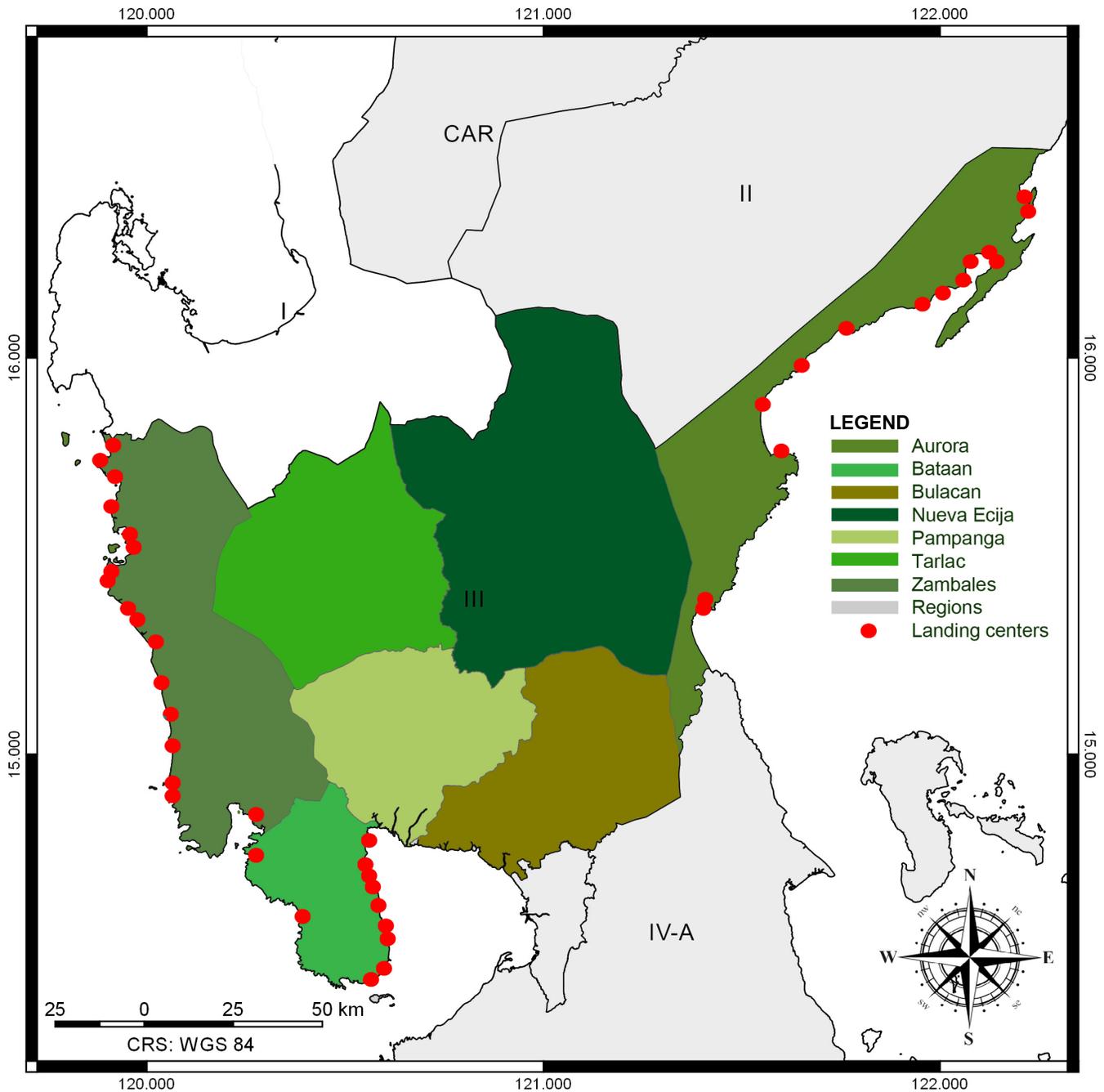


Figure 17.1: GIS map of Region 3

A. Region 3 - Central Luzon Landing Centers.

ZAMBALES

Lipay, Santa Cruz
 Venus, Santa Cruz
 Lucapon, Santa Cruz
 Misa, Santa Cruz
 Uacon, Candelaria
 Balogo/Matalvis, Masinloc
 Poblacion, Masinloc

San Juan, Palauig
 West Poblacion, Palauig
 Garreta, Palauig
 Amunga, Iba
 Sto. Rosario, Iba
 Bangan, Botolan
 Macampao, Cabangan

Laoag, Cabangan
 Sto. Niño, San Felipe
 San Miguel, San Antonio
 Pundaquit, San Antonio
 Subic Fishport M/C, Subic

BATAAN

Sabang, Morong
Pag-asa, Bagac
Tabing Ilog, Samal
Wawa, Abucay

Puerto Rivas, Balanga
Landing, Pilar
Capunitan, Orion
St. Francis 1, Limay

St. Francis 2, Limay
Batangas II, Mariveles
Townsite, Mariveles
Sisiman, Mariveles

AURORA

Masagana, Dilasag
Diniog, Dilasag
Dilud, Casiguran
Busok-busok, Casiguran
Dibacong, Casiguran

Esteves, Casiguran
Poblacion, Dinalungan
Mapalad, Dinalungan
Dinadiawan, Dipaculao
Borlongan, Dipaculao

Dianed, Dipaculao
Sabang, Baler
Baler Fishport, Baler
Dingalan Fishport, Dingalan

BULACAN

San Sebastian, Hagonoy
Panasahan, Malolos

B. Catch composition by fish groups.

 Fish Group	No. of Catch by (MT)	 Fish Group	No. of Catch by (MT)
 Oceanic tuna	8,640	 Large Pelagics	632
 Neritic Tuna	426	 Demersal Fishes	1,232
 Pelagics	332	 Sharks and Rays	28
 Small Pelagics	6,509	 Invertebrates	985

C. Gear data

 Fishing Gear	No. of Boats Landed	 Fishing Gear	No. of Boats Landed
 Gill net	38,478	 Jigger	819
 Multiple hook and line	11,395	 Troll line	632
 Bottom set gill net	6,746	 Motorized push net	584
 Hook and line	5,970	 Drive-in net	526
 Ringnet	1,607	 Cover pot	440

Top 10 Landed Aquatic Species by Volume



1 *Katsuwonus pelamis*
Skipjack Tuna
“Gulyasan”



2 *Thunnus albacares*
Yellowfin tuna
“Tambakol”



3 *Sardinella gibbosa*
Goldstripe sardinella
“Tunsoy”



4 *Decapterus macarellus*
Mackerel scad
“Galunggong”



5 *Sardinella fimbriata*
Fringescale sardinella
“Tamban”



6 *Coryphaena hippurus*
Common dolphinfish
“Dorado”



7 *Encrasicholina punctifer*
Buccaneer anchovy
“Dilis”



8 *Nototodarus philippinensis*
Hawaiian flying squid
“Pusit”



9 *Thunnus obesus*
Bigeye tuna
“Tambakol”



10 *Euthynnus affinis*
Kawakawa
“Tulingan”

Top 3 Fishing Gears in Region 3

Commercial



Purse Seine
“Pangulong”



Handline
“Loyloy”, “kawil”, “bira-bira”



Ringnet
“Kubkub”

Municipal



Multiple Handline
“Kitang”, “Ohayan”, “Rama-rama”,
“Kaskas”, “Og-Og”



Gillnet
“Taba”, “Sigay”, “Panti”



Handline
“Loyloy”, “Kawil”, “Bira-bira”

Enumerators

Aizonette Eunice T. Solon
Gabby C. Herminigildo
Welco U. Olete
Ray Anthony E. Llantero
Zandro U. Olete
Celia Marie Ampongan
Rachel I. Fenis
Mary Nel Gallardo
Mary Ann V. Flores
Marichu A. Villegas
Maria Clara Labdrador

Jhoan P. Alcantara
Lara Cariza C. Villegas
Anthony L. Luna
Reschel T. Ureta
Carla Mae De Guzman
Khim C. Ola
Aicee D. Gatchalian
John Kevin C. Isidro
Nikko S. Ibias
Crizel B. Buensuceso
Francis Samson

HoneyGrace A. Obello
Manilyn M. Cruz
Merlyn Joy David
Franz C. Almazan
Billy Jane Mendoza
Vicente O. Hapal Jr.
Jose Baluyot Jr.
Maricris Carlos
Glaiza M. Tipay
Cane F. Diosomito

Bony Barrera
Rowena B. Taasan
Edison Ednalino
Irene A. Valencia
Jay E. Diosomito
Rheagan G. Ecunar
Thelma E. Conel
Rewil E. Murciano
Aurea Agustin
Bernabe Almandres

Dennis Echon
Diana Jean S. Batan
Aiza Czarina Ednalino
Kristel Joyce B. Lucero
Tirso Elefane
Armi Carloy
Dante Ramos
Jomil Mauricio
Salvy Jane Kahano
Verlen Guintu



NSAP REGION 4A - CALABARZON

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Neil Katrina R. Sisracon and Philip Jessele Jay M. Dicdiquin

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The CALABARZON Region, also known as the Southern Tagalog Region, comprises the provinces of CAVITE, LAGUNA, BATANGAS, RIZAL and QUEZON. It is located in Southern Luzon, just south and west of Metro Manila and is the second most densely populated Region, according to the Philippine Statistics Authority. It has a total land area of 1,687,331 hectares populated by 14.4 million inhabitants. It is composed of one highly urbanized city, 18 component cities, 123 municipalities and 4,896 barangays wherein 95 or 77% are coastal municipalities and 879 or 18% are coastal barangays.

The marine fishery resources is composed of the six (6) major bays: Lamon Bay, Tayabas Bay and Ragay Gulf in Quezon province; Balayan Bay in Batangas province and Manila Bay in Cavite and the National Capital Region. CALABARZON is also the seat of the largest freshwater lake in the Philippines, Laguna Lake with an area of 90,000 hectares and the third largest lake,

Taal Lake, in Batangas with an area of 24,356 hectares and where the famous *Sardinella tawilis* abounds.

In 2015, the Region ranked fourth among the 18 fish producing regions of the country contributing 378,522 metric tons of the total national production of 4,649,313 metric tons with an estimated earnings of Php 21.64 billion 8% of the total national value of Php 224



billion (PSA). As to sectoral production, aquaculture contributed the highest percentage of 46% or a total of 174,131 metric tons. It is followed by municipal at 36% with 138,034 metric tons, and commercial at 18% with 66,357 metric tons. Among the five (5) provinces, Quezon had the highest production of 117,182 metric tons contributing 31% to the regional performance followed by Rizal with 107,352 metric tons (28%), Batangas with 92,844 metric tons (25%) and Cavite with 13,577 metric tons (4%).

Based from the Fisherfolk Registration (2013-2015), there are 113,798 registered fisherfolks in the region: 39,837 in Quezon; 35,747 in Batangas; 18,088 in Cavite; 11,959 in Laguna; and 8,167 in Rizal. As to the number of fisherfolks by bay, there are 17, 281 in Tayabas Bay, 18,325 in Lamon Bay, 3,688 in Ragay Gulf all in Quezon province and 22,153 in Balayan Bay in Batangas province.

In terms of number of commercial fishing vessels, there are 619 licensed boats with 360 at Quezon; 150 at Batangas and 109 at Cavite. The registered number of municipal boats totalled to 12,242. Quezon ranks first with 4,735 boats followed by Batangas with 3,608 boats, Cavite with 1,219 boats, Rizal with 1,632 boats and Laguna with 1,048 boats.



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Fish Stock Assessment for Tayabas Bay has been conducted from 2004 to the present date. This assessment study has generated an eleven-year data-set for analysis on production, boat landing, gear seasonality and biological information of dominant species on length frequencies and length-weight relationships. The scientific analysis of data gathered would reveal the actual situation of the bay which is vital for the formulation of policies for the management and conservation measures of the regional resources for their sustainable development.

In November 2013, BFAR Director Asis G. Perez realized the importance of NSAP data as basis in policy formulation of regulatory policies i.e. determination of species that needs some conservation efforts, declaration of closed and open fishing areas, banning of the catching of certain species and mesh size regulation. One of the output of NSAP is the Joint DA-DILG Administrative Order No. 1, series of 2011 “Establishing of a Closed Season for the Conservation of Sardines in East Sulo Sea, Basilan Strait and Sibuguey Bay”, the Visayan Sea Closure which intensified implementation of FAO 167 and Proposed Closure of Davao Gulf.

It is in the above context that NSAP coverage was expanded to include Lamon Bay and Ragay Gulf in Quezon province and Balayan Bay in Batangas province, as part of the program to cover at least 80% of all landing sites in all regions nationwide. NSAP monitors a total of 54 study sites in CALABARZON: 42 sites in Quezon province and 12 sites in Batangas province.



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Landing Centers, Catch Composition, and Gear Data

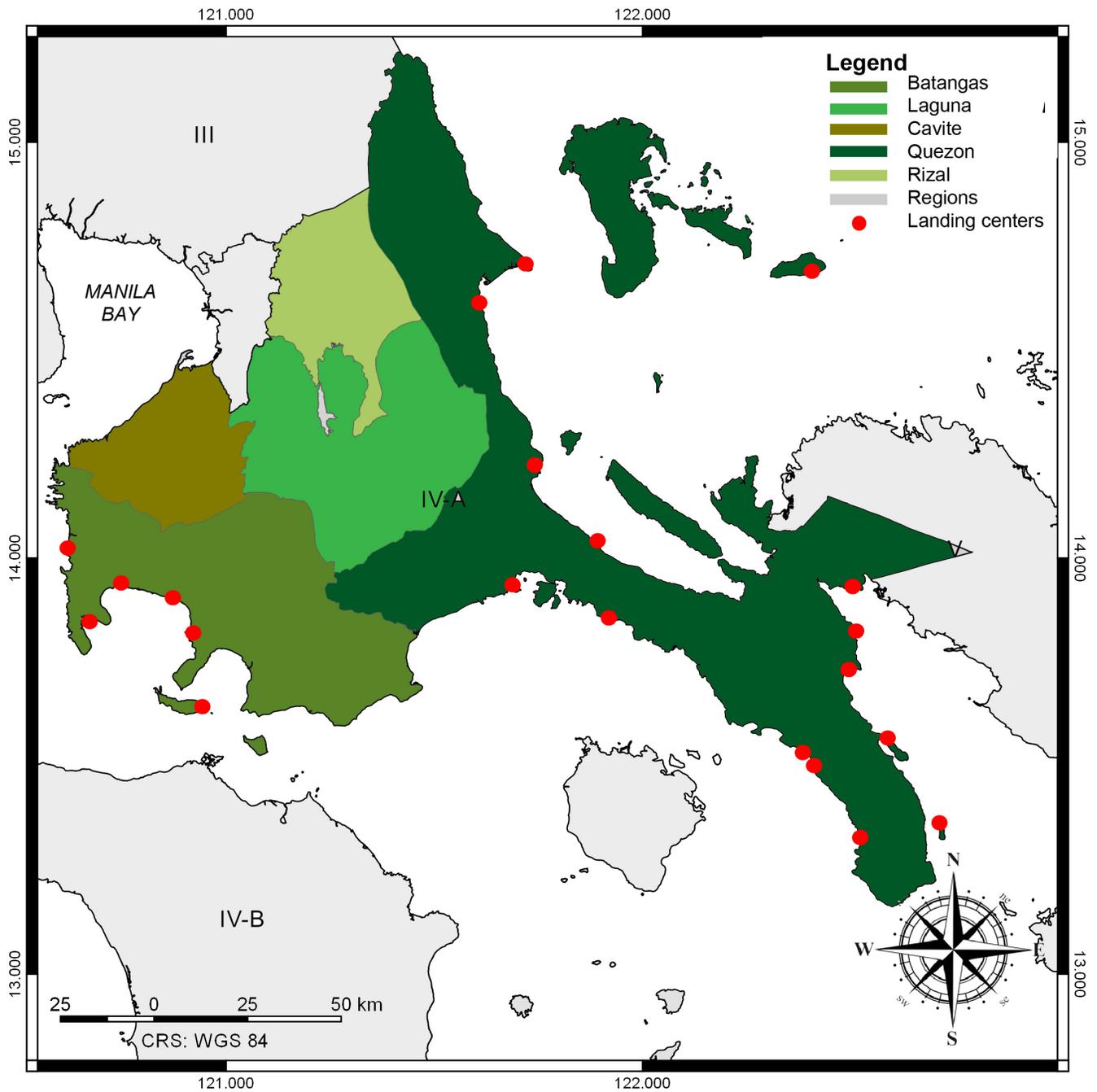


Figure 18 : GIS map of Region 4A-CALABARZON

A. Region 4A - CALABARZON Landing Centers.

BATANGAS

Brgy. Tanagan, Calatagan
 Brgy. 4, Calatagan
 Brgy. Navotas, Balayan
 Brgy. San Piro, Balayan

Brgy. 10, Balayan
 Brgy. 8, Balayan
 Brgy. Sambal Ibaba, Lemery
 Brgy. Sambal Ilaya, Lemery

Brgy. Salong, Calaca
 Brgy. Wawa, Nasugbu
 Brgy. Bucana, Nasugbu

QUEZON

Dalahican Fish Port, Lucena City
 Brgy. Matandang Sabang Kanluran, Catanauan
 Brgy. Masaka, Catanauan
 Brgy. Cawayan 1, San Francisco
 Brgy. Poblacion, San Francisco
 Brgy. Inabuan, San Francisco
 Brgy. Silongin, San Francisco
 Brgy. Pagsangahan, San Francisco
 Brgy. 4, Mulanay
 Brgy. Sta. Rosa, Mulanay
 L.B Brgy. Daungan, Mauban
 M.C Brgy. Daungan, Mauban
 Atimonan Fish Port, Atimonan

Brgy. Caridad Ilaya, Atimonan
 Sitio Moros, Brgy. Talisoy, Jomalig
 Sitio Salibungot, Brgy. Talisoy, Jomalig
 Brgy. Kiskusuyo, Real
 Brgy. Bagaspas, Real
 Brgy. Poblacion 61, Real
 Brgy. Ungos, Real
 Brgy. Tignoan, Real
 Dinahican Fish Port, Infanta
 Sitio Visayan Village, Infanta
 Sitio Parola, Infanta

Purok Gitna, Infanta
 Brgy. Libjo, Infanta
 Purok Bagong Silang, Infanta
 Brgy. Magsaysay, Tagkawayan
 Brgy. Rizal, Tagkawayan
 Brgy. Sabang Piris, Buenavista
 Brgy. Manlana, Buenavista
 Brgy. Abuyon, San Narciso
 Brgy. Kalwit, San Narciso
 Brgy. Poblacion, Guinayangan
 Brgy. Manlayo, Guinayangan

B. Catch composition by fish groups.

Fish Group	No. of Catch by (MT)	Fish Group	No. of Catch by (MT)
 Oceanic tuna	4,067	 Large Pelagics	80
 Neritic Tuna	2,462	 Demersal Fishes	2,808
 Pelagics	1,604	 Sharks and Rays	36
 Small Pelagics	11,595	 Invertebrates	299

C. Gear data

Fishing Gear	No. of Boats Landed	Fishing Gear	No. of Boats Landed
 Bottom set gillnet	23,127	 Spear gun	5,806
 Bottom set longline	16,147	 Hook and line	5,145
 Gill net	13,196	 Trawl	4,740
 Multiple hook and line	7,200	 Jigger	4,346
 Ringnet	6,707	 Lift net	3,142

Top 10 Landed Aquatic Species by Volume



1 *Sardinella lemuru*
Bali Sardinella
“Tamban”, “Tunsoy”



2 *Sardinella gibbosa*
Goldstripe Sardinella
“Tunsoy”



4 *Decapterus macrosoma*
Shortfin scad
“Galunggong”, “Tinabako”



3 *Auxis thazard*
Frigate Tuna
“Tulingan”



5 *Katsuwonus pelamis*
Skipjack Tuna
“Gulyasan”



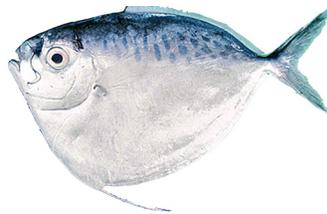
6 *Auxis rochei eudorax*
Bullet tuna
“Tulingan”



7 *Thunnus albacares*
Yellowfin tuna
“Tambakol”



8 *Decapterus tabl*
Roughear scad
“Galunggong”



9 *Mene maculata*
Moonfish
“Chabita”, “Hiwas”, “Pateros”



10 *Selar crumenophthalmus*
Bigeye scad
“Matambaka”, “Buraw”

Top 3 Fishing Gears in Region 4A - CALABARZON

Commercial



Purse seine
“Pangulong”, “Kubkob”



Ring net
“Likum-likum”, “Kubkub”,
“Pukot”



Bagnet
“Basnig”

Municipal



Multiple hook and line
“Og-og”, “Kawil”, “Ondak”,
“Bira-bira”



Bottom set gillnet
“Panteng palubog”



Bottom set longline
“Kitang”

Enumerators

Monchito M. Villanea
Glenn R. Siasa
Arlene A. España
Jesusa P. Balbin
Christopher H. Bautista
Angelo O. Baliza
Norberto D. Villaflor
Arnel M. Arsolon
Allan Ray L. Abesamis
Richard Quingeleria
Israel O. Baliza
Edwin M. Diolata

Aljon R. Umali
Nerissa P. Torres
Jollibee Love M. Dicdiquin
Jesette J. Caliwanagan
Edna P. Comia
Ramon L. Grimaldo Jr.
Oliver V. Almonte
Jenny P. Calar
Napoleon E. Regulto
Ma. Edralyn B. Concepcion
Rothzil C. Capistrano
Al Jhon M. Puserio

Joseph M. San Andres
Rosevie A. Begino
Ruel S. Leogo
Mary Ann B. Bararda
Liesel D. Prudente
Shiela Marie B. Matibag
Larry P. Zamora
Mica Marie M. Arevalo
Lorna C. Francisco
Ma. Alexis R. Abiad
Gwynyth Lai L. De Jesus
Maria Angeline G. Cagayat

Love Lea P. Vergara
Jefrel M. Cadapan
Mark Lancelot J. Mendoza
El Rose G. Sur
Aldrin A. Andrade
Ramon D. Rubio
Reyemark S. Dela Vega
Arnulfo C. Carias
Roberto S. Lanto
Gerry M. Rocafor



NSAP REGION 4B - MIMAROPA

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Located at the southern portion of Luzon, MIMAROPA is the largest region in the country in terms of land area, as well as possessing the longest coastline, rendering it as a major source of both in agriculture and in fisheries. It is bordered by “Panay Islands in the south, CALABARZON and Verde islands in the north, and Bicol region and the Pacific Ocean on the southeast” (DA IV-B MIMAROPA, 2014). Due to the presence of irregular coastlines in the region, coves and bays are dominant in the region, with Honda Bay in Palawan as a major fishing ground among others. With the richest coral reef systems, abounding diverse species, and lush fresh and marine water areas, MIMAROPA delivers not only a plenty of fisheries production, but also boasts its world-renowned sites and resources it has yet to offer. Fisheries serves as an important livelihood in the region, with its production acquired from the sectors of commercial, municipal and aquaculture (BFAR MIMAROPA Fisheries Profile, 2015).

The MIMAROPA region is located along the south of Luzon with a total of 2,661,195 hectares of land area, and a coastline of 3,661.45 km with 1,810 islets. The acronym stands for its constituent provinces, namely Mindoro Oriental, Mindoro Occidental, Marinduque, Romblon and Palawan.

Characterized by its archipelagic nature, the region is widely acclaimed to have the most extensive territorial waters, ranging from freshwater, marine

and coastal areas, and the largest land area among all regions, contributing 8.87% to the country’s total land area (PRO Mimaropa, 2016; BFAR MIMAROPA Fisheries Profile, 2015).

According to the Philippine Statistics Authority, MIMAROPA ranked 2nd in fisheries production nationwide (2005-2009; 2011-2012) accounting for 685,647.55 MT annual production last 2012. Among all provinces in the Region, Palawan is considered the top producer (637,304.81 MT), followed by Occidental Mindoro (18,280.12 MT), Oriental Mindoro (13,842.84 MT), Romblon (10,914.08 MT) and Marinduque (5,305.69 MT). Likewise, Palawan fisheries’ yield accounts for the 60% of total fisheries production nationwide, rendering the province’s rich fishing grounds as a substantial source of livelihood, food security and income (Hamoy-Obusan, 2004 as cited by Palomares and Parducho, 2014; BAS 2011-2015 CountrySTAT Philippines).

MIMAROPA is composed of major and minor fishing grounds, namely Bacuit Bay, Balabac Strait, Coron Bay, Cuyo Pass, Green Island, Honda Bay, Imuruan Bay, Malanut Bay, Mindoro Strait, San Antonio Bay, Tablas Strait, Taytay Bay, Ulugan Bay, West Sulu Sea, and the West Philippine Sea, among others. From these, thirteen (13) are located in Palawan. A total of sixty-one (61) NSAP observation sites have been established.

Landing Centers, Catch Composition, and Gear Data

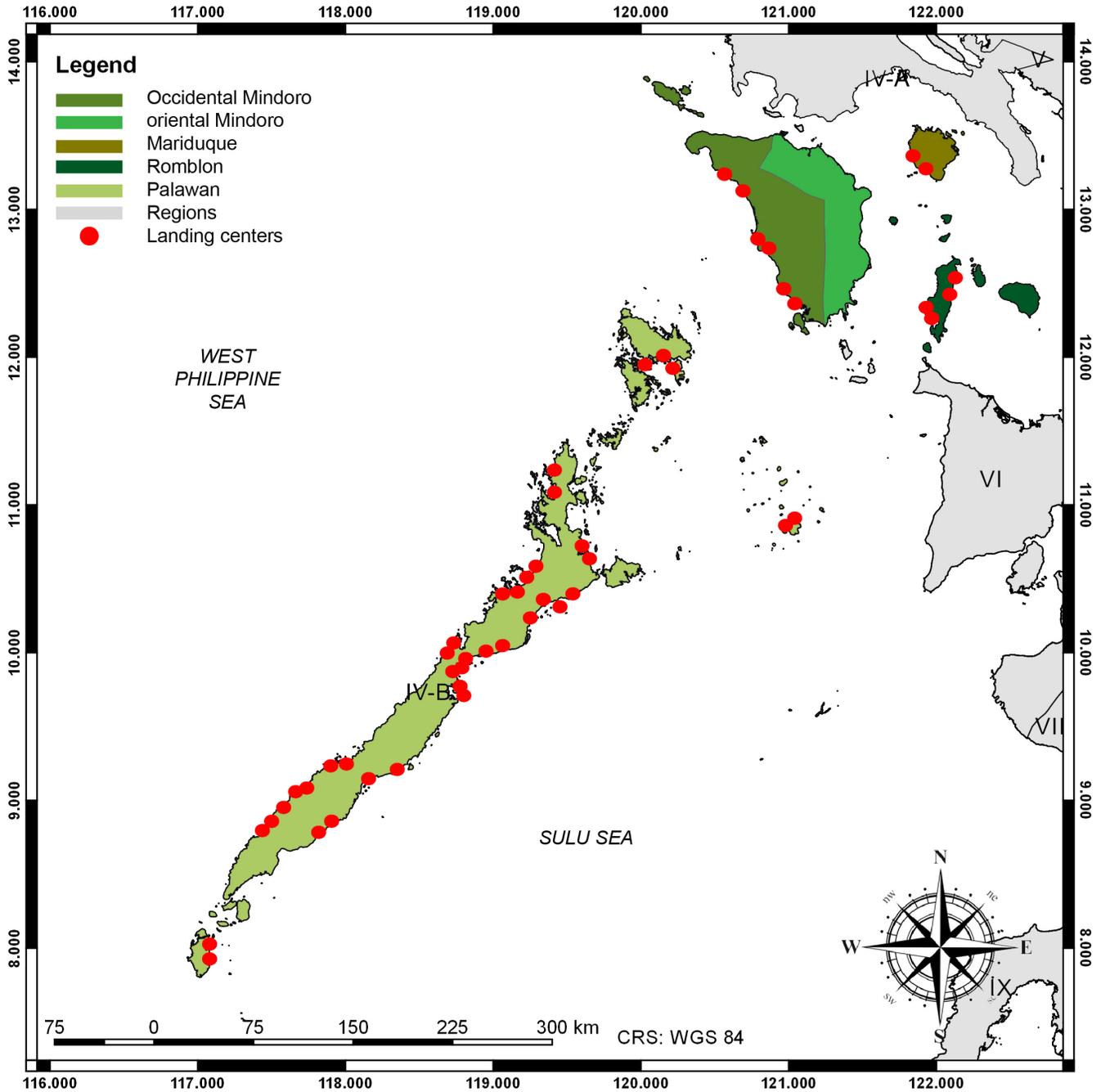


Figure 19 : GIS map of Region 4B-MIMAROPA

A. Region 4B - MIMAROPA Landing Centers.

OCIDENTAL MINDORO

Bgy. Caminawit, San Jose
Bgy. Pag-asa, San Jose

Bgy. Punta, Sablayan
Bgy. Buenavista, Sablayan

Bgy. 2, Mamburao
Bgy. 7, Mamburao

ORIENTAL MINDORO

Bgy. San Antonio, Mansalay
Bgy. Poblacion, Mansalay

MARINDUQUE

Bgy. Daykitin, Buenavista
Bgy. Pinggan, Gasan

ROMBLON

Bgy. Gabawan, Odiongan
Bgy. Tumingad, Odiongan

Bgy. Poblacion, Calatrava

Bgy. Pangulo, Calatrava

PALAWAN

Purok Aplaya, Bgy. Tagburos, Puerto Princesa City
Purok Silangan, Bgy. Tagburos, Puerto Princesa City
So. Tagbato, Bgy. Salvacion, Puerto Princesa City
So. Nasidoc, Bgy. Manalo, Puerto Princesa City
So. Anilawan, Bgy. Babuyan, Puerto Princesa City
Purok Barimbing, Bgy. Babuyan, Puerto Princesa City
So. Human, Bgy. Lucbuan, Puerto Princesa City
So. Katumbal, Bgy. Lucbuan, Puerto Princesa City
Bgy. Binduyan, Puerto Princesa City
Bgy. Langogan, Puerto Princesa City
Purok Jacana, Bgy. Banca-bancao, Puerto Princesa City
Fishport Complex, Bgy. Matahimik, Puerto Princesa City
Bgy. Bagong Silang, Puerto Princesa City
Bgy. Macarascas, Puerto Princesa City
Bgy. Bahile, Puerto Princesa City
Bgy. Panacan, Narra
Bgy. Calategas, Narra
Fishport Port, Bgy. Alfonso XIII, Quezon
Maritime Port, Bgy. Alfonso XIII, Quezon
Bgy. Tabon, Quezon
Bgy. Poblacion District 1, Brooke's Point
Bgy. Pangobilian, Brooke's Point
So. Base, Bgy. Punta Baja, Rizal
So. Liwayway, Bgy. Punta Baja, Rizal
Purok Malapandig, Bgy. Punta Baja, Rizal
Bgy. 3, Balabac

Bgy. 4, Balabac
Bgy. 5, Balabac
Bgy. 6, Balabac
Bgy. Caramay, Roxas
Bgy. Nicanor Zabala, Roxas
Zone I, Green Island, Bgy. Tumarbong, Roxas
Zone II, Green Island, Bgy. Tumarbong, Roxas
Zone III, Green Island, Bgy. Tumarbong, Roxas
Zone IV, Green Island, Bgy. Tumarbong, Roxas
Bgy. Poblacion I, Taytay
Bgy. Poblacion II, Taytay
So. Pamulot, Bgy. Bantulan, Taytay
Bgy. Alimanguhan, San Vicente
Bgy. Sto. Niño, San Vicente
Bgy. Panindigan (Commercial), San Vicente
Bgy. Panindigan (Municipal), San Vicente
Bgy. Buena swerte, El Nido
Bgy. Lamoro, El Nido
Purok 3, Bgy. Bebeladan, El Nido
Purok 4, Bgy. Bebeladan, El Nido
Bgy. Tenga-tenga, Cuyo
Bgy. Tabunan, Cuyo
Bgy. Suba, Cuyo
Bgy. Poblacion 2, Coron
So. Maquinit, Bgy. Tagumpay, Coron
So. Tagum, Bgy. Tagumpay, Coron

B. Catch composition by fish groups.

 Fish Group	No. of Catch by (MT)	 Fish Group	No. of Catch by (MT)
 Oceanic tuna	31,527	 Large Pelagics	1,550
 Neritic Tuna	11,859	 Demersal Fishes	27,182
 Pelagics	8,190	 Sharks and Rays	485
 Small Pelagics	64,184	 Invertebrates	5,472

C. Gear data

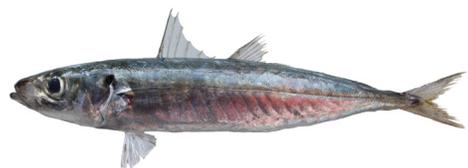
 Fishing Gear	No. of Boats Landed	 Fishing Gear	No. of Boats Landed
 Bottom set gillnet	5,122	 Stationary lift net	887
 Hook and line	1,888	 Bag net	852
 Multiple hook and line	1,784	 Spear gun	642
 Gill net	1,626	 Jigger	596
 Bottom set longline	1,381	 Drive-in net	434

Top 10 Landed Aquatic Species by Volume

Thunnus albacares
Yellowfin Tuna
“Tuna”, “Tambakol”,



1



2 *Decapterus macrosoma*
Yellow Tail Roundscad
“Galunggong”, “Bilugan”, “Galung-
gong lalaki”



3 *Amblygaster sirm*
Spotted Sardines
“Tamban”



4 *Decapterus russelli*
Indian Scad, roundscad
“Galunggong”, “Lapad”, “Galung-
gong babae”



5 *Stolephorus indicus*
Indian Anchovy
“Dilis”



6 *Encrasicholina devisi*
Devi's Anchovy
“Dilis”



7 *Rastrelliger kanagurta*
Indian Mackerel
“Alumahan”, “Buraw”



8 *Euthynnus affinis*
Eastern Little Tuna
“Kawakawa”



9 *Auxis rochei*
Bullet Tuna
“Tulingan”



10 *Stolephorus commersoni*
Commerson's Anchovy
“Dilis”

Top 3 Fishing Gears in Region 4B - MIMAROPA

Commercial



Bagnet
“Basnig”



Ringnet
“Pangulong”, “Likom”

Municipal



Hook and line (common)
“Kawil”



Hook and line (tuna)
“Kawil” (panambakol)



Bottom Gillnet
“Panting-palubog”

Enumerators

Adrian Rey P. Hubo
Almar P. Villaruel
Antonieta O. Galili
April Anne T. Graciano
Arlyn A. Echague
Bjorn H. Lota
Donald B. Cajolo
Elmer B. Lorenzo
Franklen R. Amasan
Hamsin D. Alsad
Imelda B. Caseñas
Ivan M. Oja

Jamaica B. Natividad
Jayvee M. Moral
Jeffrey E. Cuaresma
Jennifer A. Divino
Jennifer S. Salonga
John Mark Anthony A. Cayao
John Michael Valdeztamon
Jomari “Jun-Jun” B. Gerago
Julie Ann A. Ibrahim
Ma. Cristina E. Canonico
Manuel N. Javarez
Mary Cristine N. Corpuz

Merle R. Baculinao
Merry Ann D. Verdeflor
Rachel J. Lita
Rebecca S. Apgao
Richard M. Archedera
Rochelle L. Villanueva
Ruthcily P. Taripe
Shryn Daryl S. Collantes
Zhavarzad J. Omar
Adrian Lucky A. Gallos
Allan Earl S. Labrador
Anabel M. Fronza

Archie G. Dumarig
Hernando Remotin
Jerome M. Mayorga
Jessie M. Irang
Lanie M. Gallano
Lian S. Magparangal
Marcial F. Ytang, Jr.
Mariet G. Sarmiento
Mery Rose P. Veral
Michel E. Pastor
Rebecca M. Letada



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NSAP REGION 5 - BICOL

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Bicol Region is situated in the Southern Luzon comprising of six (6) provinces, namely: Camarines Norte, Camarines Sur, Albay, Sorsogon, and the island provinces of Masbate, and Catanduanes. It is characterized by mountainous, vast agricultural areas and diverse marine ecosystem. In addition, it has an extensive coastline and sea coast which is surrounded with numerous bays and gulfs that gives life to the fishing industry. There are sixteen (16) major fishing grounds situated in the region, seven of which are among the richest in the country, namely: Lagonoy Gulf, Sorsogon Bay, Albay Gulf, San Miguel Bay, Lamon Bay, Ragay Gulf and Asid Gulf (in the Visayan Sea). With the presence of such important fishing grounds, the National Stock Assessment Program (NSAP) was tasked to monitor and assess the condition of fisheries and to generate data that will be useful for management and conservation of such resources. NSAP is one of the major programs of BFAR being implemented nationwide, and was undertaken to respond to the mandate of RA 8550, known as the Philippine Fisheries Code of 1998.

Lagonoy Gulf is a large and deep body of water in the East coast of Bicol Region with coordinates of 13.5900°N and 123.6728°E. It is bounded by fifteen (15) settlements from three (3) provinces: Rapu-Rapu, Bacacay, Malilipot, Tabaco City, Malinao, and Tiwi from Albay; Tigaon, Sagñay, Caramoan, Lagonoy, Goa, Presentacion, and San Jose in Camarines Sur; and, San Andres, Bato and Virac in Catanduanes. It has an area of about 3,071 km² with 80% of its area is between 800 meters and 1,400 meters deep. There are about 9,851 fishers residing in the coastal municipalities along this gulf. Both municipal and commercial fisheries are characterized by multifishery and multifishing gear activity.

This gulf is known for tuna (*Thunnus alalunga*, *T. albacares*, *T. obesus*, *T. tonggol*, and *Katsuwonus pelamis*) and tuna-like species (*Rastrelliger kanagurta*, *R. faughni*, *Auxis* species and *Euthynnus affinis*), as well as other large and small pelagic species such as *Istiophorus platypterus*, *Istiompax (Makaira) mazara*, *I. indica* and Carangidae species. At present, eighteen

(18) landing stations are monitored by NSAP consisting of 8 stations established during the onset of NSAP implementation all over the country in 1998 and 10 expansion areas which started in 2014. These are located within the city of Tabaco and the municipalities of Tiwi, Bacacay, Sagñay, San Jose, Bato, Virac and San Andres. The composition of the catch in Lagonoy Gulf consisted of 127 families with 875 species which were recorded from 1998-2012. Finfishes dominated the catch with 753 different species followed by elasmobranchs with 67 species and invertebrates with 55 species. For the past 15 years, tuna species such as *K. pelamis*, *Thunnus albacares*, *T. alalunga*, and other pelagic species such as *Encrasicholina punctifer*, *Rastrelliger faughni*, *R. kanagurta* and *Selar crumenophthalmus* dominated the catch of the Gulf. Another observation is that the catch of *Manta birostris* has declined from 1998-2011 while in 2012 there was no recorded catch of the said species. *T. alalunga* has been noted to have a peak production in 2009 which surpasses the other tuna species such as *K. pelamis* and *T. albacares* which are the most dominant among the tuna species.

Sorsogon Bay is known for its varied marine produce such as crabs (*Portunus pelagicus*), shrimps (*Penaeus monodon*), shellfishes such as *Pinna bicolor* (which is one of the local delicacies in the province), other pelagic and demersal species with higher commercial value, as well as other products such as seashells and Capi shell (*Placuna placenta*) which are used for window pane and other home decorations. It is located at coordinates 12.9167°N latitude and 124.0025°E longitude. A total of 12 landing stations were monitored by NSAP wherein five (6) of which are expansion areas within Sorsogon City, Castilla and Magallanes. Sorsogon City and four coastal municipalities – Casiguran, Castilla, Juban, and Magallanes, share the marine produce of the Bay. A total of 93 families comprised of 324 species of finfish, 62 species of invertebrates and 16 species of elasmobranch were recorded in Sorsogon Bay from 1999 to 2013.

The Provincial Board of Sorsogon unanimously approved Resolution No. 24 on January 14, 1972, declaring Sorsogon Bay as a conservation area and banning the use of trawl and other destructive fishing operations. However, this consequently led to the exploration of the benthic biomass in the bay and started the shellfish collection in the area.

San Miguel Bay is one of the most productive fishing grounds in the Bicol Region due to its shallow, protected and nutrient-rich waters. It is round shaped and is located on the southeastern coast of Luzon Island, lying between the provinces of Camarines Sur and Camarines Norte. Situated at 13.9849°N latitude and 123.2204°E longitude, and has a total surface area of approximately 840 square kilometers. The communities surrounding the Bay belong to the municipalities of Cabusao, Calabanga, Sipocot, Siruma and Tinambac, all within the province of Camarines Sur, and the municipalities of Basud and Mercedes in Camarines Norte.

It produces large catches of fish, shrimps and other crustaceans. Primarily known for croaker *Otolithes ruber* and cutlass *Trichiurus lepturus* fishery, it is also an important fishing ground for shrimps and a variety of other finfish species such as herrings, mullets, juvenile Spanish mackerels, anchovies and crevalles. These are caught by the Bay fishermen using a variety of fishing gears such as stationary fish traps, gill nets, fish corrals, beach seines, lift nets and trawls. The fishery of San Miguel Bay is seasonal in nature due to the rough weather prevailing during the northeast monsoon. However, this feature is less pronounced than in other parts of the Philippine Pacific coast.

San Miguel Bay is the latest expansion area being covered by NSAP5, having been included in June 2014.

Lamon Bay is a large body of water in the southern part of Luzon Island, connecting the southeastern part of Quezon province and the province of Camarines Norte in Bicol to the Pacific Ocean. Situated at 14.4160°N latitude and 122.0590°E longitude, it is bounded by the coastal towns of Jose Panganiban, Paracale, Sta. Elena and Vinzons, and the island of Calaguas in Camarines Norte, and by the coastal towns of Atimonan, Gumaca, Plaridel, Lopez, Calauag, and the islands of Alabat in Quezon province.

It is a rich fishing ground and home to live coral reefs. Most parts of the bay is of gray sand, some parts are filled with rocks, and others with living corals. It is gradually sloping to the extent that, during low tide, the water level is low enough to allow one to walk as far as five hundred metres from the shore. The top ten fishery

resources of Lamon Bay as indicated in the NSAP5 2014 data include the following species: *Aluterus monocerus*, *Decapterus macrosoma*, *Rastrelliger faughni*, *R. kanagurta*, *Selar crumenophthalmus*, *D. russelli*, *R. brachysoma*, *Sepiotheuthis lessoniana*, *Sardinella gibbosa* and *D. macarellus*.

Ragay Gulf is another large fishing ground in the southern part of Luzon Island. It is a part of the Sibuyan Sea, and is located 13.5839°N latitude and 123.0654°E longitude, between the Bicol and Bondoc Peninsulas. Seventeen (17) coastal settlements border Ragay Gulf. These are the towns of San Pascual, Masbate; Del Gallego, Ragay, Lupi, Sipocot, Libmanan, Pasacao, San Fernando, Minalabac, Bula, Balatan and Bato in Camarines Sur; and Tagkawayan, Guinayangan, Buenavista, San Narciso and San Andres in Quezon province. It also encompasses the municipalities abutting the Burias-Ticao Pass including the towns in the Burias and Ticao Islands, the coastal towns of Donsol, Pilar and Castilla in Sorsogon, and the municipalities of Ligao, Oas and Libon in Albay.

Ragay Gulf is a rich fishing ground for Clupeids and Engraulids. The top ten species accounting for the Gulf's total fisheries production are *Sardinella gibbosa*, *Diaphus phillipsi*, *Spratelloides gracilis*, *Encrasicholina punctifer*, *Dussumieria acuta*, *Stolephorus ronquilloi*, *Auxis rochei*, *Decapterus russelli*, *Sardinella lemuru* and *Thunnus albacares*. These species are mostly caught by the following gears: purse seine, ring net, surface gill net, bagnet and bottom set gill net.

Ragay Gulf is included among NSAP5 expansion areas having been included in the NSAP coverage in June 2014.

Albay Gulf is situated at 13.1810°N latitude and 123.9260°E longitude in Southern Luzon. It is considered a major fishing ground for large and small pelagics, demersal and invertebrate species. It is famous for tuna and tuna-like species and has a rich marine biodiversity. The enclosed Gulf is surrounded by 6 coastal municipalities and 1 city: Bacon District of Sorsogon City and Prieto Diaz in the province of Sorsogon, and by Rapu-Rapu, Bacacay, Sto. Domingo, Manito, and Legazpi City and in the north and west.

The dominant pelagic species caught in the area were *Encrasicholina punctifer*, *Katsuwonus pelamis*, *Decapterus russelli*, *Atule mate* and *D. macarellus*. For the demersal species, the top species are *Priacanthus* sp., *P. macracanthus* and *Lethrinus ornatus*. The dominant invertebrates caught in the area are *Sepiotheuthis lessoniana*, *Portunus pelagicus*, *Sepia pharaonis*, *Octopus macropus* and *Scylla serrata*.

Albay Gulf is an expansion area for NSAPV and has been a part of NSAP coverage in the Bicol Region since March 2007 for the municipalities of Rapu-Rapu, Legazpi City and Bacon District, Sorsogon City (Pigsabunan and Caricaran landing centers), whereas, the municipalities of Sto. Domingo and Bacon District Sorsogon City (Buenavista and Sawanga landing centers) were established on June 2014.

Asid Gulf is a part of the Visayan Sea forming its northernmost extent. It is located south of the island province of Masbate situated at 12.1790°N latitude and 123.4990°E longitude. It is endowed with rich pelagic and demersal fishes and with an abundance of invertebrate species which contribute to the fisheries production data not only in the Bicol Region but also for the whole Visayan Sea which encompasses 3 regions (Regions 5, 6 and 7).

The most dominant species produced in Asid Gulf is, *Portunus pelagicus* commonly known as kasag from other invertebrate caught such as *Photololigo duvaucelli*, *Photololigo edulis*, *Sepiotheuthis lessoniana*, *Sepia lycidas*, *Octopus aegina* and shrimps and prawns belonging to the genera *Penaeus* and *Metapenaeus*.

The top finfish species caught in the area are *Leiognathus splendens*, *Sardinella fimbriata*, *Sillago sihama*, *Selaroides leptolepis*, *Sillago maculata*, *Sardinella gibbosa* and *Rastrelliger brachysoma*.

Asid Gulf is an NSAPV expansion area which was included in March 2007. It is important in the integrated NSAP data from Regions 5, 6 and 7 in providing a comprehensive database for the proper utilization, conservation and holistic ecosystem-based management approach for the whole Visayan Sea.

Landing Centers, Catch Composition, and Gear Data

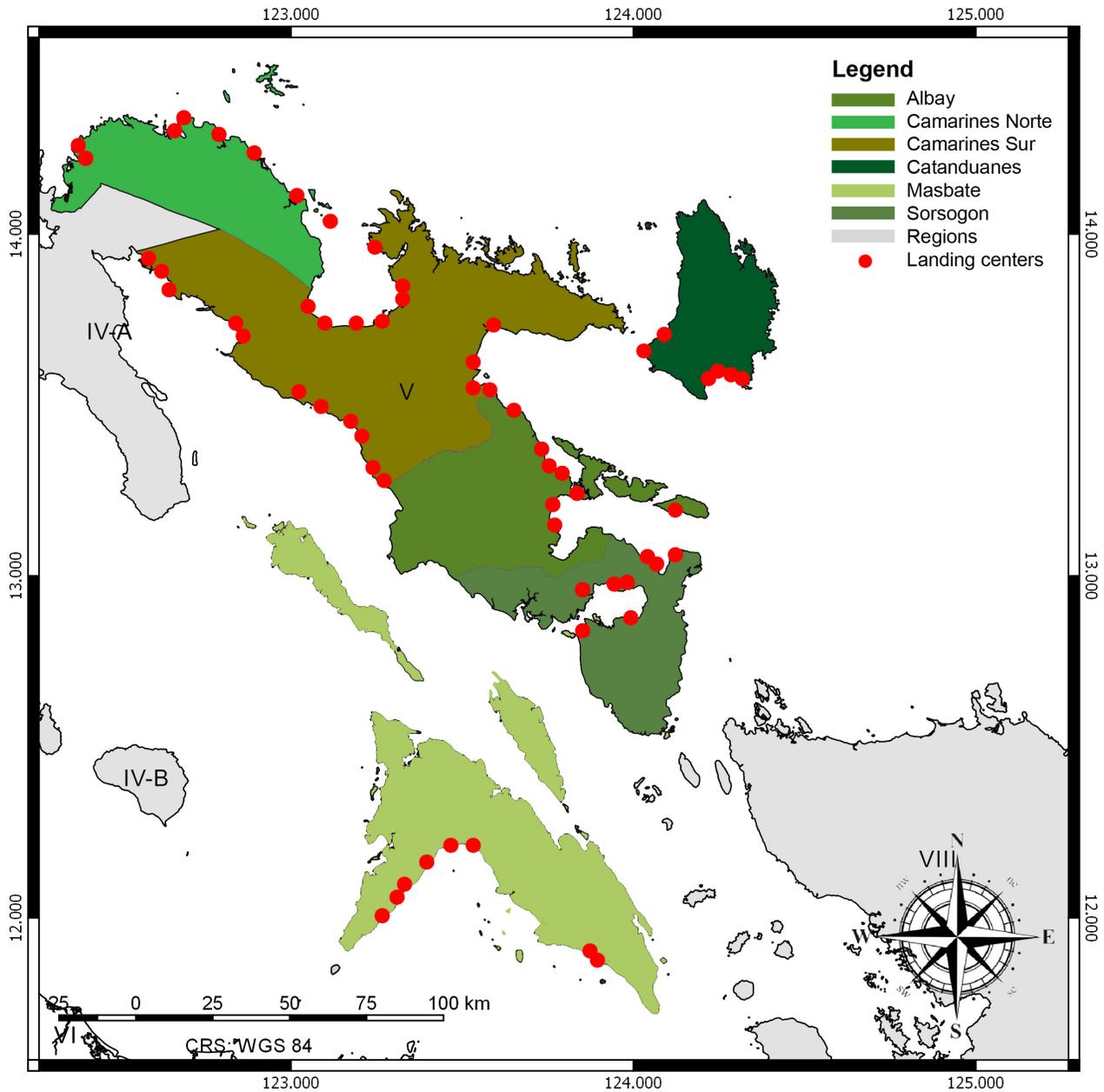


Figure 20 : GIS map of Region 5

A. Region 5 - Bicol Landing Centers.

CAMARINES SUR

Nato (Wharf & Sta. Cruz), Sagñay
 Nato (La Purisima & del Carmen), Sagñay
 Bungalon, Sagñay
 Patitinan, Sagñay
 Sabang (Ilawaod), San Jose
 Sabang (Iraya), San Jose
 Castillo Zone 3, Castillo, Cabusao
 Barcelonita, Cabusao
 Sabang, Calabanga
 Bonot, Calabanga

Poblacion-Salvacion, Tinambac
 Sugod, Tinambac
 Filarca, Tinambac
 New Caaluan, Tinambac
 Vito, Siruma
 Sitio Popoot, Vito, Siruma
 Barangay 5, Mercedes
 Barangay 7, Mercedes
 Caringo Isl (Purok 2 &5), Mercedes
 Tagbak, Ragay
 Catabangan Proper, Ragay

Bangon, Lupi
 Sancirilo (Fish Port), Pasacao
 Caranan, Pasacao
 Luluasan, Balatan
 Pararao, Balatan
 Duran, Balatan
 Siramag, Balatan
 Sabang, *Del Gallego
 Pasay, * Del Gallego
 Salingogon, Minalabac
 Bagolatao, Minalabac

SORSOGON

Buenavista, Bacon Dist., Sor. City	Peñafrancia, Sorsogon City	Tulay, Casiguran
Sitio Pampang & Dancalan, Bacon Dist., Sor. City	Embarcadero & Parola, Poblacion, Castilla	Pantalan, Magallanes
Pigsabunan, Bacon Dist., Sor. City	Market site, Poblacion, Castilla	Central, Magallanes
Caricaran, Bacon Dis., Sor. City	Cawit, Casiguran	Cawit Proper, Magallanes
Cambulaga, Sorsogon City	Central, Casiguran	Bacolod, Magallanes

ALBAY

Buhatan, Sto. Domingo	Barangay 1, Telegrapo, Poblacion, Bacacay	Sogod (Zone 1-2), Sogod, Tiwi
Poblacion, Pandayan, Sto. Domingo	Puro, Legazpi City	Sogod (Zone 4-6), Sogod, Tiwi
Poblacion, Sto. Domingo St. Sto. Domingo	Victory Village Brgy. 27, Legazpi City	Igang, Bacacay
Pier Site, Quinale, Tabaco City	Victory Village Brgy. 28, Legazpi City	
San Roque, Tabaco City	(Poblacion- Purok 1-6), Rapu-Rapu	

MASBATE

Poblacion East, Milagros	Salvacion, Balud	Villa Inocencio, Placer
Poblacion West, Milagros	Panguiranan, Balud	Pasiagon, Placer
Bangad, Milagros	Jangan, Balud	

CATANDUANES

Batalay, Bato	Cabugao, Bato	Mayngaway, San Andres
Pananaogan, Bato	San Vicente, Virac	Codon, San Andres

CAMARINES NORTE

San Lorenzo (lower Minasag), Sta. Elena	Palanas, Paracale	Bonocboc, Calaguas Island,
Salvacion, Sta. Elena	Sabang Purok 1, Vinzons	Vinzons Sugod,
Poblacion Norte, Paracale	Sabang Purok 3, Vinzons	Calaguas Island, Vinzons

B. Catch composition by fish groups.

 Fish Group	No. of Catch by (MT)	 Fish Group	No. of Catch by (MT)
 Oceanic tuna	11,520	 Large Pelagics	6,982
 Neritic Tuna	18,994	 Demersal Fishes	21,855
 Pelagics	18,462	 Sharks and Rays	854
 Small Pelagics	82,288	 Invertebrates	28,843

C. Gear data

 Fishing Gear	No. of Boats Landed	 Fishing Gear	No. of Boats Landed
 Bottom set gillnet	43,441	 Bottom set longline	7,673
 Gill net	21,770	 Lift net	5,942
 Hook and line	15,633	 Ringnet	5,667
 Multiple hook and line	9,626	 Crab trap	4,947
 Trawl	9,043	 Jigger	4,343

Top 10 Landed Aquatic Species by Volume



Thunnus albacares 1
Yellowfin Tuna
“Bangkulis”, “Tikyaw”



Thunnus alalunga 2
Albacore tuna
“Bangkulis”, “Iliwan”



Trichiurus lepturus 10
Largehead hairtail
“Langkoy”



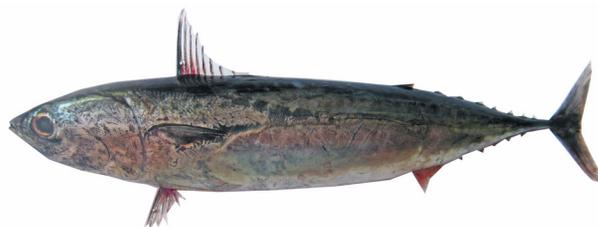
Selar crumenophthalmus 3
Bigeye scad
“Matambaka”, “Malughaw”



Otolithes ruber 9
Tigertooth croaker
“Abo”



Escualosa thoracata 4
White sardines
“Silag”, “Sarubasid”



Auxis rochei 8
Bullet Tuna
“Turingan”



Sillago ingenuua 5
Bay Sillago
“Osoos”, “Tayutos”



Rastrelliger brachysoma 6
Short mackerel
“Buraw”, “Gumaa”



Rastrelliger faughni 7
Island mackerel
“Buraw”, “Kabalyas”

Top 3 Fishing Gears in Region 5

Commercial



Ringnet
“Palakaya”, “Kalansisi”



Trawl
“Galadgad”



Bagnet
“Basnig”

Municipal



Bottom Set Gillnet
“Pankeng pang-irarom”



Bottom Set Long Line
“Kitang”



Surface Gillnet
“Pankeng pang-ibabaw”

Enumerators

Kristine SM. Paredes
Erick N. Ballaran
Dahlia B. Batalla
Conсорcia L. Pescador
Myra B. De Vera
Cecilio A. Bajas Jr.
Ricardo V. Arcilla Jr.
John Paul C. Ibayan
Archie R. Ballaran
Jenelyn B. Boholst
Michael John O. Vargas
Julius U. Bermundo
Kim Francis L. Moralde
Cristelle Alan S. Imperial Jr.
Cybel L. Dialogo
Jessie Lyn R. Azagra
Katrina G. Enciso
Elgie B. Carascal
Meriam D. Gepaya
Emar R. Marabillo
Joel M. Convencido

Efeligenia C. Concepcion
Alexandra A. Tenajeros
Elsa B. Bermas
Cristine E. Esquejo
Czarina Navarro
Kim C. Francisco
Lara Jean L. Mago
Errol M. Gallego
Mark Edward H. Jao
Glenn Benedict M. Yabut
Jose Mari D. Delos Santos
Maria Karla Anjiella A. Borromeo
Edena A. Mortega
Jay-Ar S. Diaz
Rodante T. Trajano
Aireen J. Azurin
Lovellev B. Villar
Delmar R. Morcon
John Rex C. Balino
Tiffany L. Albao
Ryan G. Cedino

Marco B. Briz
Richard V. Bondocoy
Joselyn B. Balila
Jenelyn B. Canlas
Maria Elena M. Gadin
Anthony T. Mendoza
Norman B. Solomon
Annie Mae T. Zafe
Elyrose B. Caballero
Myra C. Boqueo
Maritoni C. Borromeo
Jessabel R. Barrozo
Ronel P. Dacuya
Edgar F. Sta. Rosa, Jr
Arlene A. Nicart
John Lester N. Bongon
Eden H. Castillo
Joevin P. Durante
Catherine B. Baliwag
Nephtali M. Amor
Carlos R. Gonzales Jr.

Roselle B. Manzanido
Marygrace V. Orosco
Jenea B. Balila
Raquel G. Buitizon
Conrado D. Grencio Jr.
Joan C. Clavecillas
Genevieve M. Flores
Whinmar B. Castro
Ezer L. Quizon
Hernan C. Dela Torre
Marc Angelo B. Lanzuela
Analito F. Cortes
Mylene A. Daet
Jennelyn S. Vargas
John Philip B. Bernales
Raena Ruth S. Octa
Jansen C. Cuadro
Arcil B. Abarca
Joel L. Ibanez
John Edgar Y. Cadag
Joey E. Camay



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NSAP REGION 6 - WESTERN VISAYAS

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Western Visayas Region, designated as Region VI is composed of six (6) provinces: Aklan, Antique, Capiz, Guimaras, Iloilo, and Negros Occidental. Under Executive Order 183 signed by former President Benigno S. Aquino III on May 29, 2015, Negros Occidental together with Negros Oriental is identified to compose the Negros Island Region.

The region is bounded by rich marine fishing grounds such as the Visayan Sea on the northeast, Sibuyan Sea on the north, Cuyo East Pass on the east, Panay Gulf on the southeast, and Guimaras Strait on the Southwest. These fishing grounds contribute to the fisheries status of Region 6 ranking 4th in terms of volume of fish production, and 2nd in terms of value (PSA, 2014).

Region 6 is composed of 14 coastal cities and 70 coastal municipalities with 779 coastal barangays dependent on the fishery resources for livelihood (BFAR6, 2009). In terms of fish landing facilities, the region has 39 major fish ports (BFAR6, 2009) and 1,052 minor fish landing centers. The region, being one of the major fishing areas, also hosted nine (9) fisheries schools that are considered State Universities and Colleges with BFAR supporting students under the

Fisheries Scholarship Program both for the industry leaders and fisherfolk children.

Region 6 has one of the highest numbers of fisherfolk and gears in the country. Currently, the region registers 147,349 registered fisherfolk and 18,620 registered fishing boats as of December 2015 based on the FishR and BoatR (BFAR6, 2016).

Major fish species include sardines and mackerels that have an annual closure season under FAO (Fisheries Administrative Order) 167-3. Scads locally known as tamodios or galunggong which are mostly caught in the Cuyo East Pass area are under the closure season of Joint Administrative Order (JAO) 01 series of 2015. Oceanic tuna species are also major catch with data landing contribution to the Western Pacific East Asia Tuna (WPEA) fisheries. The region is also known as the major source of blue swimming crab with conservation initiatives under the JAO 01 series of 2014. Visayan Sea to be specific is known as one of the rich fishing grounds in the country and is being proposed as part of Fisheries Management Area for sardines, blue swimming crab, and sharks and rays.

Landing Centers, Catch Composition, and Gear Data

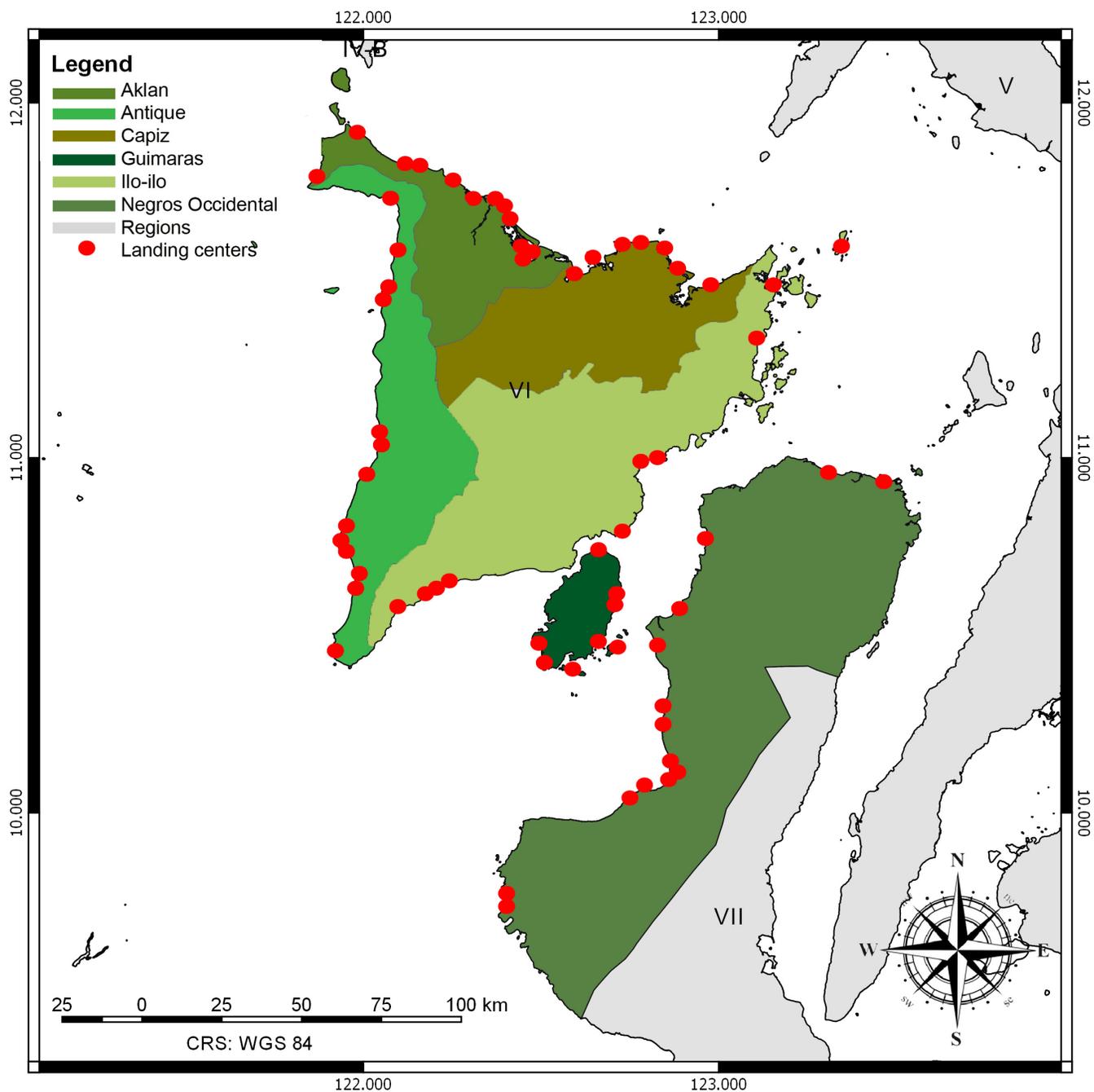


Figure 21 : GIS map of Region 6

A. Region 6 - Western Visayas Landing Centers.

AKLAN

Mandong, Batan
 Sungcolan, Batan
 Poblacion, Batan
 Mabilo, Kalibo
 New Buswang, Kalibo
 Navitas, Numancia

Camansi Norte, Numancia
 Baybay, Makato
 Naisud, Ibajay
 San Isidro, Ibajay
 BugtongBato, Ibajay
 Buena Suerte, Nabas

Polo, New Washington
 Dumaguit, New Washington
 Jawili & Dumatad, Tangalan
 Port of Alegria, Buruanga

GUIMARAS

Sabang, Sibunag
Nauway, Sibunag
Igang, Nueva Valencia,

Sto. Domingo, Nueva Valencia,
Cabalagnan, Nueva Valencia
Guiwanon, Nueva Valencia

Suclaran, San Lorenzo
Avila/East Valencia, Buenavista
Libas, San Lorenzo
Langab, San Lorenzo

ANTIQUE

Maybato Sur, San Jose
Talisayan, Anini-y
San Anghel/Malaiba, San Jose
Maybato North, San Jose
Poblacion, Sebaste
Zaldivar, Pandan

Guinsang-an Asluman, Hamtic
Asluman, Hamtic
Mapatag, Hamtic
Paliwan, Bugasong
Lipata, Culasi
Catwayan/Playa, Patnongon

Jinalinan, Bugasong
Poblacion, Culasi
Union, Libertad
Tinigbas, Libertad

ILOILO

Binon-an, Batad
Bagongon, Concepcion
Buaya, Carles
Binuluangan, Carles
Tiabas, San Dionisio
Bacay, Dumangas,
Bucaya, San Joaquin
San Salvador, Banate

Pantalan Nabaye, Ajuy
Concepcion Municipal Fish Port
Concepcion, Daculan, Estancia
Bancal Municipal Fish Port, Carles
Cabasi, Guimbal,
Baras, Guimbal
Poblacion, Banate,
Estancia Feeders Port Complex,

Estancia, Poblacion,
San Dionisio,
San Francisco, Barotac Viejo,
Baybay Norte, Miagao
Kirayan, Miag-ao,
Lantangan, Gigante Sur, Carles,
Iloilo Fish Port Complex, Iloilo City
Iloilo Fish Port Complex, Iloilo City

NEGROS OCCIDENTAL

Zone 4/Zone 6, Cadiz City
Gahit/Panawsawon, EB Magalona
Bombels & Looc, Old Sagay FLS, Sagay City
Tiglawigan, Cadiz City
Catabla Baybay, Zone 3, Talisay City
Punta Mesa, Manapla
Tortosa, Manapla
Poblacion, Bago City
Central Tabao Mun. Fish Port, Valladolid
Tagda, Hinigaran

Aguisan, Himamaylan City
Enclaro, Binalbagan
Brgy 6A, Victorias City
Chambery, Manapla
Canmoros, Binalbagan
Saraet, Himamaylan City
Talaban, Himamaylan City
Bocana, Ilog
Brgy. 2, Sipalay City
Brgy. 4, Sipalay City

Punta Roma/Crotons/San Pedro, Old
Sagay, Sagay City
Taloc, Bago City
Saguabanua, Valladolid
Sigay & Barikutot FLS, Catabla, Zone 3,
Talisay City
Balaring FLS, Silay City
Tomongtong, EB Magalona
Suyac Is., Taba-ao, Sagay City

CAPIZ

Pilar Fishport, Pilar
Natividad, Pilar
Culasi Port, Roxas City
Roxas City Fish Port, Roxas

Culasi, Lonoy, Sapián
Agojo, Agojo, Panay
Basiao Fishport, Basiao, Ivisan
Barra, Roxas City

Punta Cogon, Roxas City
Marita, President Roxas
Dayhagan, Pilar
Tacas, Pontevedra

B. Catch composition by fish groups.

 Fish Group	No. of Catch by (MT)	 Fish Group	No. of Catch by (MT)
 Oceanic tuna	1,460	 Large Pelagics	205
 Neritic Tuna	4,707	 Demersal Fishes	12,257
 Pelagics	4,698	 Sharks and Rays	163
 Small Pelagics	29,938	 Invertebrates	3,233

C. Gear data

Fishing Gear	No. of Boats Landed	Fishing Gear	No. of Boats Landed
 Crab trap	1,797	 Fish trap	313
 Drive-in net	867	 Multiple hook and line	248
 Bottom set gillnet	802	 Fish coral	243
 Hook and line	721	 Ringnet	207
 Trawl	415	 Purse seine	198

Top 10 Landed Aquatic Species by Volume



1 *Sardinella lemuru*
Bali sardine
“Tamban tuloy”



2 *Sardinella gibbosa*
Gold-stripe sardine
“Tabagak”



3 *Auxis rochei*
Bullet tuna
“Aloy”



4 *Selar crumenophthalmus*
Bigeye scad
“Mat-an”



5 *Decapterus macrosoma*
Japanese scad
“Tamodios”, “Galunggong”,
“Marot”



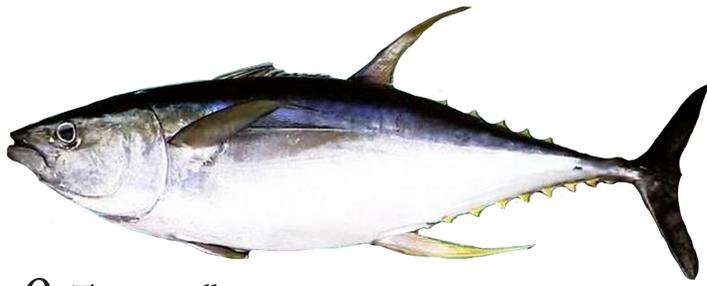
6 *Decapterus kurroides*
Redtail scad
“Batikuling”



7 *Rastrelliger kanagurta*
Indian mackerel
“Bulaw”



8 *Leiognathus splendens*
Splendid ponyfish
“Lawayan”



9 *Thunnus albacares*
Yellowfin tuna
“Panit”, “Bantalaan”



10 *Katsuwonus pelamis*
Blue swimming crab
“Kasag”

Top 3 Fishing Gears in Region 6

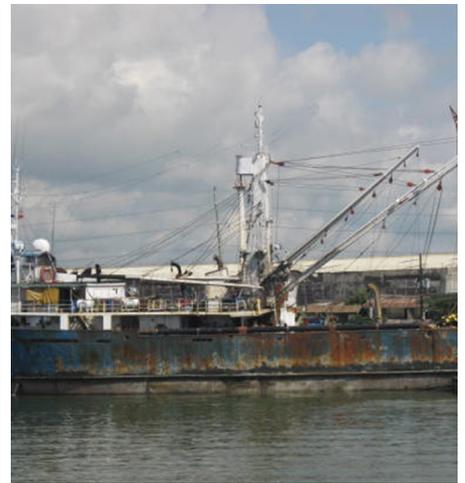
Commercial



Midwater trawl
“Palupad”



Danish seine
“Hulbot-hulbot”, “Zipper”



Purse Seine
“Purse Seine”

Municipal



Drift gillnet
“Panteng kalabaw”, “Patuloy”,
“Palugdang”



Bottomset gillnet
“Pakaroy”, “Palubog”



Danish Seine
“Hulbot-hulbot”

Enumerators

Genevieve F. Magpusao	Elmar S. Paborito	Eddielyn Jaromay	Zyrie B. Celada
Jonalyn B. Asis	Gilbert B. Belen	Melchizedek P. Batiancila	Rodel G. Nombre
May Flor P. Gallo	Marjun B. Toquiro	Vincent C. Icamina	John Carlo E. Bangoy
Roma Angela L. Quimpo	Rodelyn P. Molina	Welmer Valencia	Roxan V. Quitano
Mary Ann V. Ruiz	Julieta Batiller	Richfield T.Ortiaga Jr.	Jonathan J. Eseller Jr.
Ailed G. Villaruel	Israel F. Farrol	Regine Mae O. Lopez	Dave S. Fernandez
Sharon A. Madronial	Tj P. Manalo	Ricky E. Togalon	Ruthsan S. Magallanes
Reina Marie D. Dela Cruz	Cherry T. Solomon	Jimbo M. Calawod	Diana M. Dela Cruz
Vincent Cris Villaruel	Dhorlyn G. Dela Cruz	Rhea Christine D. Lontiong	Ryan A. Ortiga
Evelyn C. Nemis	Gerlyn M. Borreros	Eldie D. Vasquez	Zedrex B. Arinque
Nick Q. Andrade	Ramil F. Villaflor	Jeffrey D. Agapito	Girly B. Colangoy
Roberto J. Dorde	Shelalyn B. Dela Cruz	Fe A. Dela Cruz	Reagan A. Ganila
Mark J. Estrella	Lina B. Gerafil	Joven B. Bernardo	Alcris G. Anacan
Vicenta M. Cabe	Kin Teodosio	Rethzel D. Seberias	Cherry Lyn P. Elechicon
Albina A. Albarico	Vanessa C. Dela Cruz	Rocky G. Reginan	Carl Andrian Bolinas
Ivar Glene J. Navarro	Analyn U. Sebastian	Rey A. Gelardino	Richard S. Sagre
Larry B. Trinidad	Anna Rhea C. Masbano	Elizabeth B. Contillo	Kenneth G. John Solis
Nancy De Castro	Genia Flor B. Julian	Glen D. Gabasan	Junilo G. Gallego
Rolando L. Cordero Jr.	Cherry May R. Trias	Dranreb L. Garceniego	Joel S. Dela Cruz
Jexelo B. Balano	Jungie L. Aguilos	Jan Michael F. Alfaro	Lyasel John V. Siatong
Desirie P. Solivio	Jonalyn G. Dador	Jenny L. Villalobos	Alane May V. Del Carmen
Riza B. Barredo	Desiree D. Francisco	Jay P. Aguanta	Maximo D. Constantino
Armando D. Aberde, Jr.	Ronalyn O. Lopez	Rogene T. Ramirez	Kristel Jan T. Garde
Willy C. Magbanua	Elisa A. Borreros	Ruel B. Abrise	Jerry A. Lausa



NSAP REGION 7 - CENTRAL VISAYAS

Prudencio B. Belga, Jr.*, Bruna T. Abrenica and Johnson S. Paran

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Central Visayas, designated as Region VII lies at the center of the Philippines archipelago between islands of Luzon and Mindanao. Four island provinces compose the region, namely; Bohol, Cebu, Negros Oriental and Siquijor. It consists of 132 municipalities, of which 109 are coastal and 1,027 coastal barangays (CRMP-GIS 2004) and surrounded by major fishing grounds such as Bohol Sea, Camotes Sea, Cebu Strait, Danajon Bank, East Sulu Sea, Tañon Strait and Visayan Sea. These fishing grounds cover a total coastline of 1,987.60 km and total ecosystem area of 336,104.6 km² inside and outside of Central Visayas. Conservation and management of the region's fisheries resources is a continuous effort of the local government units, NGAs, NGOs, academe and stakeholders.

The National Stock Assessment Program (NSAP) was conceived and institutionalized in the Department of Agriculture on January 1997 by virtue of the DA Special Order No. 456, series of 1997 and was incorporated in the General Appropriations of DA through BFAR. Since then up to the present, NSAP is continuously collecting information on the country's fishery resources in the selected fish landing centers all over the Philippines. Scientific information consisting time series data on capture fisheries, population parameters, catch and effort among others will serve as basis for proper utilization, conservation, protection, development and management of the country's fisheries and aquatic resources.



© NSAP BFAR Region 7

In order to gather more comprehensive fisheries data, an expansion of the NSAP was proposed by the National Fisheries Research and Development Institute (NFRDI) in 2014 and was also approved for implementation in the same year. In Region VII, the expansion was started in April 2014. The number of monitoring sites is increased from 7 to 46 landing centers (or 557% increase) and from 13 enumerators to 55 (323%). Similarly, the fishing grounds monitored have been expanded from the original two fishing grounds (Visayan Sea & Camotes Sea) to six fishing grounds to include Bohol Sea, Cebu Strait, Sulu Sea and Tañon Strait.

Top Dominant Species

Primary catch data collected from May 16, 2014 to December 31, 2014 in 46 selected landing centers in six major fishing grounds of Central Visayas recorded a total of 553 species of finfishes, four elasmobranch, eight mollusk and four crustaceans.

The top ten dominant fish species based on landed volume are mainly pelagic in nature topped by *Sardinella lemuru* or *Bali Sardinella* locally called tamban tuloy with 2,670.7 MT comprising around 19% of the overall catch. It is followed by *Rastrelliger kanagurta* or anduhaw (2,251.6 MT or 15.8%), *Decapterus tabl* or budboron with 2,055.8 MT or 14.4%, *Atule mate* with

1,168.5 MT or 8.2%, *Rastrelliger brachysoma* (1,110.05 MT or 7.8%), *Decapterus macrosoma* or burot 1,097.5 MT or 7.7%, *Selar crumenophthalmus* or tamarong 998.02 MT or 7%, *Mene maculata* or bilong-bilong 487.6 MT or 3.4%, *Decapterus kurroides* or pulag-ikog 478.6 MT or 3.3% and *Decapterus maruadsi* or burot 369.5 MT or 2.6%.

The top two species are protected under FAO 167-3, the law prohibiting the catching of sardines, herrings and mackerels in the Visayan by commercial fishing from November 15 – February 15 annually starting 2012.

Previous result of NSAP monitoring in Visayan Sea and Camotes Sea also reveals that small pelagics species dominate the catch of Central Visayas.

Fishing Gear and Boat

Result of gear inventory in selected NSAP monitoring sites conducted in 2014 reveals Hook and Line group as the most prevalent gear with a total of 2,984 units classified into Single Handline (1,544 unit), Multiple Hook & Line (1,207), Spear Gun (342), Squid Jigger (171), Bottom Set Long Line (47) and Troll Line (15). Gill nets ranked second with 2,159 units followed by, Traps (381) and Ring Net (209). Fishing gears not commonly used were Lift Net (72), Scoop Net (61), Seine Net (15) and Baby Trawl with only one unit.

Boat inventory recorded a total of 6,892 boats from 24 coastal municipalities in the six fishing grounds (Bohol Sea, Camotes Sea, Cebu Strait, Sulu Sea, Tañon Strait and Visayan Sea) of Central Visayas. Of the boats non-motorized type comprised the majority with 4,335 units (63%) against the motorized with 2,557 (37%).

Among the fishing grounds, highest count was noted in Cebu Strait (1,664), followed by Tañon Strait (1,476), Camotes Sea (1,450) and Bohol Sea with 1,162 units. Visayan Sea and Sulu Sea registered the least figure with only 805 and 335 units, respectively.

Landing Centers, Catch Composition, and Gear Data

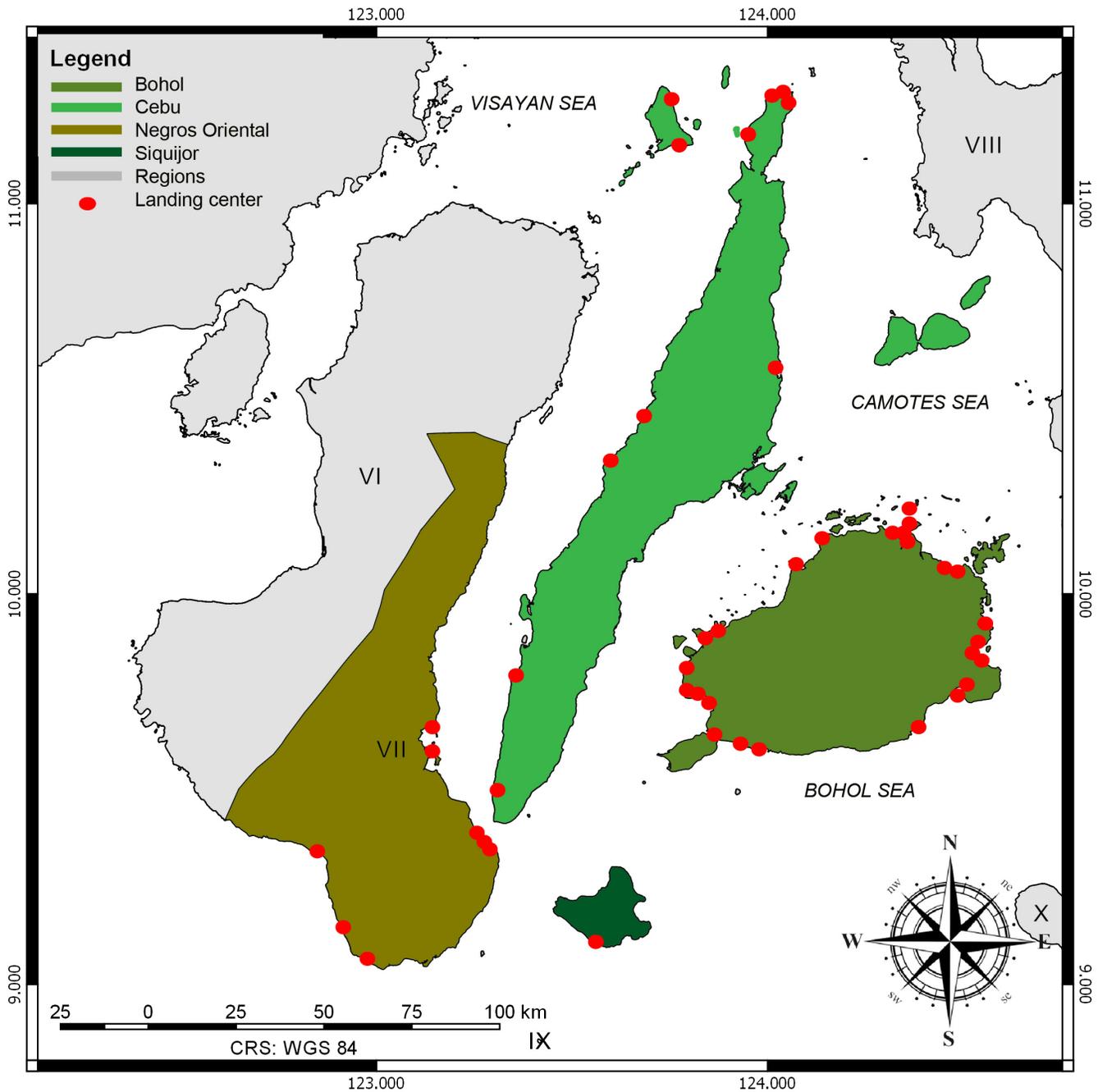


Figure 22 : GIS map of Region 7

A. Region 7 - Central Visayas Landing Centers.

NEGROS ORIENTAL

Okiot, Bais Bay
 Dungan, Manjuyod
 Villareal, Bayawan City
 Maloh, Siaton

Bonawon, Siaton
 Bantayan, Dumaguete City
 Calindagan, Dumaguete City
 Poblacion, Sibulan

SIQUIJOR

Catulayan, San Juan

BOHOL

Poblacion, Maribojoc
 Punta Cruz, Maribojoc
 Manga, Tagbilaran City
 Corte Baud, Jetafe
 Tugas, Jetafe
 Pandan, Tubigon
 Panaytayon, Tubigon
 Mantatao, Calape
 Napo, Loon

Lintuan, Loon
 Poblacion 1, Tagbilaran City
 Poblacion Ubos, Loay
 Alegria Sur, Loay
 Can-opao, Jagna
 Puerto San Pedro, Bien Unido,
 Canhaway, Guindulman
 Tabajan, Guindulman
 Cogtong, Candijay

Panas, Candijay
 Cawayanan, Mabini
 Tanghaligue, Talibon
 Cataban, Talibon
 Pinamgo, Bien Unido
 Baybayon, Mabini
 Poblacion, Bien Unido
 San Isidro, Ubay
 Tapon, Ubay

CEBU

Fishport, Danao City
 Poblacion, Danao City
 Looc, Danao City
 Tapilon, Daanbantayan
 Maya, Daanbantayan
 Punta, San Remegio,
 Mahawak, Medellin
 Kaongkod, Madridejos

Poblacion, Daanbantayan
 Hagnaya, San Remegio
 Pang-pang, Tapilon, Daanbantayan
 Kawit, Medellin
 Malokbalok, Agujo, Daanbantayan
 Lower Danawan, Agujo, Daanbantayan
 Sampero, Tapilon, Daanbantayan

Marikaban, Sta. Fe
 Matab-ang, Toledo City
 Sta. Felomina, Alegria
 Sto. Niño, Alegria
 Suba, Samboan
 Poblacion, Samboan

B. Catch composition by fish groups.

 Fish Group	No. of Catch by (MT)	 Fish Group	No. of Catch by (MT)
 Oceanic tuna	540	 Large Pelagics	85
 Neritic Tuna	2,370	 Demersal Fishes	4,219
 Pelagics	2,975	 Sharks and Rays	0.163
 Small Pelagics	20,158	 Invertebrates	163

C. Gear data

 Fishing Gear	No. of Boats Landed	 Fishing Gear	No. of Boats Landed
 Gill net	5,414	 Ringnet	1,517
 Multiple hook and line	4,855	 Fish coral	1,216
 Bottom set gillnet	3,381	 Jigger	1,170
 Hook and line	1,801	 Encircling gillnet	683
 Crab trap	1,688	 Spear gun	437

Top 10 Landed Aquatic Species by Volume



1 *Sardinella lemuru*
Bali sardinella
“Tamban”, “Tuloy”



2 *Rastrelliger kanagurta*
Indian mackerel
“Anduhaw”, “Buraw”



3 *Decapterus tabl*
Roughear scad
“Bodboron”, “Ering-ering”,
“Budloy”



4 *Atule mate*
Yellowtail scad
“Gutob”, “Marapati”, “Shokitok”



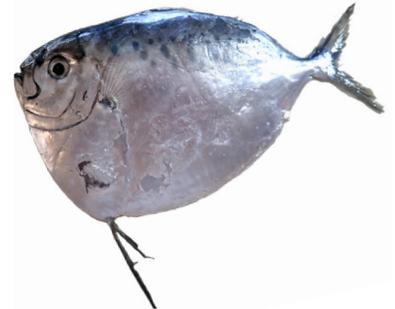
5 *Rastrelliger brachysoma*
Indo-Pacific mackerel
“Kapisnon”



6 *Decapterus macrosoma*
Shortfin scad
“Bodboron”, “Burot”, “Lingin”



7 *Selar crumenophthalmus*
Bigeye scad
“Tamarong”



8 *Mene maculata*
Moonfish
“Belong-belong”



9 *Decapterus kurroides*
Redtail scad
“Pula-ikog”, “Budloy”



10 *Decapterus maruadsi*
Round scad
“Bodboron”, “Kibol”

Top 3 Fishing Gears in Region 7

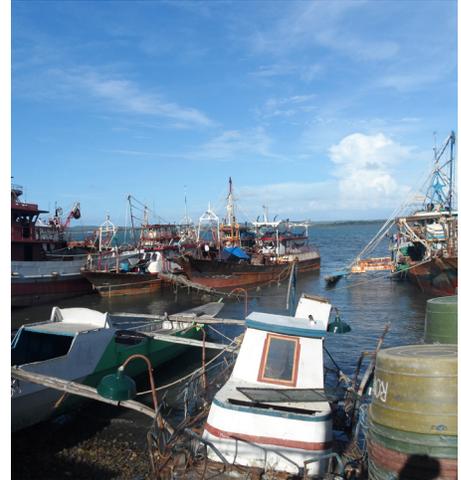
Commercial



Purse Seine
“Sensoro”



Ring Net
“Kubkob”



Danish Seine
“Hulbot-hulbot”

Municipal



Fish Pot
“Bubo”



Gill net
“Pukot”



Single Handline
“Pasol”

Enumerators

Ramel M. Raaging
Lotis O. Abare
Severo B. Montebon, Jr.
Geraldine P. Pugoy
Erme G. Piquero
Vivian E. Hinautan
Jeffrey I. Infiesto
Ernesto L. Caño
Julieta E. Labrador
Victor R. Soria, Jr.
Joseph B. Clapano
Victor E. Galagar
Merlina C. Inojales

Benjamin G. Aparici, Jr.
Loida Blanca M. Evaristo
Ronald E. Gultia
Mary Rose C. Coyoca
Jusell D. Gastador
Elmer R. Camay
Vilome R. Condes
Riza C. Rosaceña
Joseph O. Aurestila
Edna E. Olavides
Mercedes C. Jaminal
Rufina B. Escobido
Elnie A. Dublin

Eliseo H. Lagahit
Rogelio B. Into
Juliana O. Neri
Joel V. Oplenario
Nickeissa G. Dote
Ritzel L. Cano
Huberto Origenes
Gina G. Rulona
Dominica C. Torreón
Hilda H. Lingotan
Amar O. Piloton
Crisanto M. Morano
Remberto C. Rodrigo

Junjie D. Cutab
Eric P. Dublin
Ednie Ric C. Coyoca
Lourdes N. Roxas
Sergio L. Centino
Arlene Lanzaderas
Ruby Theresa Dela Cerna
Albert G. Casas
Maylin A. Mendoza
Jimboy E. Nituda
Irenea C. Inojales
Ellanare G. Dote
Ma. Marilou C. Gaballo

John Rev V. Cabatay
Grecilla S. Ramo
Jhona A. Melana
Armando C. Sucano
Enrique Brina
Jeceriza R. Yangan
Sandro R. Yase
Marissa M. Victoria
Ma. Jessa P. Gulfan
Juliet L. Granada
Silvano V. Rosell



NSAP REGION 8 - EASTERN VISAYAS

Nancy A. Dayap*, Lea A. Tumabiene, Miriam C. Francisco - Amigo and Matt T. Alcantara

*nancydayap@yahoo.com

Leyte Gulf is among the major fishing grounds in the Philippines covering the waters between the islands of Samar and Leyte. With a shelf area of 13, 147 km², the gulf is bounded on the north by the island of Samar, to the south by Surigao Strait. Its importance as a major fishing ground was the reason why it was chosen as the study area in Eastern Visayas under the National Stock Assessment Program (NSAP).

The annual fish catch from 2001-2011 showed a declining trend. The lowest was in 2008 (12, 483.52 MT); the highest was 26, 367.32 MT in 2003. The municipal fisheries had a high catch contribution except in 2001, where commercial catch was higher by 30%.

There are 38 different types of fishing gears identified operating in Leyte Gulf. Danish seine (commercial, DSC) had the highest yield in the commercial fisheries sector; Gillnet (GN) in the municipal fisheries sector. The highest catch of DSC was observed in 2004 (4,243.30 MT) and the lowest in 2010 (1,203.05 MT). The highest CPUE for DSC was in 2004

(288.66) also and the lowest was in 2010 (167.09). For GN, the highest catch and CPUE was in 2004 (3, 010.72 MT) and 2003 (8.27) respectively; while the lowest in catch and CPUE was in 2001 (339.37 MT, 4.05).

The top ten (10) dominant species caught belong to the families: *Leiognathidae*, *Carangidae*, *Nemipteridae*, *Scombridae*, *Gerreidae*, *Engraulidae*, *Mullidae*, *Synodontidae*, *Clupeidae*, and *Portunidae*. The selected five (5) major stocks: *Rastrelliger kanagurta*, *Leiognathus bindus*, *Gazza minuta*, *Selar crumenophthalmus*, and *Nemipterus hexodon* were mostly abundant in the second half of the year.

The percentage of catch at which they were caught before their length at maturity were as follows: 60% - *R. kanagurta*, 85% - *L. bindus*, 13% - *G. minuta*, 45% - *S. crumenophthalmus*, 51% - *N. hexodon*. Fish catch from Leyte Gulf formed a plateau in 2004-2007 at 20,000 MT then a fluctuating trend from 2009 until 2011.

Landing Centers, Catch Composition, and Gear Data

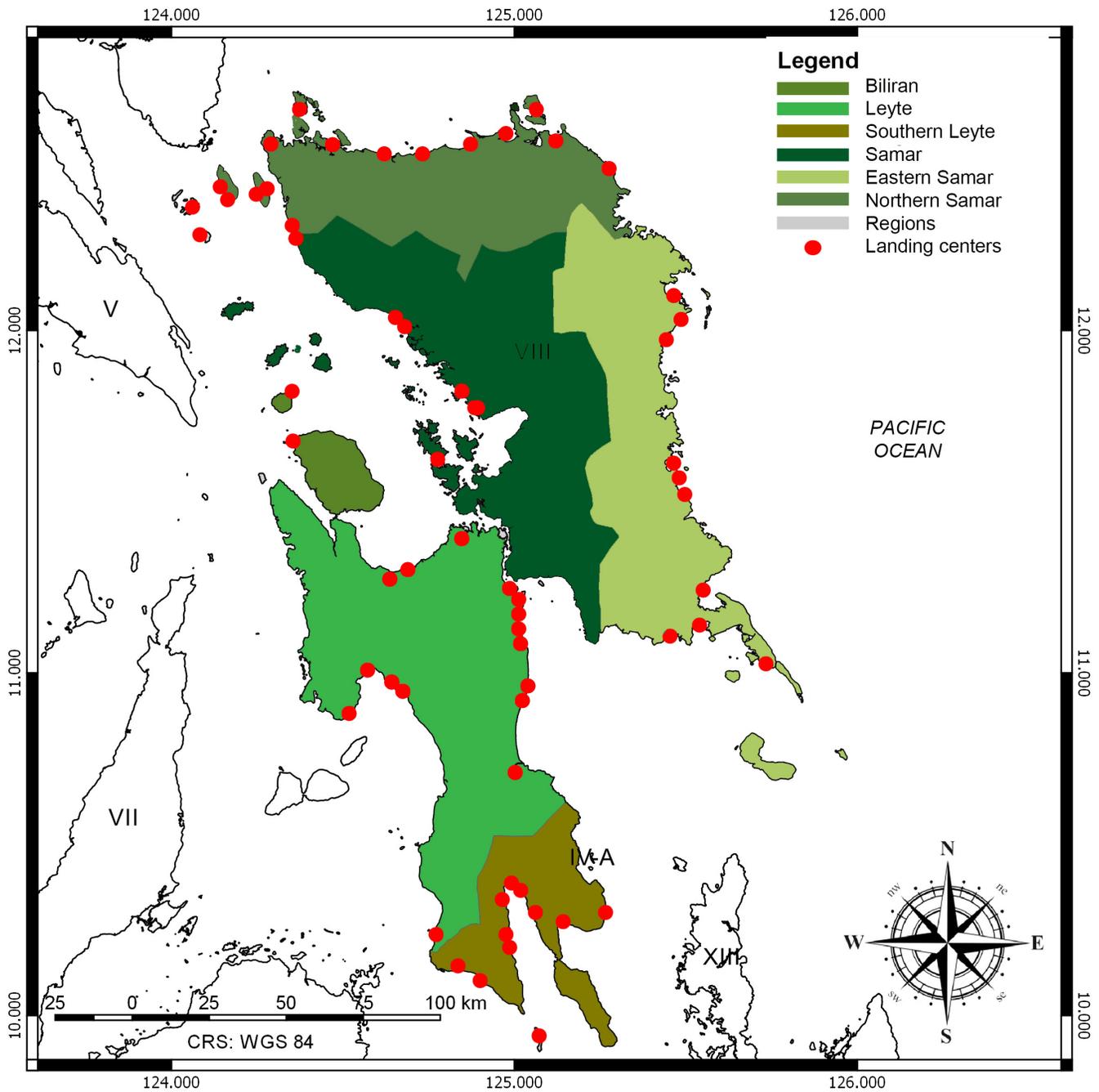


Figure 23 : GIS map of Region 8

A. Region 8 - Eastern Visayas Landing Centers.

BILIRAN

Brgy. Looc, Culaba
 Brgy. Virginia, Culaba
 Brgy. Uson, Caibiran
 Brgy. Bariis, Caibiran

Brgy. Langgao, Cabucgayan
 Brgy. Baso, Cabucgayan
 Poblacion, Naval
 Brgy. Catmon, Naval

Brgy. Balite, Kawayan
 Brgy. Masagaosao, Kawayan

SAMAR

Brgy. Poblacion 2, Daram
Brgy. Poblacion 3, Daram

Brgy. Burabod, Sta. Margarita
Pier 1 Catbalogan City

Brgy. Iguid, Catbalogan City
Brgy. Carayman, Calbayog City

NORTHERN SAMAR

Brgy. Dalupirit, San Antonio
Brgy. San Nicolas, San Antonio
Brgy. Sawang, Capul
Brgy. Oson, Capul
Brgy. Rawis, Laoang
Brgy. Cahayagan, Laoang
Allen Fish Port
Brgy. Layuhan, San Jose

Brgy. Tarnate, San Vicente
Brgy. Mongolbongol, San Vicente
Brgy. Cawayan, Catarman
Brgy. Baybay, Catarman
Brgy. Libas, Lavezares
Brgy. Villa, Lavezares
Brgy. Veriato, San Isidro
Brgy. Alegria, San Isidro

Brgy. Makiwalo, Mondragon
Brgy. Laoangan, San Roque
Brgy. Del Norte, Mapanas
Brgy. Manaybanay, Mapanas
Brgy. Talolora, Palapag
Brgy. Mapno, Palapag
Sitio Salvacion, Biri
Brgy. San Pedro, Biri

LEYTE

Brgy. Sto Niño, Matalom, Leyte
Brgy. Dolho, Bato, Leyte
Brgy. Balugo, Albuera
Brgy. Damulaan, Albuera
Brgy. Cogon Palo
Brgy. Bislig, Tanauan
Brgy. San Roque, Tanauan
Brgy. Rizal, Dulag

Brgy. San Miguel, Dulag
Brgy. Doña Brigida, Tolosa
Brgy. Telegrapoy, Tolosa
Brgy. Sto. Niño, Abuyog
Brgy. San Roque, Mayorga
Brgy. Baybay, Carigara
Brgy. Culasian, Capoocan

Brgy. District 4, Babatngon
Brgy. Monbon, Babatngon
Poblacion Albuera
Brgy. Cambalading, Albuera
Brgy. Naungan, Ormoc City
Brgy. San Jose, Tacloban City
Brgy. Macario, Merida Leyte

SOUTHERN LEYTE

Brgy. Himatagon, St. Bernard
Brgy. Lipanto, St. Bernard
Brgy. Amagusan, Anahawan
Brgy. Mahalo, Anahawan
Brgy. Triana, Limasawa
Brgy. Magallanes, Limasawa

Poblacion Bontoc
Brgy. Maac, Sogod
Brgy. Ichon, Macrohon
Assumption, Macrohon
Brgy. Assuncion, Maasin City
Brgy. Juangon, Malitbog

Brgy. San Vicente, Malitbog
Brgy. Nahulid, Libagon
Brgy. Tigbao, Libagon

EASTERN SAMAR

Brgy. Riverside, Oras
Brgy. Tawagan, Oras
Brgy. Japitan, Dolores
Brgy. 12, Dolores
Brgy. 5, Maydolong

Brgy. 7, Maydolong
Brgy. 2, Gen. MacArthur
Brgy. 7, Gen. MacArthur
Brgy. Palanas Salcedo
Brgy. 01 Giporlos

Brgy. 06 Balangiga
Brgy. Sto. Niño, Quinapondan
Brgy. Buenavista, Quinapondan
Brgy. 3 San Julian
Brgy. Sabang South, Borongan
Guiuan Public Market

B. Catch composition by fish groups

 Fish Group	No. of Catch by (MT)	 Fish Group	No. of Catch by (MT)
 Oceanic tuna	36	 Large Pelagics	4
 Neritic Tuna	70	 Demersal Fishes	10,384
 Pelagics	1,081	 Sharks and Rays	62
 Small Pelagics	3,660	 Invertebrates	498

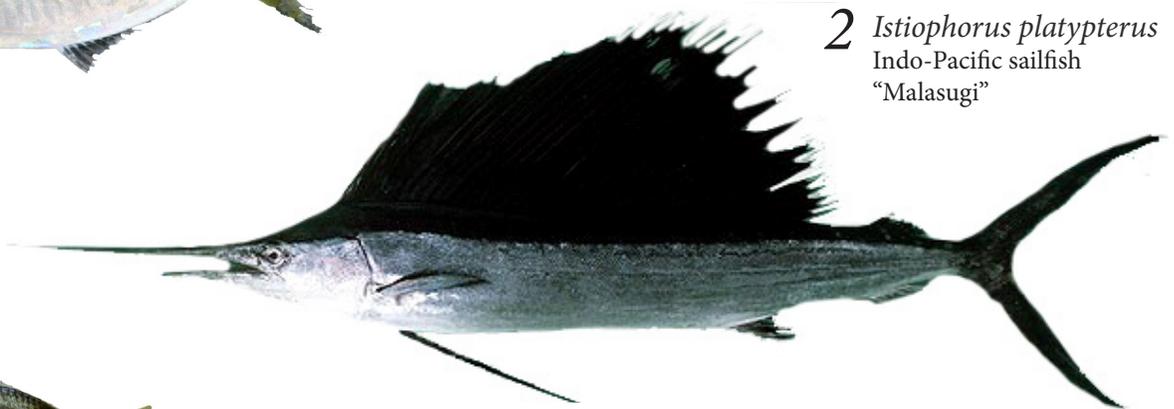
C. Gear data

Fishing Gear	No. of Boats Landed	Fishing Gear	No. of Boats Landed
 Gill net	9,582	 Ringnet	920
 Hook and line	3,412	 Fish trap	845
 Multiple hook and line	2,084	 Spear gun	580
 Danish seine	2,003	 Troll line	444
 Crab trap	1,033	 Fish coral	342

Top 10 Landed Aquatic Species by Volume



1 *Selaroides leptolepis*
Yellowstripe scad
“Lambiyaw”



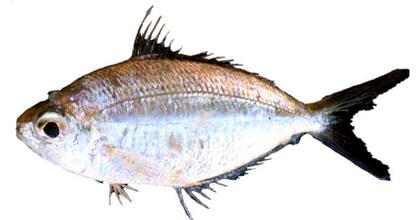
2 *Istiophorus platypterus*
Indo-Pacific sailfish
“Malasugi”



3 *Leiognathus bindus*
Orangefin ponyfish
“Parutpot”, “Sap - sap”



4 *Nemipterus hexodon*
Ornate threadfin bream
“Sagisi-on”



5 *Pentaprion longimanus*
Longfin mojarra
“Hubo”, “Lubas”



6 *Decapterus maruadsi*
Japanese scad
“Malimno”, “Galunggong”



7 *Ablennes hians*
Flat needlefish
“Balo”



9 *Thunnus albacares*
Yellowfin tuna
“Baliling”, “Panit”



8 *Stolephorus commersonii*
Commerson's anchovy
“Bulinaw”



10 *Upeneus quadrilineatus*
Four-stripe goatfish
“Tiaw”

Top 3 Fishing Gears in Region 8

Commercial



Danish Seine
“Hulbot-hulbot”



Commercial trawl
“Trawl”



Ring net
“Kubkoban”, “Likosan”

Municipal



Gill net
“Pukot”, “Pamanti”



Hook and line
“Kawil”



Multiple Hook and Line
“Undak”

Enumerators

Edgardo M. De Veyra
Joji Espina
Rodolfo T. Cumpio
Mary Angelie G. Sanchez
Rogelio P. Clemente
Robert C. Vacal
Fritzie M. Gonzales
Rene T. Hanopol
Ronnell U. Pardilla
Ma. Teresa L. Macawile
Jesila C. Baguinon

Denis D. Sarsosa
Grace Pevida
Francis O. Maputol
Marilou D. Bolina
Ronald T. Amaranto
Noel E. Genio
Hector O. Ibañez
Dennis P. De Guia
Angelita G. Masdo
Ma. Ivy E. Siervo
Rexone De Pablo

Rolando Z. Sabulao Jr.
Joey O. Cabia-an
Gretzen A. De San Miguel
Donna Vi N. Eway
Dewey G. Nicosia Jr.
Ma. Crisanta B. Barsobia
Alfie D. Ocenar
Merly L. Rendora
Mary Jane G. Grulla
Jenny B. Avestruz
Lexter C. Alba

Sonny I. Jazmin
Anthony B. Bardaje
Jinky Daganio
Aida B. Cabueños
Libert A. Eway
Vincent Araza
Cherry Ann P. Pajaroja
Jackie L. Lim
Rhona R. Cernio
Mark Anthony P. Marilla



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NSAP REGION 9 - ZAMBOANGA PENINSULA

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Marine fisheries in Zamboanga Peninsula is dominated by small pelagics. The major fishing grounds of East Sulu Sea, Moro Gulf, and Basilan Strait are principally sardines fishing areas. In fact, nine of the top ten species of the region are small pelagics with *Sardinella lemuru* making up over sixty percent (60%) of the total volume (NSAP 2013).

The dominance of *Sardinella lemuru*, or “Tamban” in the vernacular is often attributed to the seasonal upwelling in the northern part of Zamboanga and is driven by the NorthEast Monsoon (Villanoy et.al 2011). This upwelling supports abundant plankton growth which is the main food of sardines. Near the center of this upwelling is Sindangan Bay and for which reason, sardines eggs and larvae, including juveniles are most dominant in the area (Ramiscal et.al 2012). This lends Sindangan town as the major source of “lopoy” or dried sardine juveniles.

As a consequence, commercial, as well as municipal fishing activities are dominated by fishing gears designed to catch sardines.

In terms of gross tonnage of commercial fishing vessels, Zamboanga City takes the lion’s share of 98.1%, and purse constitutes 31% of fishing gears employed followed by Danish seine with 22%, Bag net with 14%, Long line with 11%, hook and line with 10%, and Ring net with 8%.

All of the large commercial fishing vessels, 97% of all medium scale commercial fishing vessels, and 76% of all small commercial fishing vessels are based in Zamboanga City. The large commercial fishing vessels are mostly purse seines that target exclusively sardines. The medium scale vessels are composed mostly of Danish seines, bag nets, and some purse seines catching mostly small pelagic like sardines, round scads, mackerels, and neritic tuna.

In terms of catch, the commercial fishing sector catches mostly sardines which make up over 60% of total catch. Other small pelagics dominate the top ten species except for *Thunnus albacares* at third most dominant.

Landing Centers, Catch Composition, and Gear Data

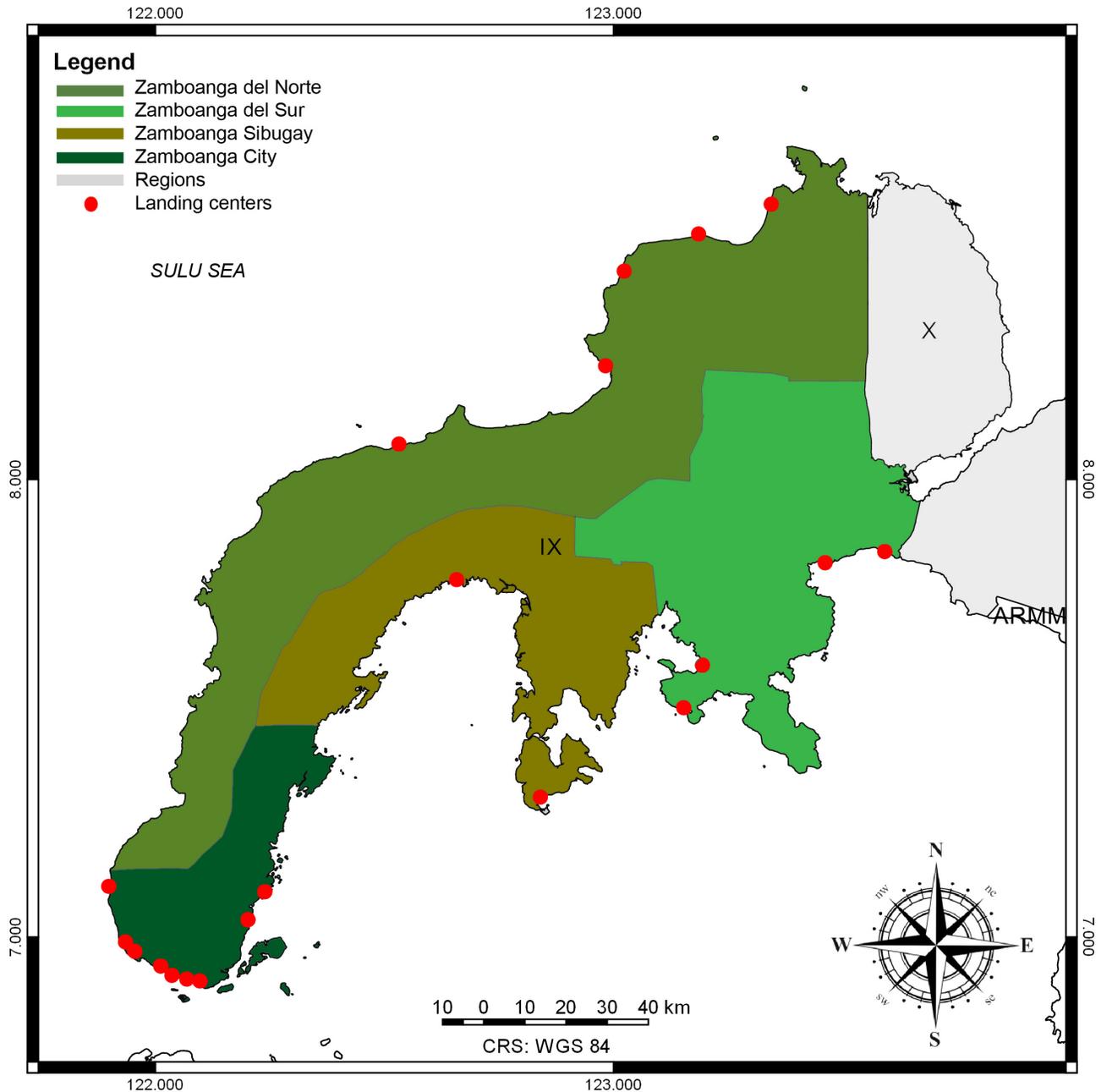


Figure 24 : GIS map of Region 9

A. Region 9 - Zamboanga Peninsula Landing Centers.

ZAMBOANGA CITY

HadjihTahah (Station 1)	Ben-Go Wharf 2	Labuan (Bato Rampoon)
Hadjih Tahah (Station 2)	Ben-Go Wharf 1	Labuan (Lawingan)
PMI Wharf (Station 1)	AMR Wharf	Sangali, Daap
PMI Wharf (Station 2)	AMR Varadero	Sangali, PFDA
Tress Marias	Mega Fishing Corporation	Pamingitan, Sangali
Wee-Ben	UCI Wharf	Bolong
Nancy Fishing Corporation	UCI Canning Wharf	
YL Fishing Corporation	Jordan Wharf	

ZAMBOANGA DEL NORTE

Sindangan Gampis, Sindangan
Sindangan Proper, Sindangan
Dipolog PFDA, Dipolog City
Sicayab, Dipolog City

Katipunan
Roxas
Labason, Antonio
Labason, Gil Sanchez

Jose Dalman, Tabon
JosaDalman, Poblacion

ZAMBOANGA DEL SUR

Margosatubig Wharf
Pagadian City Fishport
Tukuran
Vincenzo Sagun

ZAMBOANGA SIBUGAY

Naga Port, Naga
Barangay Solar, Olutanga Port

BASILAN

Isabela City

B. Catch composition by fish groups.

 Fish Group	No. of Catch by (MT)	 Fish Group	No. of Catch by (MT)
 Oceanic tuna	8,544	 Large Pelagics	2,247
 Neritic Tuna	6,063	 Demersal Fishes	892
 Pelagics	1,316	 Sharks and Rays	0
 Small Pelagics	184,800	 Invertebrates	242

C. Gear data

 Fishing Gear	No. of Boats Landed	 Fishing Gear	No. of Boats Landed
 Gill net	1,820	 Bagnet	632
 Multiple hook and line	1,681	 Hand pick	173
 Purse seine	1,333	 Encircling gillnet	148
 Hook and line	985	 Danish seine	104
 Ringnet	651	 Blast fishing	98

Top 10 Landed Aquatic Species by Volume



Sardinella lemuru 1
Bali sardinella
“Tamban”, “Tuloy”



Selar crumenophthalmus 2
Bigeye Scad
“Tulay”, “Matambaka”



Auxis rochei 3
Bullet tuna
“Pirit”, “Mangku”



Rastrelliger kanagurta 4
Indian mackerel
“Kabalyas”, “Anduhaw”, “Alumahan”



Katsuwonus pelamis 5
Skipjack Tuna
“Subad”, “Budlisan”, “Sambagon”



Decapterus macrosoma 6
Shortfin scad
“Galunggong”, “Tamarong”



Thunnus albacares 7
Yellowfin tuna
“Panit”, “Barilis”



Auxis thazard 8
Frigate Tuna
“Pirit”, “Pidlayan”



Mene maculata 9
Moon fish
“Bilong-bilong”



Decapterus tabl 10
Roughear scad
“Tamarong”, “Pula-ikog”

Top 3 Fishing Gears in Region 9

Commercial



Bagnet
“Basnig”, “Saklit”



Ring net
“Kubkob”, “Pangulong”,
“Kalansisi”



Purse Seine
“Pangulong”

Municipal



Hook and Line
“Bira-bira”



Gill net
“Pante”



Multiple Hook and Line
“Og-og”, “Kawil”, “Ondak”,
“Bira-bira”

Enumerators

Narissa Maldan
Janna Taup
Realyn Luna
Amina Napii
Patricia Alihuddin
Edgie Lyn Tayong
Hamija Baginda
Marites Francisco
Abdilla Taup
Rito Recamora

Hilda Astarani
Erwin Toribio
Sayadi Akmadul
Gerald Glen Vicente
Robin De Leon
Abdurajak Amsang
Sani Hailil
Salie Albani
Ahmad Didat Abtalin
Arlo Pamaran

Nurciya Hanani
Juvel Mar Palma
Rashida Jatil
Alhanafi Said
Ahmad Rajam
Alfredzkhan Lakibul
Rubie Galleposo
Leslie Jay Sayson
Tessie Pinote

Leah Niña Penales
Dino Tuyac
Melvin Auditor
Eric Atad
Markin Godines
Jum Oclarit
Antonio Oclarit
Jumarkhan Bara
Imee B. Pundol-Pamaran

Gina Tuballa
Zain Kimpa
Suleri Lumandong
Pinkney Lontayao
Wilson Loyloy
Caren Kate Ong
Leomy Bernardo
Jocelyn Tercio
Alain Daymiel



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NSAP REGION 10 - NORTHERN MINDANAO

Vianney Anthony A. Gapuz*, Majen M. Casinillo and Rejomar Galleros

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The bulk of commercial fishery in Northern Mindanao is from Bohol Sea. Bohol Sea is connected to the major bays in the region and also it surrounds Camiguin province. It is in these major bays that municipal fisheries production is coming from. Generally, these bays are actually municipal waters. The municipal waters within these bays are actually overlapping and yet unifying in the utilization of the fishery resources and in the management of fisheries within these bays.

Gingoog Bay is located in the eastern part of the region and is adjacent to Butuan Bay. The bay is bounded by the municipalities of Balingoan, Talisayan, Medina, Gingoog and Magsaysay. Municipal catch landings in this bay are dominated by *Sardinella lemuru*, *Encrasicholina punctifer* and *Katsuwonus pelamis*. A significant catch landings of reef fishes can be found in the municipality of Talisayan.

Macajalar Bay is in the middle of the two bays – Gingoog and Iligan bay. It is bounded by the municipalities of Laguindingan, Alubijid, El Salvador, Opol, Cagayan de Oro City, Tagoloan, Villanueva, Jasaan, Salay, Kinoguitan and Binuangan. *Sardinella lemuru*, *Decapterus kurroides* and *Auxis rochei* comprise the major bulk of the municipal catch landings in this bay.

Iligan Bay, which is in the western part of Northern Mindanao, is the biggest bay in the region. It is bounded by the three provinces of Misamis Occidental,

Lanao del Norte and Misamis Oriental. Commercial and municipal catch landings in this area is dominated by *Sardinella lemuru*, *Selar boops*, *Auxis rochei*, *Auxis thazard*, *Decapterus macarellus*, *Decapterus russelli* and *Selar crumenophthalmus*.

Panguil Bay is a small but unique bay in the region. It is located in the inner point of Iligan Bay and bounded by the municipalities of Kolabugan, Tubod, Baroy, Lala and Kapatagan of Lanao del Norte, Aurora and Tambulig of Zamboanga del Sur; and Bonifacio, Tangub and Ozamis of Misamis Occidental. Panguil Bay is 100% municipal waters with overlapping boundaries among municipalities. *Scylla serrata*, *Portunus pelagicus*, *Metapenaeus endeavourii*, *Megalops cyprinoides*, *Sardinella lemuru* and *Leiognathus splendens* and *Stolephorus commersonii* are the major catch landings in the bay. The fisheries from Panguil Bay is the major source of livelihood for the coastal barangays in the said municipalities.

Murcielagos Bay is located in the northern part of Misamis Occidental. The bay, which opens directly to Bohol Sea, is bounded by the municipalities of Baliangao, Sapang Dalaga, Rizal and Sibutad.

Camiguin is surrounded by Bohol Sea. Catch landings from municipal and commercial is dominated by *Auxis rochei*, *Auxis thazard* and *Cheilopogon furcatus*. Significant landings of reef fishes have been registered in Camiguin.

Landing Centers, Catch Composition, and Gear Data

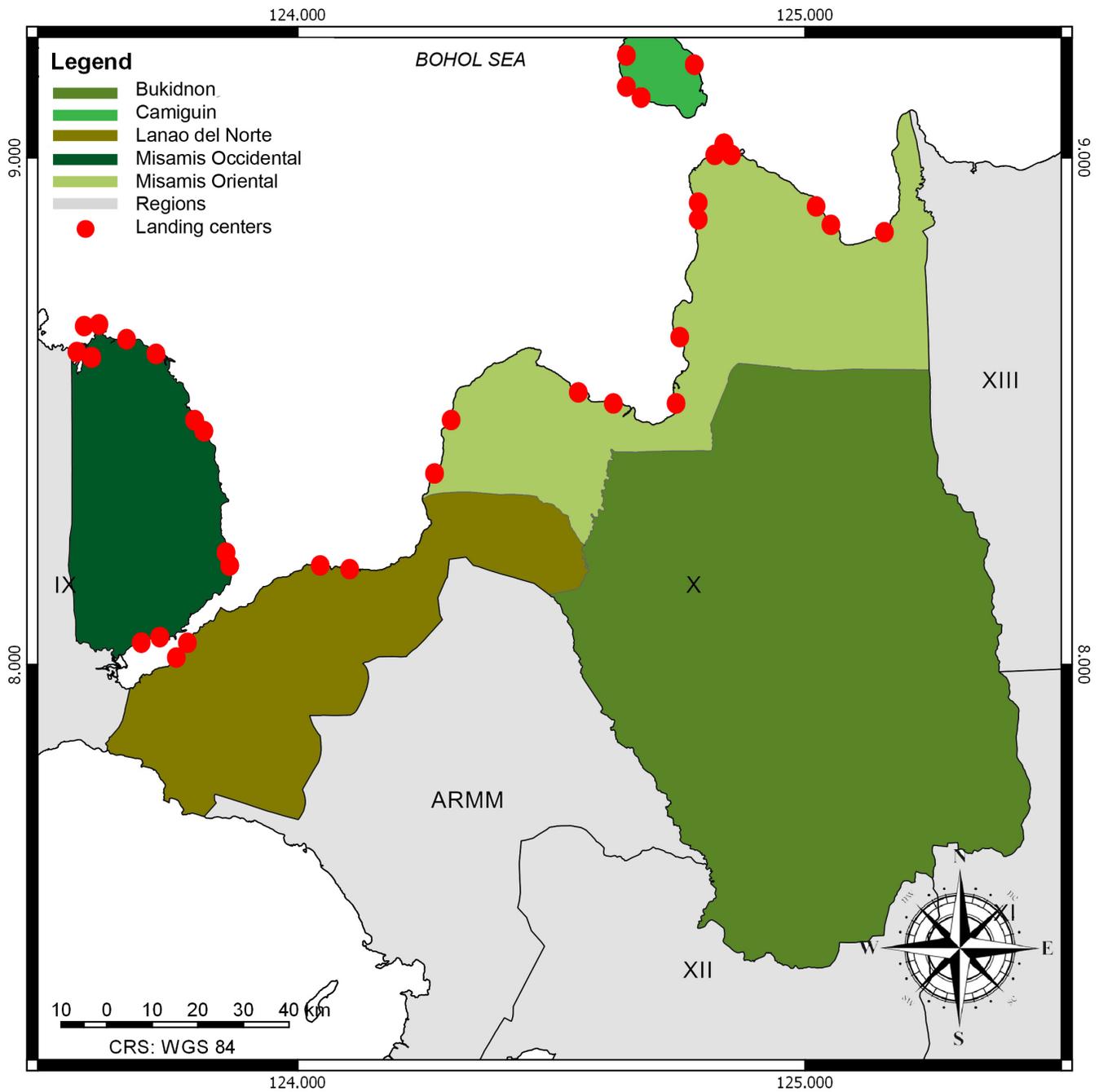


Figure 25 : GIS map of Region 10

A. Region 10 - Northern Mindanao Landing Centers.

CAMIGUIN

Yumbing, Mambajao
Mahinog, Catuhogan

Poblacion, Lawigan, Punta Puti
Looc, Catarman

LANAO DEL NORTE

Kauswagan
Bacolod

Tubod
Baroy Daku

MISAMIS OCCIDENTAL

San Antonio, Ozamis City
Poblacion Clarin, Ozamis City
Punta Miray, Baliangao
Tugas, Baliangao

Manla, Sapang Dalaga
Caluya, Sapang Dalaga
Looc, Plaridel
Usocan, Plaridel

Taboc, Oroquieta City
Loboc-canubay, Oroquieta City
Maquilao, Tangub City
Pangabuan, Tangub City

MISAMIS ORIENTAL

Opol
El Salvador
Bauk-bauk, Balingoan
Lapinig, Balingoan
Giwayanon, Talisayan
San Jose, Talisayan

North, Medina
South Poblacion, Medina
Odiong, Gingoog City
Lunao, Gingoog City
Mosangot, Binuangan
Inobulan, Salay

Balingasag
Jasaan
Agusan, CDO
Bonbon, CDO
Poblacion, Initao
Punta Silum Manticao

B. Catch composition by fish groups.

Fish Group	No. of Catch by (MT)	Fish Group	No. of Catch by (MT)
 Oceanic tuna	964	 Large Pelagics	106
 Neritic Tuna	2,082	 Demersal Fishes	1,895
 Pelagics	652	 Sharks and Rays	7
 Small Pelagics	17,853	 Invertebrates	1,156

C. Gear data

Fishing Gear	No. of Boats Landed	Fishing Gear	No. of Boats Landed
 Gill net	8,430	 Bottom set gillnet	1,977
 Multiple hook and line	5,920	 Ringnet	1,172
 Jigger	3,213	 Bagnet	1,005
 Fish coral	2,446	 Drive-in net	587
 Hook and line	2,029	 Spear gun	377

Top 10 Landed Aquatic Species by Volume



Sardinella lemuru 1
Bali sardinella
“Tuloy”, “Tamban”, “Malansi”



Cubiceps gracilis 2
Drift fish
“Amang”, “Kabaw-kabaw”



Auxis rochei 3
Bullet Tuna
“Pirit”, “Pidlayan”, “Budboron”,
“Balintong”



Auxis thazard 4
Frigate Tuna
“Pirit”, “Pidlayan”



Selar boops 5
Oxeye Scad
“Kutob”, “Tamarong”



Katsuwonus pelamis 6
Skipjack Tuna
“Bolis”, “Budlisan”, “Sambagon”



Selar crumenophthalmus 7
Bigeye Scad
“Kutob”, “Tamarong”



Oxyporhamphus micropterus micropterus 8
Atlantic Smallwing Flying fish
“Laniw”



Sardinella gibbosa 9
Goldstripe Sardine
“Tuloy”, “Tamban”, “Malansi”,
“Tayapad”



Decapterus macarellus 10
Mackerel Scad
“Burot”

Top 3 Fishing Gears in Region 10

Commercial



Bagnet
“Tapay-tapay”



Bagnet
“Tapay-tapay”



Ringnet
“Licum”

Municipal



Fish Corral
“Bungsod”



Surface / Drift Gill net
“Panambal”



Hook and Line
“Palanre”

Enumerators

Estrellita L. Pacon
Christine Mae L. Rullon
Leonor T. Atienza
Marieta Jabol
Emely Salan
Mae Cabajes
Kanejee Nel Sasutil
Rejomar A. Galleros
Shennie Unido
Arbonie Caralos

Agnes Bugahod
Villa Flora Marcial
Clyn Roche Pansa
Arlene Caminero
Charstar Ree B. Merano
Mary Rose Bagongon
Donaldo P. Ador
Jochebed Mejorada
Hermes C. Darunday
Jane Louise Muksan

Jeany Guinaldo
Juliet Haim
Tessie Mananaong
Almarie Ompoco
Theresa Bernido
Junrie Dahilog
Cyriel Limitares
Sapphire Kates Cabale
Alvin Gusto

Noe Quiñano
Abdullah L. Macadato
Sharmin Gomonit
Gil Saren
Cajenth Cajatol
Jessie Apales
Annie Jean Aclo
Lucy K. Sombrio
Ephraim Docor



NSAP REGION 11 - DAVAO

Jose A. Villanueva*, Daisy C. Burgos, Francis Jave Canillo and Rose Antoneth Loquere

**javnsap@yahoo.com*

Davao is the Hispanicized pronunciation of *daba-daba*, the Bagobo word for “fire”. Davao Region is known as the land of promise being the melting pot of various cultures and is bestowed with fertile soil, lush forests, and rare flora and fauna.

Davao Region is located in the Southeastern portion of the island of Mindanao with a total land area of 20,357.42 km². It is bounded on the north by the provinces of Surigao del Sur, Agusan del Sur and Bukidnon. In the east it is bounded by the Philippine Sea; and in the west by the Central Mindanao provinces. Within the broader geographic context, the Davao Region area faces Micronesia in the Southern Pacific Ocean to the east, and the Eastern Indonesia through the Celebes Sea to the south.

Political Division

The region encloses the Davao Gulf and its regional trade center is Davao City, which is the

largest city in the country in terms of land area. It is composed of 5 provinces (Davao Oriental, Davao del Norte, Compostela Valley, Davao del Sur and Davao Occidental, the newly created province), 1 highly urbanized city (Davao City), 5 component cities (Panabo City, Tagum City, Digos City, Mati City and the Island Garden City of Samal), and 43 municipalities, grouped into 11 congressional districts and divided into 1,162 barangays.

Davao Gulf Fishery

Davao Gulf is situated in the southeastern portion of Mindanao with an area of 3,087 sq. km. Davao Gulf cuts into the island of Mindanao from Philippine Sea. It is surrounded by all five provinces in the Davao Region. It is a very large and deep (>1km) semi-enclosed basin and lies approximately between 6° 7' and 7° 21.5' North latitude and between 125° 22' and 126° 11.5' East longitude (MSU Naawan, 1995). The gulf water is regarded as one of the most diverse cetacean habitats in

the nation, being home for at least 10 species of toothed whales and dolphins such as Sperm Whales and Beaked Whales.

Davao Gulf is a combination of multi-species and multi-gears fishery. It involves thousands of full time fisher folks and these labor forces are directly dependent on both commercial and municipal capture fisheries as means of their livelihood and economic sources for coastal inhabitants. The shared fish stock resources among the provinces, cities and municipalities of Davao are also the major source of food protein in Region XI and nearby regions.

Inventory of Boat and Gear

According to the study conducted by Armada in 2002 there 289 units of commercial fishing vessels operating in Davao Gulf and 39% of these vessels are used directly for fishing. On the other hand, there are 13,930 municipal fishing boats and 98% of these boats are used directly for fishing.

Moreover, Davao Gulf has 412 km fringing coral reef (MSU Naawan, 1995). There are 44 coral genera, these include 39 hard and five (5) soft coral (Ingles, 2002). The seagrass of Davao Gulf showed high diversity with the appearance of 10 species. On the average, about 4-5 species comprise the sea grass beds. Somehow, appears to have an apparent association between number of seaweeds and seagrass species (Ingles, 2002).

The inventory of fishing gears using NSAP forms are consolidated based on the basic classification of gears. There were 27 types of fishing gears found in Davao Gulf. The two commercial types are the bag net and the ring net, while the remaining 25 are municipal gears. The top municipal fishing gears operating in Davao Gulf are multiple hand line, tuna hand line, jigger, hook and line, and drift gill net. Commercial fisheries dominated the landed catch in Davao Gulf from CY 2004-2013 having contributed about 88% of the catch compared to the 12% catch from the municipal fisheries sector.

NSAP in Region XI

NSAP in Davao Region was initiated in 1998 by the BFAR covering the statistical fishing ground of Davao Gulf. It started with ten field data enumerators in six landing centers namely: Malita and Sta. Cruz, Davao del Sur; Toril, Matina and Bucana, Davao City; and Sigaboy, Governor Generoso, Davao Oriental including enumerators monitoring tuna landed catch. Eventually, continuous stock assessment for 17 years, NSAP XI has expanded in other provinces in the whole Davao Region. The program expansion covered the east coast areas of Davao Oriental to assess, study and exploit other important fishing grounds in this area. Moreover, other coastal areas in Davao del Sur/Occidental and del Norte were also identified as additional NSAP landing centers abutting Davao Gulf. NSAP XI now has 49 landing centers, exploring 9 fishing grounds with a total of 47 field data enumerators.

Time series data of historical catches in Davao Gulf and the results obtained from the data gathered by BFAR-NSAP XI in CY 2004-2013 showed the declining fishery resources in the fishing ground.

Thru the initiatives of stakeholders, supported by scientific results, DA and DILG implemented a joint administrative order banning the use of commercial gears ring net and bag net from June 1 to August 31, the time when most small pelagic fishes in Davao Gulf are matured and ready to spawn based on the reproductive biology study conducted. This closed season for fishing commenced in the year 2014 and the year thereafter.



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Landing Centers, Catch Composition, and Gear Data

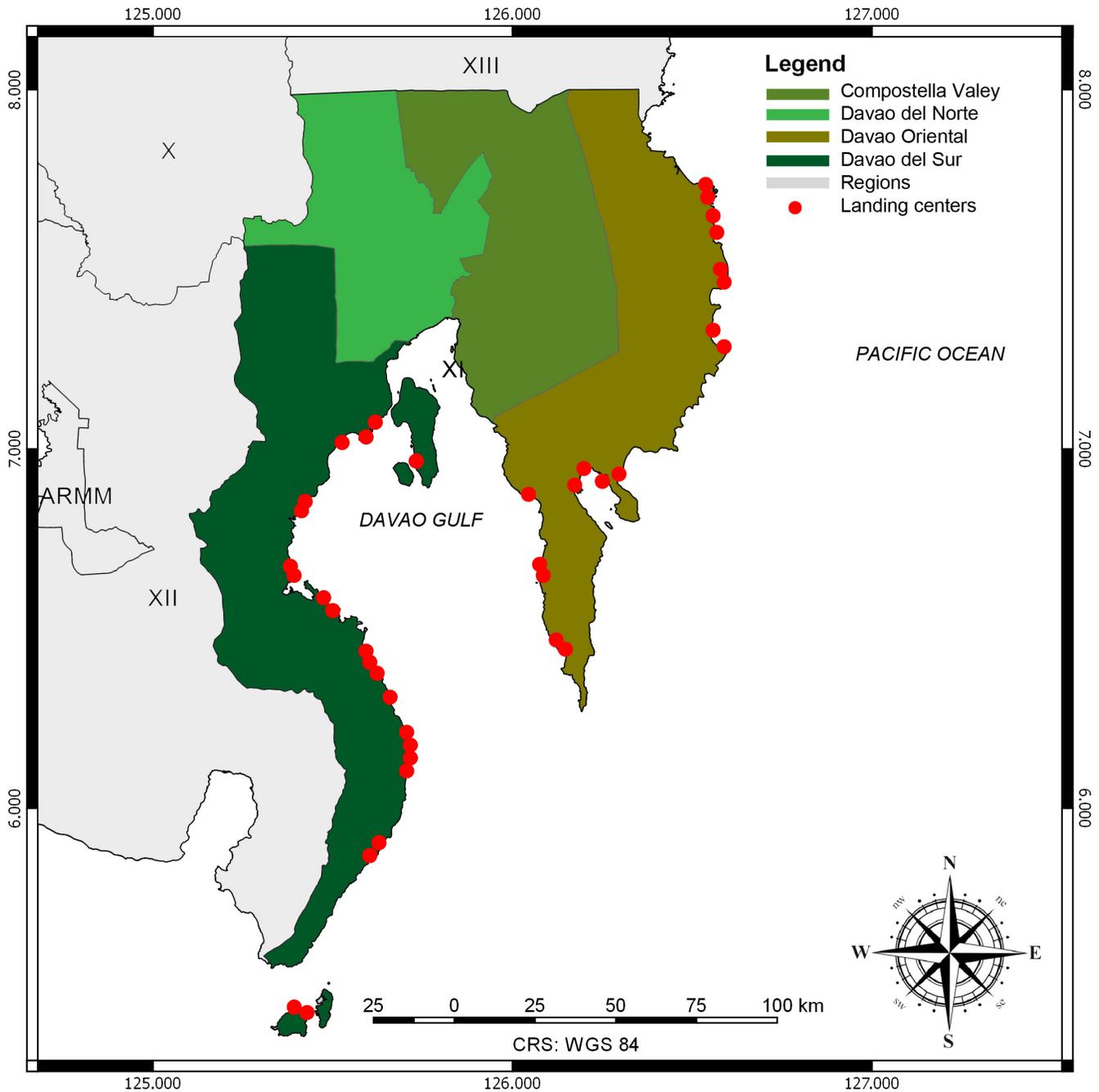


Figure 26 : GIS map of Region 11

A. Region 11 - Davao Landing Centers

DAVAO OCCIDENTAL

Maveas, Brgy. Mabila, Sarangani
 Sitio Kaimba, Brgy. Mabila, Sarangani
 Caburan Big, Jose Abad Santos
 Caburan Small, Jose Abad Santos
 Brgy. Lawa, Don Marcelino

Brgy. Kinanga, Don Mar
 Highway, Talagutong, Don Marcelino
 Sitio Migdolog, Talagutong, Don Marcelino
 Talucanga, Brgy. Mana, Malita
 Sabang, Brgy. Polacion, Malita

Sitio Pamana, Brgy. Fishing
 Village, Malita
 Brgy. Fishing Village, Malita
 Cabalanti-an, Brgy. Sto. Niño,
 Sta. Maria
 Colongan, Brgy. San Agustin

DAVAO ORIENTAL

Cebolida, Brgy Poblacion, Lupon
 Aroma, Brgy. Poblacion, Lupon,
 Mandalihan, Brgy. Poblacion, Lupon
 Tibanban, Brgy. Poblacion Sigaboy
 Bais, Polacion. Sigaboy
 Jamboree B, Brgy. Nangan
 Jamboree A, Brgy. Nangan
 Magsaysay, Brgy. Central Mati City
 Tinimbo, Cateel

Lower Tagawisan, Brgy. Badas, Mati City
 Purok Kaligoan, Brgy. Dahican, Mati City
 Purok 1, Brgy. Mayo, Mati City
 Brgy. Don Enrique Lopez, Mati City
 Purok Baybay, Brgy. Central Poblacion, Manay
 Purok Libtong, Brgy. Central, Manay
 Caracol, Brgy. Poblacion, Caraga
 Lower Mansanas, Brgy. Santiago, Caraga

Sitio Poo, Brgy. Kinablangan,
 Baganga
 Sitio Lawis, Brgy. Kinablangan,
 Baganga
 Purok Aster, Brgy. Lucod, Baganga
 Brgy. Saoquigue, Baganga
 Brgy. Sta. Filomena, Cateel
 Brgy. Poblacion, Boston
 Brgy. Sibahay, Boston

DAVAO DEL SUR

Brgy. Piape, Padada,
 Brgy. San Isidro, Padada
 Brgy. Tuban, Sta. Cruz
 Apo Beach, Brgy. Zone III Poblacion,
 Sta. Cruz
 Bitaug, Brgy. Zone IV Poblacion,
 Sta. Cruz

Davao Fishport Complex, Brgy.
 Daliao, Toril
 Lawis, Brgy. Lizada, Toril
 Brgy. Matina Aplaya, Davao City
 Brgy. Bucana, Davao City
 Bitaug, Brgy. Zone IV Poblacion, Sta. Cruz
 Davao Fishport Complex, Brgy. Daliao, Toril

Lawis, Brgy. Lizada, Toril
 Brgy. Matina Aplaya, Davao City
 Brgy. Bucana, Davao City

DAVAO DEL NORTE

Lidao, Brgy. Kaputian, IGACOS
 Brgy. Kaputian Poblacion, IGACOS

B. Catch composition by fish groups.

Fish Group	No. of Catch by (MT)	Fish Group	No. of Catch by (MT)
 Oceanic tuna	14,434	 Large Pelagics	1,779
 Neritic Tuna	2,086	 Demersal Fishes	524
 Pelagics	1,111	 Sharks and Rays	12
 Small Pelagics	9,752	 Invertebrates	2,275

C. Gear data

Fishing Gear	No. of Boats Landed	Fishing Gear	No. of Boats Landed
 Multiple hook and line	6,675	 Ringnet	1,560
 Hook and line	3,145	 Bottom set gillnet	757
 Jigger	2,334	 Bottom set longline	505
 Troll line	1,911	 Scoop net	373
 Gill net	1,790	 Trammel net	184

Top 10 Landed Aquatic Species by Volume



Selar crumenophthalmus 1
Big eye scad
"Matangbaka"



Katsuwonus pelamis 2
Skipjack Tuna
"Tulingan"



Thunnus albacares 3
Yellowfin Tuna
"Barilis"



Loligo tagoi 4
(Unknown English Name)
"Nokus"



Auxis rochei 5
Bullet Tuna
"Pirit"



6 *Decapterus macarellus*
Mackerel Scad
"Burot", "Moro-moro"



7 *Rastrelliger faughni*
Island Mackerel
"Karabalyas"



8 *Decapterus tabl*
Roughear Scad
"Burot", "Moro-moro"



9 *Auxis thazard*
Frigate Tuna
"Pirit"



10 *Mene maculata*
Moonfish
"Bilong-bilong"

Top 3 Fishing Gears in Region 11

Commercial



Ringnet
“Kubkuban”



Bagnet
“Tapay-tapay”

Municipal



Multiple Handline
“Undak”



Squid Jig
“Saranggat”



Handline
“Pasul”, ”pasol”

Enumerators

Bai Annie A. Abdulrasid
Remedios R. Ajos
Jovell P. Baladad
Glorypin I. Baniog
Sotera P. Canoy
Nancy R. Catada
Ramon T. Decolas
Rhea D. Delos Trayco
Joylen L. Dominice
Alma D. Morido
Johayna A. Doreco
Joje C. Rojas
Mae Christine V. Obusa
Benjie M. Astang

Maricel M. Velez
Glory Jean A. Sumaday
Jonaline S. Bacaro
Ronielyn Siangco
Rose Ann N. Cobacha
Sheena Mae M. Sumalinab
Kathy Jane E. Osman
Katrine Joyce G. Bacla-an
Lanie Rose A. Sapi
Malaya N. Bandigan
Ana Mae L. Owano
Arjenelyn F. Salazar
Ben Jan N. Basilisco

Christen P. Peñafiel
Clyde W. Brillantes
Christine Mae M. Matunog
Dellone Y. Maway
Grace I. Legaspi
Grecilda M. Limboc
Mark John M. Montero
Mary Grace A. Delos Reyes
Heidy B. Esmael
Ivy Rose B. Andico
Jainia L. Dagohoy
Sheena Mae C. Fernandez
Trisha Rose L. Espina

Jeanette C. Arsaga
Jeanibe F. Mamale
Jessie A. Relampago
Jesus P. Ade, Jr.
Mil John M. Lisayan
Raffy R. Cañete
Racma K. Sabdullah
Reynald N. Herbolingo
Roland E. Segovia
Jenny Cris J. Masing
Norsaira D. Jama
Karen Carmelle B. Palo
Noly M. Pelegrino



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NSAP REGION 12 - SOCCSKSARGEN

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Region XII or the famous SOCCSKSARGEN is situated in the heart of Mindanao with the total area of 19,165.87 square kilometers and population as of August 2015 was 4,545,276 with 1.94% growth rate (2010-2015). It has 4 provinces: South Cotabato, Cotabato, Sultan Kudarat and Sarangani and 5 cities namely, Cotabato, General Santos, Koronadal, Kidapawan, and Tacurong. Its extensive coastal area is endowed with marine resources which became the main riser in the economy next to agriculture (SOCCSKSARGEN RDP 2011-2016). General Santos city is known as the business center of the region and Koronadal City is the administrative center of the region where Bureau of Fisheries and Aquatic Resources (BFAR)-REGION 12 is located.

Improved fishery production is contributed by South Cotabato which encompasses majority of share followed by Sultan Kudarat, Sarangani and the least number is observed in North Cotabato. (PSA, Country Stat Philippines, 2010-2015). General Santos City Fish Port Complex also imparts high statistic production with its seven (7) canning companies and MSME's.

Commercial fishery production in Region 12 is dominated by South Cotabato. It has a total volume of production of 1,308,194.10 MT from 2010-2015. It

was followed by Sultan Kudarat with 27,410.26 MT and Sarangani Province with 2,811.49 MT. (PSA, Country Stat Philippines, and 2010-2015). North Cotabato has no output in volume of production since its area abounds no marine waters.

Municipal fishery is subdivided into 2 areas: Inland and Marine fisheries. Inland produces fish volume with 149,425.12 metric tons with 54.4% from year 2010-2015 that is larger than that of the marine which is represented with 45.6% or 125,167.86 MT of the total production (PSA, Country Stat Philippines, 2010-2015). Marine municipal fisheries volume is dominated by Sarangani with 78,741.14 MT followed by Sultan Kudarat, 36,580.32 MT and South Cotabato with 9,846.40. On the other Hand, Inland highest contributor is North Cotabato with 87,448.40 MT, followed by Sultan Kudarat, 60,265.19 MT and South Cotabato with 1,711.53 MT (PSA, Country Stat Philippines, and 2010-2015).

National Stock Assessment Program (NSAP) of Region 12 started in 1997 with only 4 major landing sites located in Lebak, Kalamansig and Palimbang of Sultan Kudarat and Kalanganan of Cotabato City. With the implementation of Executive Order No. 36, dated September 19, 2001, the Regional Office moved to

General Santos City making Region XII into the present SOCCSKSARGEN. With this movement, additional landing sites were covered and commercial waters of Moro Gulf and part of Celebes Sea and municipal water of Sarangani Bay. In 2012, there were 12 sites established with 13 data enumerators hired. In 2014, due to data deficiency particularly for tuna, the project expanded its coverage. There were 26 sites with 32 data enumerators. And in 2015, additional sites were established in Liguasan Marsh for freshwater assessment.

Moro Gulf as the largest gulf in the Philippines is also one of the rich fishing grounds where and most fishing boats from Region 12 operates. Fishing of tunas occur in all fishing grounds of the country but are heavily concentrated in Moro Gulf, Sulu Sea, South Sea and Southern Luzon. Three major gears were used in catching tuna with the use of Fish Aggregating Device (FAD) or locally known as payao. Purse seine and ring net are the two main gears used by commercial fishers and handline fishing is normally operated within or near the vicinity of a payao and mostly the municipal fishermen (Barut, 2002). Based on NSAP Data, 2015, seventy-six percent of tuna catches from domestic waters landed in General Santos City fishing port and the remaining 24 percent were from the waters of Mati, Palawan, Surigao, Tawi-tawi and Zamboanga. Landed catch from Moro Gulf recorded 28,438 MT. Sixty-three percent was the contribution of ring net and dominated the catch. Five major species observed were *Katsuwonus pelamis*, *Decapterus macarellus*, *Auxis rochei rochei*, *Auxis thazard thazard* and *Thunnus albacares*. Followed by purse seine with 27 percent share with same major species observed. On the other hand, handline shared only 10 percent with *Thunnus albacares* as the major species caught. Regardless of gears, top 5 species were *K. pelamis* (skipjack tuna) followed by *D. macarellus* (mackerel scad), *T. albacares* (yellowfin tuna), *A. rochei rochei* (bullet tuna) and *A. thazard thazard* (frigate tuna).

Celebes sea is a sea of the western Pacific Ocean. It is bordered on the north by the Sulu Archipelago and Sulu Sea and Mindanao Island of the Philippines. It is bordered on the east by the Sangihe Islands chain, on the south by Sulawesi, and on the west by Kalimantan in Indonesia (simple .wikipedia.org). There were only few fishing vessels from Kiamba and Maitum, Sarangani province operating in Celebes sea and accounted only

3.9 percent of Moro Gulf production. Small pelagics also dominated the catch and some of the fishing boats used surface gill net that targeted flying fishes and hook and lines(NSAP Data, 2015).

The Sarangani Bay is a protected seascape found in Southern Mindanao. It is part of the National Integrated Protected Areas System (NIPAS) of the Philippines. Thus, it is managed by the Department of Environment and Natural Resources (DENR). It is located at Southern part of Mindanao. The total area of the bay is 449 km² and the average depth is 350m respectively. (de Jesus et.al,2001). In the 13 landing centers established in Sarangani Bay, there were 2,784 boats monitored. The highest number of boats was observed in Kiamba, followed by Malapatan, Maitum, General Santos, Glan and the least number of boats was recorded in Alabel. Sarangani bay is a multi-gear and multi-species fisheries. Small pelagics dominated the catch and gillnets and hook and lines were the commonly used gears in the 7 coastal communities utilizing the bay. Top five species in terms of volume of catches observed were *Sardinella lemuru*, *Selar crumenophthalmus*, *Sardinella gibbosa*, *Decapterus kurroides*, and *Auxis rochei rochei* (NSAP Data, 2015).

For freshwater assessment, Liguasan Marsh has great potential for freshwater species. Region 12 established 6 landing centers in Pigcawayan, Pikit and Midsayap. There were 12 commonly used gears namely: fish trap, harvesting net, gillnet (encircling gill net, bottom set, and surface gill net), fish corral, fyke net, hook and line, cast net, pole and line and electro fishing was also practiced by some fishermen. As to the species monitored, among the top five species in terms of volume were, *Oreochromis niloticus* (native tilapia), *Labeo rohita* (rohu carp), *Cyprinus carpio* (common carp), *Channa striata* (mudfish) and *Clarias batrachus* (catfish) (NSAP Data, 2015).

At present, the four provinces of Region 12 were covered. There were 33 landing centers established with 39 data enumerators assigned in the field and four data analysts assigned in the Satellite office of BFAR 12. Out of 33 landing sites, 7 were commercial sites and 26 were municipal sites. Moro Gulf, Sarangani Bay and Liguasan Marsh are the major fishing grounds monitored for Region 12, however, there were also recorded landings from Celebes sea.

Landing Centers, Catch Composition, and Gear Data

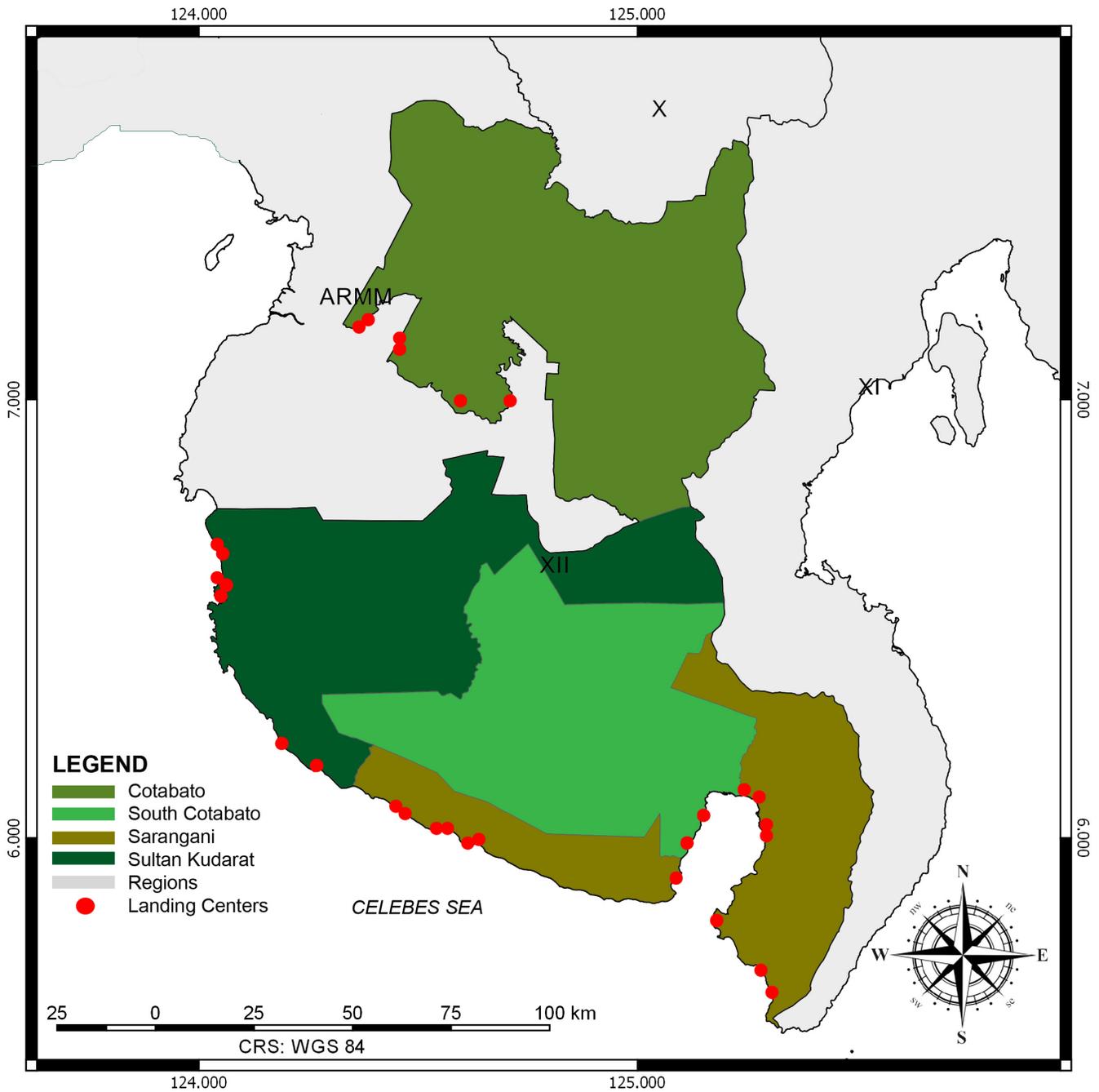


Figure 27 : GIS map of Region 12

A. Region 12 - SOCCSKSARGEN Landing Centers

COTABATO

Bago-Inged, Pikit, North Cotabato	Matilac, Pigcawayan, North Cotabato	Malingao, Midsayap, North Cotabato
Punol, Pikit, North Cotabato	Datu Mantil, Pigcawayan, North Cotabato	Tumbras, Midsayap, North Cotabato

SOUTH COTABATO

Bawing, Tambler, G.S.C
Minanga, Buayan, G.S.C

Market 1, Fishport Complex, Tambler, G.S.C. Market 3, Fishport Complex, Tamber, G.S.C.
Market 2, Fishport Complex, Tambler, G.S.C.

SULTAN KUDARAT

San Roque, Palimbang
Poblacion, Palimbang
Tinago, Lebak

Tibpuan, Lebak
Poral, Kalamansig
Sta. Clara, Kalamansig

Pag-asa, Kalamansig
Poblacion, Kalamansig

SARANGANI

Old. Pob, Maitum
Mabay, Maitum
Tinoto, Maasim
Ladol, Alabel
Tuyan, Malapatan

Batulaki, Glan
Poblacion, Malapatan
Big Margus, Glan
Small Margus, Glan
Pangyan, Glan

Gumamela, Kiamba
Suli, Kiamba
Salakit, Kiamba
Nalus, Kiamba

B. Catch composition by fish groups.

 Fish Group	No. of Catch by (MT)	 Fish Group	No. of Catch by (MT)
 Oceanic tuna	113,540	 Large Pelagics	703
 Neritic Tuna	8,005	 Demersal Fishes	343
 Pelagics	1,083	 Sharks and Rays	0
 Small Pelagics	12,127	 Invertebrates	227

C. Gear data

 Fishing Gear	No. of Boats Landed	 Fishing Gear	No. of Boats Landed
 Multiple hook and line	14,238	 Ringnet	2,635
 Hook and line	5,225	 Troll line	1,687
 Bottom set longline	4,591	 Spear gun	1,023
 Gillnet	4,412	 Bottom set gillnet	396
 Jigger	4,178	 Purse seine	315

Top 10 Landed Aquatic Species by Volume



1 *Katsuwonus pelamis*
Skipjack tuna
“Sambagon”, “Karaw”



2 *Thunnus albacares*
Yellowfin tuna
“Barilis”



3 *Decapterus macarellus*
Mackerel scad
“Borot”



4 *Auxis rochei rochei*
Bullet tuna
“Pirit”



5 *Auxis thazard thazard*
Frigate tuna
“Budboron”, “Pirit”



6 *Thunnus obesus*
Big eye tuna
“Barilis”



7 *Elagatis bipinnulata*
Rainbow runner
“Salmon”



8 *Euthynnus affinis*
Eastern Little tuna
“Pirit”, “Kawa Kawa”



9 *Coryphaena hippurus*
Common dolphinfish
“Lamarang”



10 *Selar crumenophthalmus*
Big eye scad
“Matambaka”, “Tulay”

Top 3 Fishing Gears in Region 12

Commercial



Handline
“Pamariles”



Ringnet
“Likos”, “Likom”



Purse seine
“Pangulong”

Municipal



Multiple hook and line
“Undak”



Troll line
“Pangukos”, “Sarangat”



Surface Gillnet
“Pukot”, “Pante”, “Palutaw”

Enumerators

Mark Anthony Laraya
Wiljoy Eroy
Mac Gyver Mirasol
Janet Templonuevo
Mangi Abdillah
Sharmaine Torres
Alnajer Nackderol
Remelyn Abian
Ma. Ruth Mari
Aimeeh Cabanas
Chamberlane Bancaerin

Maritess Magallanes
Jomar Maas
Arianne Shane Valdez
Axel Rose Jimenez
Rakman Esmael
Raymond Biaca
Samuel Sumagaysay
Ma. Zillah Bacongco
Leorim Jade Abunas
Elgano Yatoy Jr.
Ronald Timcang

Ma. Dolorosa Hurtada
Eugene Tuscano
Joven Velario
Bryan Gersalino
Vergil Guadalquiver
Ronnell Cordero
Basa Umal
Lovely Jean Delariarte
Angela Montero
Henry Nemiz
Janelyn Me C. Quiapo

Alkhaizar Embin
Consuelo P. Abdulgani
Ramil Zacaria
Glem Hope Caballero
Laida Balabagan
Landro M. Guiamel
Janine Rose Merca
Ropah Oracion
Cyril Mae Demavivas



NSAP REGION 13 - CARAGA

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Caraga Region, designated as Region XIII, is an administrative region of the Philippines occupying the northeastern section of the island of Mindanao. The Caraga Region was created through Republic Act No. 7901 on February 23, 1995. The region comprises five provinces: Agusan del Norte, Agusan del Sur, Surigao del Norte, Surigao del Sur and Dinagat Islands; six cities: Butuan, Cabadbaran, Surigao City, Tandag, Bislig and Bayugan; 67 municipalities and 1,311 barangays. Butuan is the regional administrative center.

The region has a total land area of 18,846.97 square kilometres (7,276.86 sq mi), representing 6.3% of the country's total land area and 18.5% of the island of Mindanao. The region is noted for its wood-based economy, its extensive water resources and its rich mineral deposits such as iron, gold, silver, nickel, chromite, manganese and copper. Its leading crops are palay, banana and coconut. The region features several beaches, abundant seafood, hot and cold springs, evergreen forests and balmy weather. (<https://wikipedia.org/wiki/Caraga>). Fisheries sector supports the economic and development in the region.

To support fishery conservation and management effort requires the continuous stock assessment in all

fishing grounds of the country (RA 8550 section 7-9). Hence, the Bureau of Fisheries and Aquatic Resources-Caraga Region response to this, through the National Stock Assessment Program (NSAP).

A time series data starting 1998 to the present have been generated to provide reliable fishery information where results will serve as a tool for policymakers in formulating management options for sustainability.

The region has implemented its wide NSAP expansion in May 2014 covering a total of 53 major and minor landing centers in 23 coastal municipalities and 5 lakeshore municipalities. The activity was manned by 50 trained enumerators and 6 Data Analysts which focus ten major fishing grounds such as Hinatuan Passage, Dinagat Sound, Surigao Strait, Lanuza Bay, Surigao Sea, Hinatuan Bay, Bislig Bay and Butuan Bay. Moreover, included also were the Freshwater systems in Lake Mainit and Agusan Marsh.

In 2015 results showed that among the fishing grounds on study Surigao Sea of Surigao del Sur shared 30% of the total landed catch in the region where oceanic tuna dominated.

Landing Centers, Catch Composition, and Gear Data

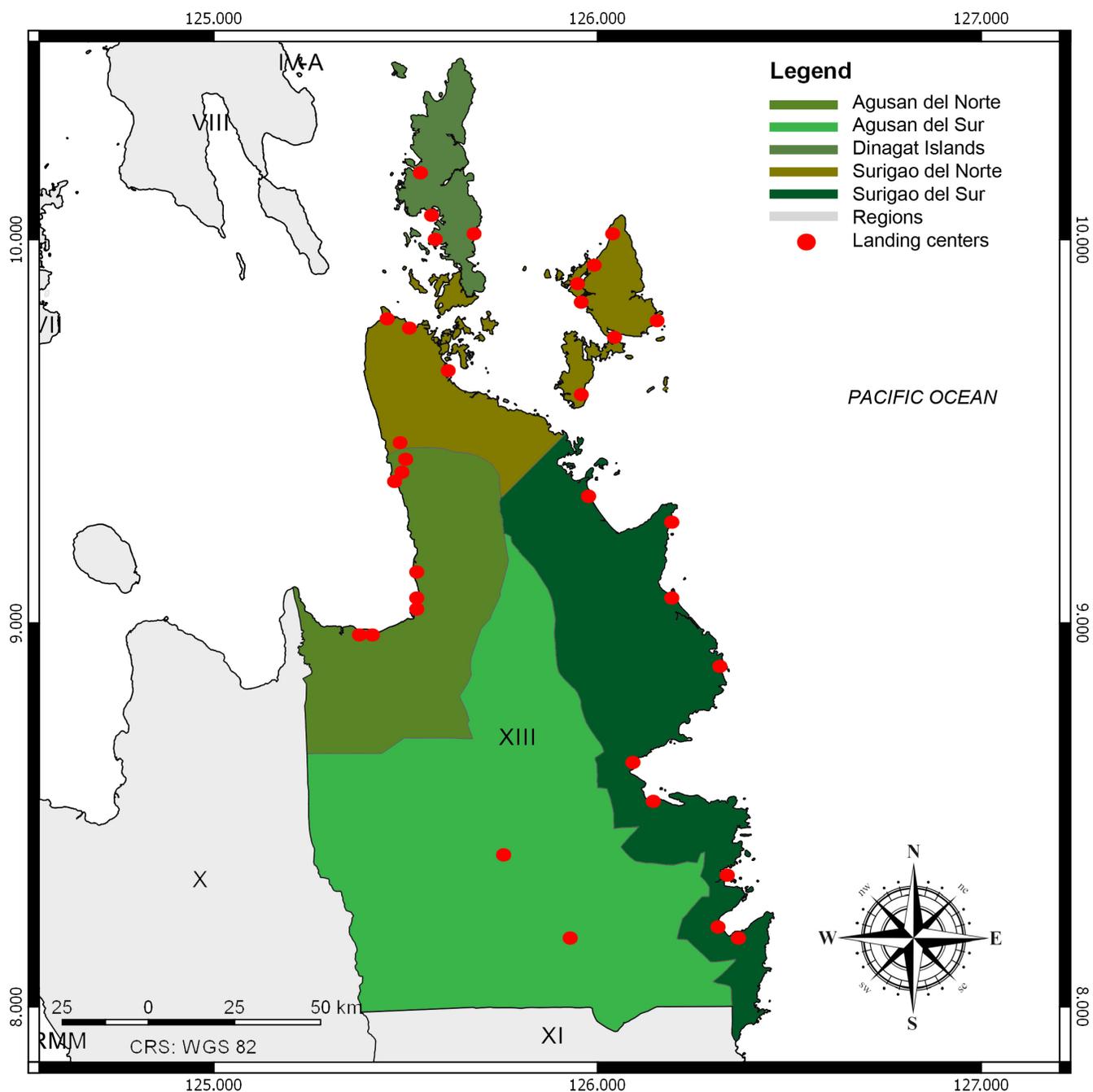


Figure 28 : GIS map of Region 13

A. Region 13 - CARAGA Landing Centers

SURIGAO DEL SUR

Brgy. Mangagoy, Bislig City
 P-4, Dampingan, Mangagoy, Bislig City
 Unidad, Cagwait
 Aras-asan, Cagwait
 Aquino, Hinatuan

Brgy. Sto Niño
 Brgy. Lacasa, Hinatuan
 Poblacion, Barobo
 Kalipayan, Bungtod, Tandag City
 Santan, Bungtod, Tandag City

Poblacion, Lianga
 Poblacion, Cortes
 Tag-anongan, Cortes
 Magosilom, Cantilan

AGUSAN DEL NORTE

Barangay 2, Tubay
Poblacion, Tubay
Brgy. 10, Buenavista

Manapa, Buenavista
La Union, Cabadbaran City
Calibunan, Cabadbaran City

San Roque, Kitcharao
Beltran, Jabonga
Poblacion, Jabonga

SURIGAO DEL NORTE

Magsaysay, Placer
Washington (Storage), Surigao City
P-5, Mabua, Surigao City
P-6, Mabua, Surigao City
Purok Rosal, Quezon, Mainit
Purok Lotus, Quezon, Mainit
Poblacion 1, General Luna

Poblacion 3, General Luna
Brgy 13, Poblacion, Dapa
Brgy 12 & Kawit, Dapa
Rizal, Socorro
Taruc, Socorro
Navarro, Socorro
San Fernando, Del Carmen

Poblacion, Del Carmen
Talisay, San Benito
Sta. Cruz, San Benito
Rizal, Sta. Monica
T-Arlan, Sta. Monica

AGUSAN DEL SUR

Agpangon, Lapaz
Kiandag, Lapaz

La Flora, Talacogon
San Agustin, Talacogon

DINAGAT ISLAND

Poblacion, San Jose
Sta. Cruz, San Jose
San Juan, San Jose

Poblacion, Cagdianao
Cabungbongan, Cagdianao
Ferdinand, Basilisa

Tag-abaca, Basilisa
Osmeña, Libjo
San Antonio, Libjo

B. Catch composition by fish groups.

 Fish Group	No. of Catch by (MT)	 Fish Group	No. of Catch by (MT)
 Oceanic tuna	10,567	 Large Pelagics	838
 Neritic Tuna	352	 Demersal Fishes	975
 Pelagics	778	 Sharks and Rays	5
 Small Pelagics	8,364	 Invertebrates	191

C. Gear data

 Fishing Gear	No. of Boats Landed	 Fishing Gear	No. of Boats Landed
 Troll line	14,852	 Multiple hook and line	3,803
 Gill net	14,778	 Jigger	3,691
 Bottom set gill net	6,907	 Bottom set longline	1,844
 Hook and line	6,256	 Fish trap	1,552
 Spear gun	6,183	 Drive-in net	546

Top 10 Landed Aquatic Species by Volume



1 *Sardinella lemuru*
Bali Sardines
“Tamban”



2 *Katsuwonus pelamis*
Skipjack
“Pawayan”



3 *Thunnus albacares*
Yellowfin Tuna
“Panit”, “Barilis”



4 *Encrasicholina heteroloba*
Short Head Anchovy
“Bolinaw”



5 *Amblygaster sirm*
Spotted sardinella
“Hawol-Hawol”



6 *Coryphaena hippurus*
Common Dolphinfish
“Tamarang”



7 *Selar crumenophthalmus*
Big-eye Scad
“Adlo”, “Matambaka”



8 *Elagatis bipinnulata*
Rainbow Runner
“Salindatu”



9 *Spratelloides gracilis*
Silverstripped Round Herring
“Domodo-ot”



10 *Euthynnus affinis*
Kawa-kawa
“Bulis”

Top 3 Fishing Gears in Region 13

Commercial



Ringnet
“Likom-likom”



Multiple hook and line
“Margate, undak”



Troll Line
“Subid-subid”

Municipal



Troll line
“Subid-subid”



Multiple hook and line
“Margate-margate”



Drift Gillnet
“Pamo-pamo”

Enumerators

Mendoza, John Jacob
Sabanal, Jerry
Mendoza, Madel
Cosido, Irish
Naïve, Junelyn
Mecompal, Jaycie Anne
Cadelina, Cerilo
Bernaldez, Florendo
Golosinda, Remeros
Epis, Nobey
Monteros, Junelyn
Baay, Jonah Mae
Brainerd Avenido
Lelibeth Gabutero

Avenido, Brainerd
Quijado, Jestoni
Castro, Jocelyn
Florendo Bernaldez
Remirose Golosinda
Mark Alfie Malano
Doligol, Mark Anthony
Huyo, Ellie Faye
Fidelis, Renie Boy
Exclamador, Sabino
Gabutero, Lilibeth
Sayson, Robert
Renato Abreu

Quiño, Seychem
Jamero, Novie
Castaño, Tristan
Saga, Remelou Joy
Perocho, Divina
Beltran, Jean
Garcia, Alexis
Barit, Gary
Bolanio, Brylle Adam
Junelyn Monteros
Mark John Roda
Reneboy Fediles
Cirilo Cadelina

Guiral, Mylene
Ronquillo, Zaila Mae
Tatad, Maria Luz
Sabarre, Jaimesita
Guillen, Vanissa
Sumaoy, Concordio
Dumas, Renie Mae
Balus, Jose Antonio
Navarro, Agustin
Charito Jandayan
Nobey Epis
Henry Nichol Obordo
Robert Sayson



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NSAP AUTONOMOUS REGION IN MUSLIM MINDANAO

Macmod Mamalangkap*, Sammy M. Ayub, Salim S. Sabawa, Norodin M. Kid and Usop K. Mokamad

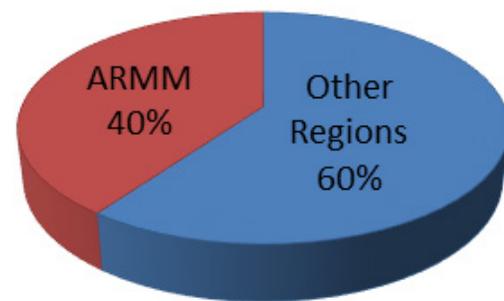
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The Autonomous Region in Muslim Mindanao was created by virtue of Republic Act 6734 otherwise known as the “Organic Act of the Autonomous Region in Muslim Mindanao (ARMM)”. It was then strengthened and expanded through the passage of Republic Act 9054 otherwise known as “An Act to Strengthen and Expand The Organic Act for the Autonomous Region in Muslim Mindanao (ARMM)” on August 14, 2001. This resulted in the present political subdivision of ARMM into five (5) provinces, two (2) component cities, one hundred sixteen (116) municipalities, two thousand four hundred ninety (2,490) barangays and eight (8) Congressional Districts. Of these, 93 are coastal municipalities and 1,955 are coastal barangays.

The ARMM is located southwest of the Philippines, about 1200 - 1240 N and 800 - 500E with a land area of 27,517.10 km². It has a total territorial water of 18,426,613.2 ha, shelf area of 2,811,141.07 ha, and a coastline length of 3,232.29 km.

There are two major fishing grounds of the ARMM, the Sulu Sea and the Illana Bay. Sulu Sea is situated in the Western Pacific Ocean, enclosed by Borneo, the Mindanao Island, Negros, Palawan Bay and Sulu Archipelago. It has an area of about 260,000 sq.km.

Illana Bay, on the other hand, is bounded on the north by the coastline of Lanao del Norte and Lanao del Sur, on the east by the coastline of Maguindanao



Seaweed Production 2015

and Cotabato City, and on the west by the coastline of Zamboanga del Sur and Pagadian City.

When it comes to seaweeds production, the ARMM has always been the highest seaweeds-producing region in the country. In 2015 seaweeds production, the ARMM recorded a production of 627,435.50 metric tons or 40% of the country’s total seaweeds production of 1,566,361.70 (mt) with Tawi-Tawi as its largest seaweeds-producing province.

The region also caters to the growing demands in freshwater fish species because the second largest lake in the Philippines, the Lake Lanao, is located in the province of Lanao del Sur. Other major lakes in the region are the Lake Danao, Lake Dapao, Lake Buluan, Lake Darapanan, Lake Balut, and Seit Lake. Swamplands in the region are the Ligawasan Marsh, and the Butilen Marsh.

Fishing is one of the main sources of living in ARMM. Based on the Fisherfolk Registration (FishR) conducted by BFAR-ARMM, the region has a total of 232,516 registered municipal fisherfolk.

Owing to the rich biodiversity of the region's fishing grounds vis-à-vis the need for scientific fisheries assessments in the country, the National Stock Assessment Program (NSAP) in ARMM took off in 1998. The NSAP-ARMM started out with two (2) sampling sites per province. In 2014, the NSAP expanded its sampling areas nationwide. In ARMM, the NSAP covers a total of thirty six (36) sampling sites for its marine fisheries assessment and additional four (4) sampling sites for freshwater assessment in 2015.

A glimpse on the provinces of ARMM

Maguindanao is one of the provinces in the Autonomous Region in Muslim Mindanao (ARMM). Since 2014 the provincial capital is Buluan but the legislative branch of the provincial government, the Sangguniang Panlalawigan, convenes in the old provincial capitol in the town of Sultan Kudarat. It borders Lanao del Sur to the north, Cotabato to the east, Sultan Kudarat to the south, and the Illana Bay to the west. It has 36 municipalities of which 23 are inland and 6 are marine coastal municipalities. It has a total of 2,673 motorized banca and 9,710 non-motorized. It has 61,385 fishing families. As of 2015 PSA census of population, it has 1,173,933 total population.

Lanao del Sur is a province in the Philippines located in the Autonomous Region in Muslim Mindanao (ARMM). The capital is the city of Marawi, and it borders Lanao del Norte to the north, Bukidnon to the east, and Maguindanao and Cotabato to the south. To the southwest lies Illana Bay, an arm of the Moro Gulf. It has 25 coastal municipalities of which 4 are marine and 21 are inland. It has 12,298 fishing households with 5,633 full-time fishermen and 653 are part-time. It has 245 motorized bancas and 49 non-motorized bancas operating in its marine waters while there are 1,513 non-motorized bancas operating in its inland bodies of water. As of 2015 PSA census of population, it has 1,045,429 total populations. It is home to the country's second largest lake, the Lake Lanao with 139,000 hectares.

Basilan is the largest and northernmost of the major islands of the Sulu Archipelago. It is located just off the southern coast of the geographic Zamboanga Peninsula. It has one city, the Lamitan City. It is home to three main ethnic groups, the indigenous Yakans, and the later-arriving Tausugs and Zamboangueño. It has 12 coastal municipalities, 112 coastal barangays, and 11,250 fishing industry. It has 15,379 full-time fishermen and 6,591 part-time fishermen. Its commercial fishing boat operators are 60. As regards its municipal boats, it has 963 motorized bancas and 643 non-motorized bancas. As of 2015 PSA census of population, its population is 346,579.

Sulu is a province of the Philippines in the Sulu Archipelago and part of the Autonomous Region in Muslim Mindanao (ARMM). Its capital is Jolo on the island of the same name. Sulu is along the southern border of the Sulu Sea and the northern boundary of the Celebes Sea. It has 19 coastal municipalities with 199 coastal barangays. It has 18,700 fishing household. As of 2015 PSA census of population, its population is 824,731

Tawi-Tawi is the southernmost province of the country, sharing sea borders with the Malaysian state of Sabah and the Indonesian North Kalimantan province, both on the island of Borneo to the west. To the northeast lies the province of Sulu. It also covers some islands in the Sulu Sea to the northwest, the Cagayan de Tawi-Tawi Island and the Turtle Islands, just 20 kilometres (12 mi) away from Sabah. The capital of Tawi-Tawi is Bongao, per Batas Pambansa Blg. 24 enacted on April 4, 1979. It has 11 coastal municipalities, 196 coastal barangays, and 8,345 number of fishing households. As of 2015 PSA census of population, its population is 390,715.

The Administrative Order No. 1, otherwise known as the Implementing Rules and Regulations (IRR) of the Muslim Mindanao Autonomy Act (MMAA #86) or ARMM Aquatic and Fisheries Code of 1999, the Regional Government has empowered the Bureau of Fisheries and Aquatic Resources – ARMM (BFAR-ARMM) in the performance of its mandate for an effective protection, conservation, utilization, and development of ARMM waters.

Landing Centers, Catch Composition, and Gear Data

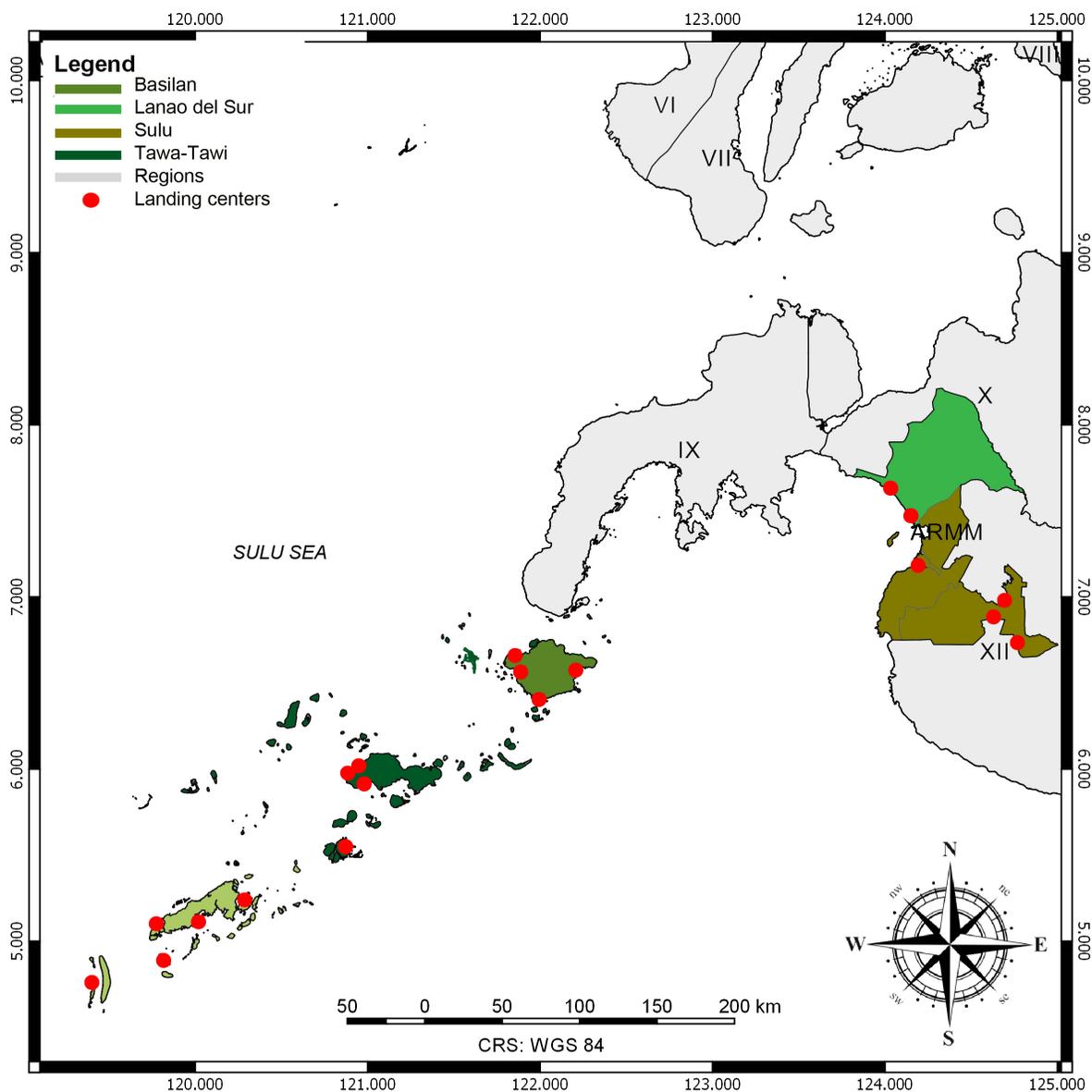


Figure 29 : GIS map of ARMM

A. ARMM Landing Centers

BASILAN

Lantawan
Maluso
Sumisip

Tipo-Tipo
Lamitan

MAGUINDANAO

Datu Blah T. Sinsuat
Datu Odin Sinsuat

Parang
Sultan Mastura

SULU

Jolo
Maimbung

Parang
Siasi

TAWI-TAWI

Bongao
Panglima Sugala
Simunul

Sitangkai
South Ubian
Tandubas

LANAO DEL SUR

Balabagan
Malabang

Picong

B. Catch composition by fish groups.

Fish Group	No. of Catch by (MT)	Fish Group	No. of Catch by (MT)
 Oceanic tuna	11,690	 Large Pelagics	5,965
 Neritic Tuna	12,825	 Demersal Fishes	12,012
 Pelagics	6,485	 Sharks and Rays	0
 Small Pelagics	8,772	 Invertebrates	0

C. Gear data

Fishing Gear	No. of Boats Landed	Fishing Gear	No. of Boats Landed
 Gill net	8,802	 Bagnet	2,234
 Multiple hook and line	8,159	 Spear gun	1,358
 Hook and line	5,669	 Fish trap	971
 Troll line	3,363	 Bottom set gill net	930
 Ringnet	2,402	 Lift net	496

Top 10 Landed Aquatic Species by Volume



1 *Katsuwonus pelamis*
Skipjack
“Puyan”, “Langalak”



2 *Sardinella lemuru*
Bali Sardines
“Tamban”



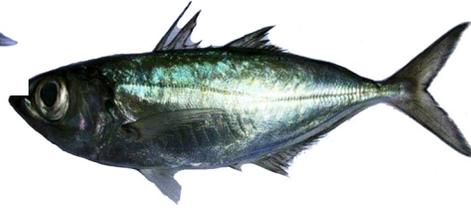
3 *Decapterus macrosoma*
Shortfin scad
“Bodboron”, “Burot”, “Lingin”



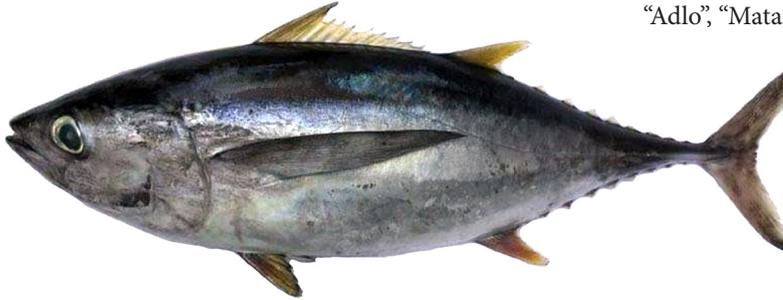
4 *Amblygaster sirm*
Spotted sardinella
“Tamban”



5 *Rastrelliger kanagurta*
Indian mackerel
“Alumahan”, “Kabalyas”



6 *Selar crumenophthalmus*
Big-eye Scad
“Adlo”, “Matambaka”



8 *Thunnus obesus*
Big eye tuna
“Barilis”



7 *Decapterus kurroides*
Mackerel scad
“Baulo”



9 *Auxis rochei rochei*
Bullet tuna
“Pirit”



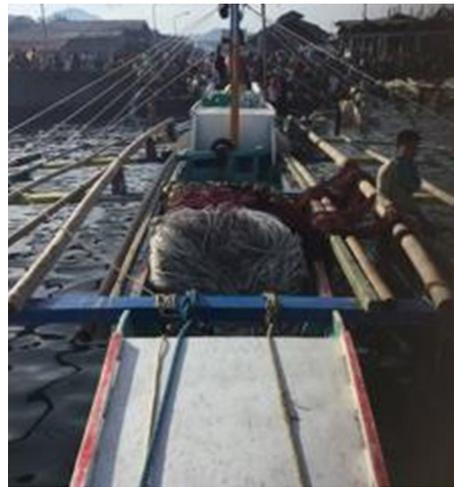
10 *Euthynnus affinis*
Kawa-kawa
“Buron”

Top 3 Fishing Gears in ARMM

Commercial



Ring net
“Kolibo”



Bagnet
“Basnig”

Municipal



Gill net
“Pokot”, “Panti”



Multiple hook and line
“Bira-bira”



Drift Gill net
“Pikit-pikit”

Enumerators

Bailina Macarimbang
Montaser Mamalangkap
Mehamin Abas
Esmail Udtong
Nasrudin Esmail
Janet Teves
Saudia Hassim
Datukon Acob
Aden Sembrano

Jariya Kasan
Edzmar Sanawi
Jainuddin Pajiran
Razil Nurdani
Sherwin Abdilla
Wahid Abduhalik
Julhasim Halun
Abdelnasser Taradji
Mohammad Nasil Mualil

Yasher Tadus
Violeta Salasain
Alpha Jimlan
Ar-rashid Ebing
Crisanto Malalay
Alben Albani
Aphadar Arabain
Gemayel Tawasil
Sappalya Dansalan

Pili Musa
Monaoray Balangue
Anisa Ambihal
Ibnis Dimbong
Ebnal Bandal
Catherine Hussin
Armalia Sultan
Norhanida Manda

A vertical photograph of five silver fish, likely tilapia, arranged in a column on a white, textured surface. The fish are shown from the side, facing left. The top fish is the smallest, and they gradually increase in size towards the bottom. The background is a solid teal color.

4

Chapter

STATUS OF FRESHWATER FISHERIES

- Region CAR - Cordillera
Administrative Region
- Region 4A - CALABARZON
- Region 12 - SOCCSKSARGEN
- Region 13 - CARAGA

Introduction

Chapter 4 presents the regional NSAP freshwater fisheries including the Regional fisheries profile, the names and location of the NSAP-monitored landing centers, catch composition and fishing gear data, and pictures of dominant species and fishing gears, and list of enumerators.

Only the fishery profiles of four (4) areas thus far (CAR, Taal Lake, Region 12 and Region 13), which have so far conducted stock assessments, are shown. The profiles consist of the region's brief history, geographic information, topography and other fishery information, the location of NSAP monitored landing centers shown by Province.

The catch composition by aquatic species group and effort data for CY 2014 was generated using the reporting function of the NSAP – Database. The top 10 landed aquatic species by volume is also shown labeled with scientific name, common name and local name. Moreover, the top 3 commercial and municipal fishing gears are also presented labeled with English and local name.



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NSAP CAR – CORDILLERA ADMINISTRATIVE REGION

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*nerd_traveller@yahoo.com

The Bureau of Fisheries and Aquatic Resources – Cordillera Administrative Region (BFAR-CAR) conducts a stock assessment activity of inland water resources in the region through the National Stock Assessment Program (NSAP) of the Bureau of Fisheries and Aquatic Resources (BFAR). The NSAP is spearheaded by the National Fisheries Research and Development Institute (NFRDI) which is the “research arm” of the Bureau. The program is in consonance with the Bureau’s aim to gather essential information that will serve as a basis for the formulation of policies and appropriate management and conservation measures to attain sustainable utilization of the inland water resources in the region.

The conduct of NSAP has something to do with the implementation of the Philippine Republic Act (RA) 8550 (1998) specifically in the Chapter II, Sections 5: “That *research and survey activities may be allowed under strict regulations*, for purely research, scientific, technological and educational purposes that would also

benefit Filipino citizens”; Section 7: “The Department shall issue such number of licenses and permits for the conduct of fishery activities subject to the *limits of the MSY of the resource as determined by scientific studies or best available evidence*”; Section 8: The Secretary may prescribe *limitations or quota on the total quantity of fish captured, for a specified period of time and specified area based on the best available evidence*”; and Section 11: The Department shall declare *closed seasons and take conservation and rehabilitation measures for rare, threatened and endangered species, as it may determine, and shall ban the fishing and/or taking of rare, threatened and/or endangered species, including their eggs/offspring as identified by existing laws in concurrence with concerned government agencies*” as stated in the Philippine Fisheries Code of 1998.

With the RA 10654, NSAP has become more needed in providing significant data as basis for policy makers and resource managers. Data generated from NSAP will be used to establish the *reference points as*



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stipulated in Chapter II, Section 8, Rule 8.1 of the RA 10654 (2015) which states that Reference Points – within one (1) year from effectivity of this IRR, the DA-BFAR shall determine the Target Reference Points (TRP) and Limit Reference Points (LRP), and the Harvest Control Rules (HCR) to achieve TRP and avoid LRP in all fishing grounds or fishery management areas, based on the results of national stock assessments, the precautionary principle and the process stated in Rule 65.2 among others.

In addition, FAO (1995) stated that, conservation and management decisions for fisheries should be based on the best scientific evidence available, also taking into account traditional knowledge of the resources and habitat, as well as relevant environmental, economic and social factors. FAO (1995) also said that the states (the government) should prevent overfishing and should implement management measures to ensure that fishing effort is commensurate with the productive capacity of the fishery resources and their sustainable utilization. With these, the stock assessment of fisheries and aquatic resources is an important activity not only in the regions with coastal and marine waters but also in the Cordillera where the aquatic ecosystems are inland waters such as rivers, lakes and reservoirs.

During the early years of the NSAP, the Cordillera – being a land-locked region was not included in the implementation of the program. However, a proposal made by BFAR-CAR was submitted to the BFAR – Central Office (BFAR-CO) on the “Assessment of Commercially Important Species of Abra River in the Cordillera” in 2012. Fortunately, this was funded and has been conducted immediately in the second

semester of that year. This activity aimed to know the composition of the different commercially important fish species, determine the fishing gears used, species relative abundance, seasonality and occurrence of species and catch per unit effort along the Abra River. The research produced significant information on the river ecosystem and became the preliminary stage of NSAP in the Cordillera. It started in gathering data from the 10 municipalities of Abra (which was considered as Landing Centers (LC)) located along the stretch of the Abra River. The assessment activity was led by Ms. Lois June B. Fermin as the Project Leader (PL), Mr. Marx Perfecto C. Garcia as the Assistant Project Leader (APL) and Ms. Michelle A. Peralta as the Data Analyst

In 2013, another proposal on the same kind of assessment activity along the Apayao-Abulug River in Apayao Province was funded by the BFAR-CO. This was pushed and supported by now Regional Director (RD) Lilibeth L. Signey in order to provide baseline information on fisheries resources of the province. RD Signey was the former PFO of Apayao Province before. The stock assessment in this fishing ground was led by Dr. Honorio P. Yamoyam with the assistance of Ms. Judy Toyoken and Mr. Chris Q. Calawen. Four municipalities of the said province from where the Apayao-Abulug River transects were considered as landing centers. The same objectives with the earlier proposal were also



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satisfied. However, the former assessment activity has identified more fish and aquatic species in its respective fishing ground due to more detailed data enumerators and identified landing centers.

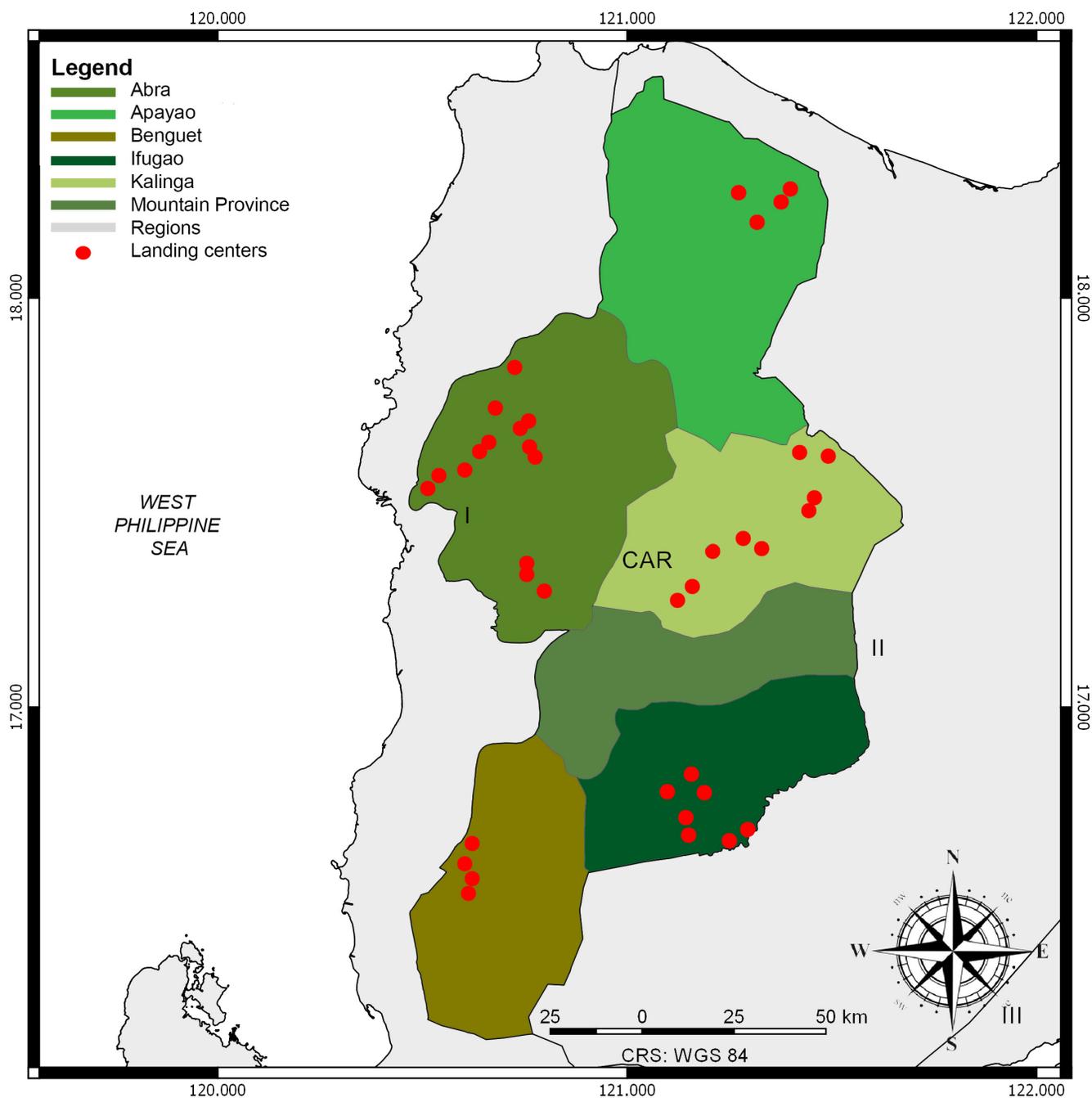
During the implementation years, the successive workshops, meetings, and trainings conducted helped a lot in the capacity development of the implementers of the assessment activities. The capability building activities also became the venues for the presentation of the research results to share new knowledge and ideas from the inland water capture fisheries. The NSAP implementers throughout the nation were captivated with the results of the study making them realized that there are significant interrelationship of water systems

from ridges to reefs and that sustainable exploitation of inland resources is as important as the coastal waters due to their roles as sources of food and livelihood of the marginal people in the country. With these, the BFAR and the NFRDI management were encouraged of including freshwater systems in the conduct of the NSAP. Thus, BFAR-CAR management with the help of NFRDI persevered to appeal to the BFAR-CO to provide a regular budget under the General Appropriations (GA) Fund for the conduct of NSAP by the BFAR-CAR in the region.

In 2014, with the objective of the former Bureau Director, Atty. Asis G. Perez, to gather more significant data from the capture fisheries, the NSAP was expanded. NSAP in CAR was already approved; however, it is still through a proposal-based budget. The nationwide expansion of the NSAP in 2014 catered additional fishing grounds in the Cordillera such as Ibulao River in Ifugao, Chico River in Kalinga and Amburayan River in Benguet. The two fishing grounds such as Abra River in Abra and Apayao-Abulug River in Apayao were maintained. Each fishing grounds have their respective LCs located in identified municipalities and these are the following: Tineg, San Juan, Tayum, Dolores, Bangued, Langiden, Tubo, La Paz, Lagayan, San Quintin and Pidigan in Abra; Kiangan, Lagawe and Lamut in Ifugao; Atok, Kapangan and Kibungan in Benguet; Tinglayan, Tabuk, Pinukpuk and Lubuagan in Kalinga; and Flora, Pudtol, Sta. Marcela and Luna in Apayao.

As a summary of the expansion of NSAP in CAR, there were five fishing grounds approved as areas for its conduct with a total of 24 landing centers. Three data analyst and 24 data enumerators were provided with employment. The leadership in the expansion of the NSAP was passed on to Mr. Marx Perfecto C. Garcia as the PL while Ms. Mary P. Tauli became the APL. Fortunately in 2015, NSAP in CAR has its regular budget under the GA to be conducted as one of the regular activities of the BFAR-CAR in the region. The approved budget which was under the research fund amounts to roughly PHP 6,854,000.00.

Landing Centers, Catch Composition, and Gear Data



A. CAR Landing Centers

ABRA RIVER

Caganayan, Tineg
 Badas, San Juan
 Pattaoig, San Juan
 Calaba, Bangued
 Bumagcat, Tayum

Pagpagatpat, Tayum
 Mudiit, Dolores
 Quillat, Langiden
 Kili, Tubo
 Amtuagan, Tubo

Tiempo, Tubo
 Mudeng, La Paz
 Poblacion, Lagayan
 Poblacion, San Quintin
 Laskig, Pidigan

CHICO RIVER

Ambato-Legleg, Tinglayan
Luplupa, Tinglayan
Suchot, Pinukpuk
Junction, Pinukpuk

Magsaysay, Tabuk
Appas, Tabuk
Balawag, Tabuk

Dupag, Tabuk
Bado-Dangwa, Tabuk
Tanglag, Lubuagan

IBULAO RIVER

Baguinge, Kiangnan
Bolog, Kiangnan
Caba, Lagawe

Munggayang, Kiangnan
Pugol, Lamut

Tungngod, Lagawe
Tupaya, Lagawe

AMBURAYAN RIVER

Naguey, Atok
Poblacion, Atok

Cuba, Kapangan
Badeo, Kibungan

APAYAO RIVER

Poblacion West, Flora
Capannikian, Pudtol

Imelda, Sta. Marcela
Marag, Luna

B. Gear data

Fishing Gear	No. of Boats Landed	Fishing Gear	No. of Boats Landed
 Electrofishing	2,316	 Hook and line	830
 Gill net	2,023	 Bokatot	686
 Barekbek	1,626	 Fish trap	649
 Asar	902	 Cast net	528
 Spear gun	897	 Push net	248

Top 10 Landed Aquatic Species by Volume



1 *Cyprinus carpio*
Common carp
“Karpa”



2 *Oreochromis niloticus*
Nile tilapia
“Pla pla”



3 *BFARCAR_Bukto_001**
“Bukto”



4 *Awaous melanocephalus*
Largesnout goby
“Bunog”



5 *Anguilla marmorata*
Giant Mottled Eel
“Igat”



6 *Sicyopterus lacrymosus*
Goby
“Paliling”



7 *BFARCAR_Kip-kip_048**
“Kipkip”



8 *BFARCAR_Purong_008**
Mullet
“Purong”



9 *Macrobrachium lepidactylus*
Fresh Water Prawn
“Udang”



10 *BFARCAR_Purong_007**
Mullet
“Purong”

Top 3 Fishing Gears in CAR

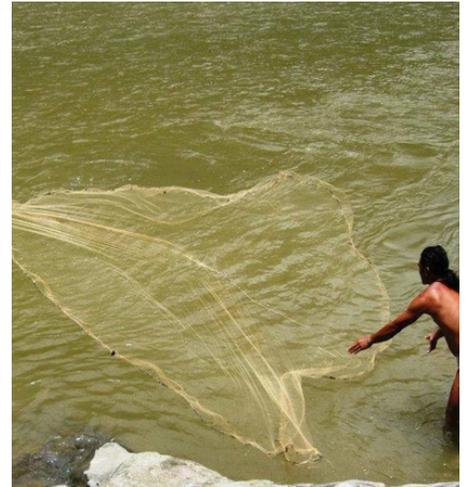
Commercial



Spear Gun
“Pana”



Gill net
“Sigay”



Cast net
“Tabukol”



Longline
“Bantak”



Hook and Line
“Banni-it”, “Lawin”



Fish Trap
“Bubo”

Enumerators

Leo Brazil Jr.
Victor Delusen
Maritess Payanay
Ma. Rhoda Fe Andres
Grechen Leppago
Jocelyn Paleyan

Editha Padama
Paradise Pachico
Geraldine Viernes
Cristina Correa
Baggeo, Belly Jane
Chris Calawen

Josue Caclini
Maricel Kinit
Herminia Belingon
Marcial Boteng
Espirita Umba-ang
Rona-Lee Barnigan

Ian Astrero
Arthur Idao
Lanie D. Lagaban
Bernlee D. Itok
Mowanah Marie Jovellanos



NSAP TAAL LAKE

Maria Theresa M. Mutia*, Myla C. Muyot, Mae Anne P. Gardon and Shangrilla T. Seposo

**tmmutia@yahoo.com*

Taal Lake is the third largest lake in the country with an area of 24,356.4 ha. There are nine towns and two cities that surround the lake, namely: Alitagtag, Agoncillo, Balete, Cuenca, Laurel, Lipa City, Mataas na Kahoy, San Nicolas, Sta. Teresita, Tanauan City and Talisay. In its center lies the 23.8 sq.km Volcano Island which has a 1.9 km crater lake in the middle. The lake is the deepest in the country with a maximum recorded depth of 180 meters and an average depth of 65 m. There are 38 tributary rivers draining into the lake, some of which are spring waters of origin. Located at the southern portion of the lake is the 8.2 km Pansipit River which is the only drainage of the lake that empties into Balayan Bay. As a multiple-resource lake, its dominant use is fisheries of which aquaculture has flourished rapidly over the years. The resource is also used for recreation, tourism, navigation, water source for domestic and agricultural use, and source of feeds for ducks. The lake and its watershed are declared as protected areas and it is under the jurisdiction and management of the Protected Area Management

Board (PAMB) and Department of Environment and Natural Resources (DENR). In March 2007, the PAMB approved the Unified Rules and Regulations for fisheries of Taal Volcano Protected Landscape wherein provisions in Section 4 states the establishment of a Tawilis Reserve Area as designated by local executives after consultations with stakeholders and the Bureau of Fisheries and Aquatic Resources (BFAR). This reserve area was established for the protection and conservation of Tawilis fishery in the lake.

Preliminary studies on Taal Lake fishery resource assessment were done by PCTT in 1993, RRA-UPLB in 1996, Mercene in 1997. Villanueva et al (1996) determined the status of Taal Lake capture fisheries and the extent of exploitation of tawilis. Catch and length frequency data were enumerated and analyzed using the standard fish stock assessment method. In the 1990s, fish production was reported to be 8,792 MT in 1992 (Aypa, 1993) which decreased to 1,058 MT in 1999 (Mutia, 2000).

Stock Assessment of Taal Lake

In support of the management and conservation of lake's fisheries resources, the National Fisheries Research and Development Institute-National Fisheries Biological Center (NFRDI-NFBC) conducted stock assessment of fishery resources in Taal Lake for more than 10 years from 1996 to 2000, 2008 to 2011, 2014 up to the present. From 1996 to 2000, Tawilis, the most important fish species for commercial fisheries in Taal Lake, had been reported to have dramatically decreased from 744 MT to 294 MT due to illegal operations of active fishing gears and pollution loads from aquaculture (Mutia, 2004). Though species production continuously decline, population of non-native fishes in the lake was observed to be increasing in terms of species diversity. In 1997, five introduced species were recorded in the lake (Mercene 1997). In 2004, Fishbase listed 6 species that were unintentionally or deliberately introduced into the lake for various purposes.

In 2008 to 2011, a fish landed catch survey was conducted in ten landing centers around Taal Lake namely: Agoncillo, San Nicolas, Sta. Teresita, Alitagtag, Balete, Tanauan City, Lipa City, Cuenca, Talisay and Mataas na Kahoy. Sampling was done in 10 days a month at each landing site at 2 days interval during peak landing time. Five enumerators were hired to survey and record the fish catch using the fish catch survey forms. Data gathered include: catch/species composition, volume of catch, seasonal occurrence, type of gear used and fishing effort. Fish production, species composition, seasonal occurrence, relative abundance and catch per unit effort



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were determined. The survey also showed declining fish production (273.62 MT in 2010 and 459.51 MT in 2011 respectively) and there are now 14 introduced species inhabiting the lake.

In 2014, due to the alarming increase of introduced fish species in the lake which could potentially affect the native biota of Taal Lake, a landed catch survey was conducted to generate an up-to-date inventory of the introduced alien species in Taal Lake. A total of 14 landing centers in eight coastal municipalities of Taal Lake namely Agoncillo, Cuenca, Laurel, Mataas na Kahoy, San Nicolas, Sta. Teresita, Talisay and Tanauan City were surveyed. Results revealed that introduced species comprised 63% of the total fisheries production in the lake.

In 2015, the National Stock Assessment Program was expanded to include inland freshwater fisheries. Taal Lake, a freshwater inland lake with at least 2,761 sustenance fisherfolk dependent on its fishery resources, was included in the expansion. A landed catch survey was conducted in 15 landing centers in 11 coastal municipalities surrounding Taal Lake, including the whole stretch of Pansipit River. Identification of landing centers and sampling protocols are patterned upon the National Stock Assessment Method. The data gathered by the enumerators are encoded and deposited in the NSAP Database – the major repository of the collected data in NSAP. Report generation on catch composition, production, and CPUE per gear or per landing center were already automated and can be extracted directly from the database into various file extensions.



© NSAP BFAR TAAL LAKE

Landing Centers, Catch Composition, and Gear Data

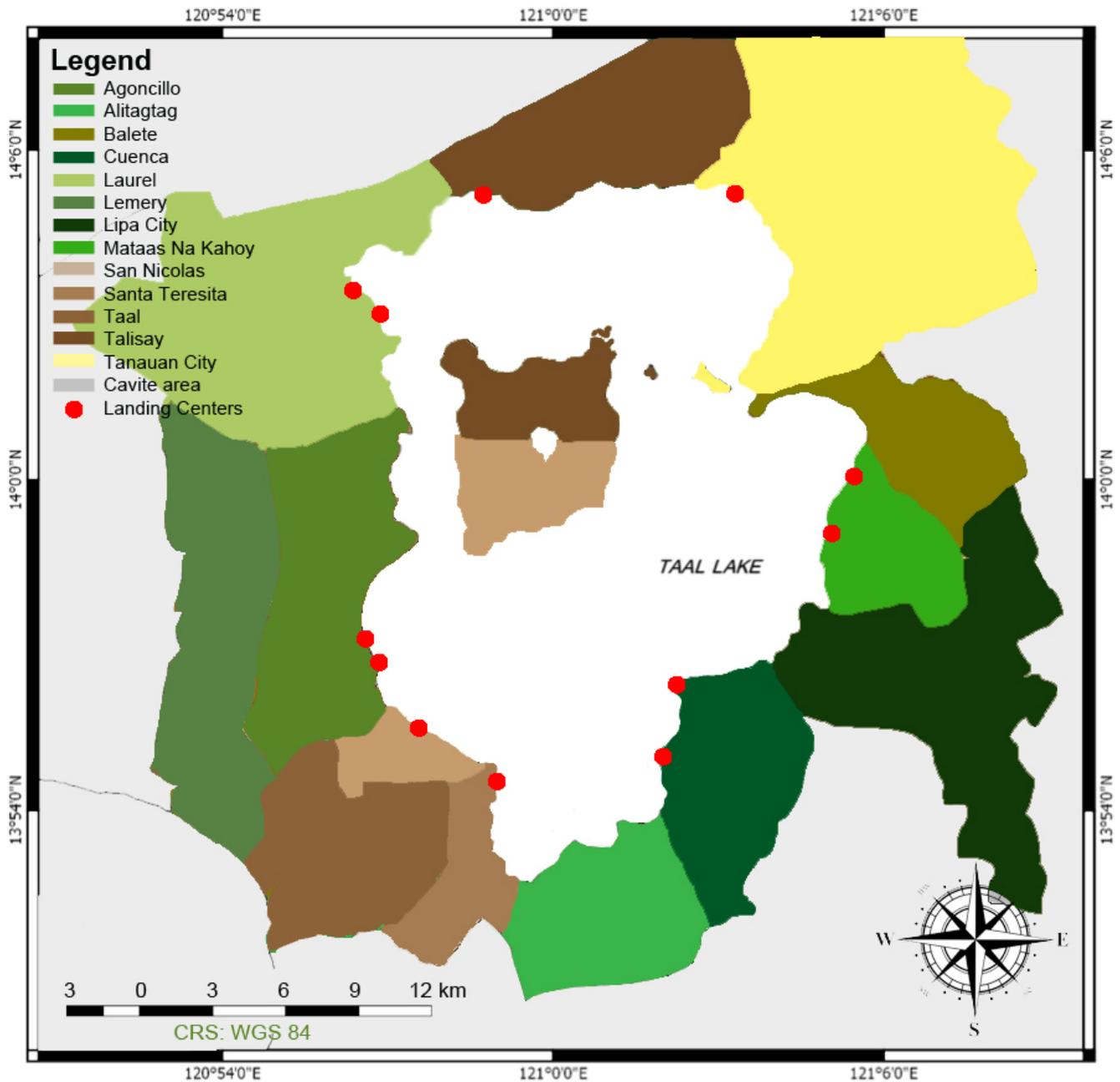


Figure 31 : GIS map of Taal Lake

A. Taal Lake Landing Centers

AGOCILLO

Subic Ilaya
Subic Ibaba

CUENCA

Napapanayan
Don Juan

LAUREL

Poblacion
Bugaan East

MATAAS NA KAHOY

Kinalaglagan
Nangkaan

SAN NICOLAS

Abelo

SAN TERESITA

Saimsim

TALISAY

Sampaloc

TANAUAN CITY

Ambulong

B. Catch composition by fish groups.

Fish Group	No. of Boats Landed (MT)	Fish Group	No. of Boats Landed (MT)
 Benthopelagics	47	 Demersal fishes	63
 Pelagics	38	 Invertebrates	2
 Small pelagics	178	 Others	12

Top 10 Landed Aquatic Species by Volume



1 *Sardinella tawilis*
Freshwater sardine
“Tawilis”



2 *Chanos chanos*
Milkfish
“Bangus”



3 *Sarotherodon melanotheron*
Black chinned tilapia
“Tilapiang arroyo”



4 *Parachromis managuensis*
Jaguar guapote
“Dugong”



5 *Oreochromis niloticus*
Nile tilapia
“Tilapia”



6 *O. niloticus x O. hornorum*
Red tilapia
“Red tilapia”, “Tilapiang goldfish”



7 *Leiopotherapon plumbeus*
Silver perch
“Ayungin”



8 *Glossogobius giuris*
Tank goby
“Biya”



9 *Apogon hyalosoma*
Humpbacked cardinal fish
“Muang”



10 *Carassius carassius*
Crucian carp
“Karpita”

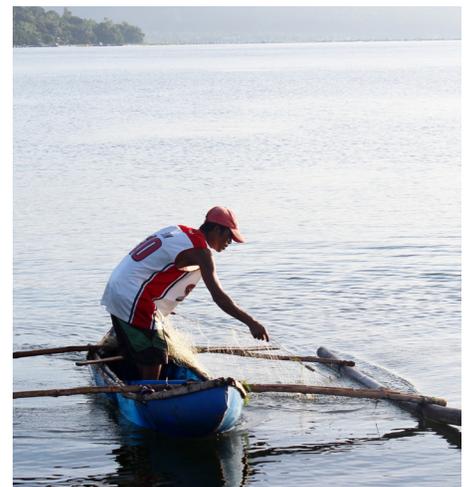
Top 6 Fishing Gears in Taal Lake



Beach Seine
“Pukot”



Fish pot
“Patanga”



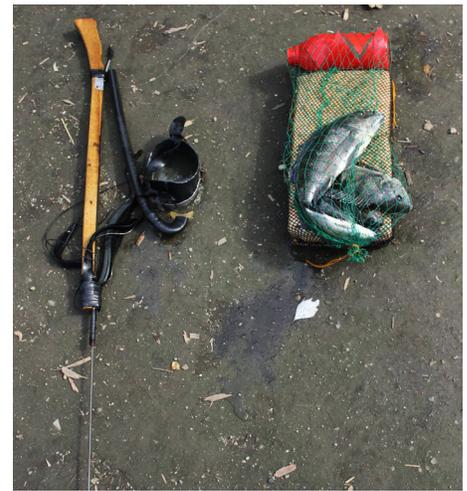
Gill net
“Pante”



Hand dredge
“Salap”



Simple Hook and Line
“Kawil”



Spear gun
“Pana”

Enumerators

Maribel M. Orense
Jay Zues S. Malones
Crisoleo P. Rosario
Elmer Mores
Paul John Caunan
Marvin M. Lumayor
Maria Gonzales

Reuel Magracia
Nea Bellones
Liandro Antig
Nerissa Faminiano
Roldan F. Monte Jr
Ligaya C. Santarin
Margielyn Muñoz

Dina Marie Pastoral
Kenneth Emer Roldan
Nelson Faminiano
Virginia Lamano
Genelyn Decena
Rosalie Ricafort

Cinderella Marasigan
Josie T. Manguiat
Adoracion Bajar
Maria Teresa M. Alcazar
Charice M. Faminialagao
Lucy D. Ren



NSAP REGION 12 - SOCCSKSARGEN (LIGUASAN MARSH)

Laila L. Emperua*, Theresa D. Angeline Balonos, Rosemarie R. Pechon, Al-Azeez T. Pautong
and Emelyn A. Donia
*bfar12.pmed@gmail.com

Liguasan Marsh is a vast complex of river channels, small freshwater lakes and ponds, extensive marshes, and arable land in the basin of Mindanao River. Although referred to as just Liguasan Marsh, the marsh actually consists of two adjoining marshy basins, Liguasan Marsh and Libungan Marsh, with different water regimes. Liguasan lies at the confluence of the Pulangi, Maganoy, Buluan and Allah rivers while Libungan lies at the confluence of Libungan and Mindanao rivers. It is also the biggest source of freshwater fish in Mindanao which has enormous value for a wide range in municipal and commercial fisheries. In fact, Liguasan marsh is the major source of livelihood in 20 municipalities and one city, and it straddles Maguindanao, North Cotabato, and Sultan Kudarat. Bautista et (1999) also stated in their socio-economic profile conducted that fishing contributed 81.5% and said to be the major source of livelihood also of the respondents.

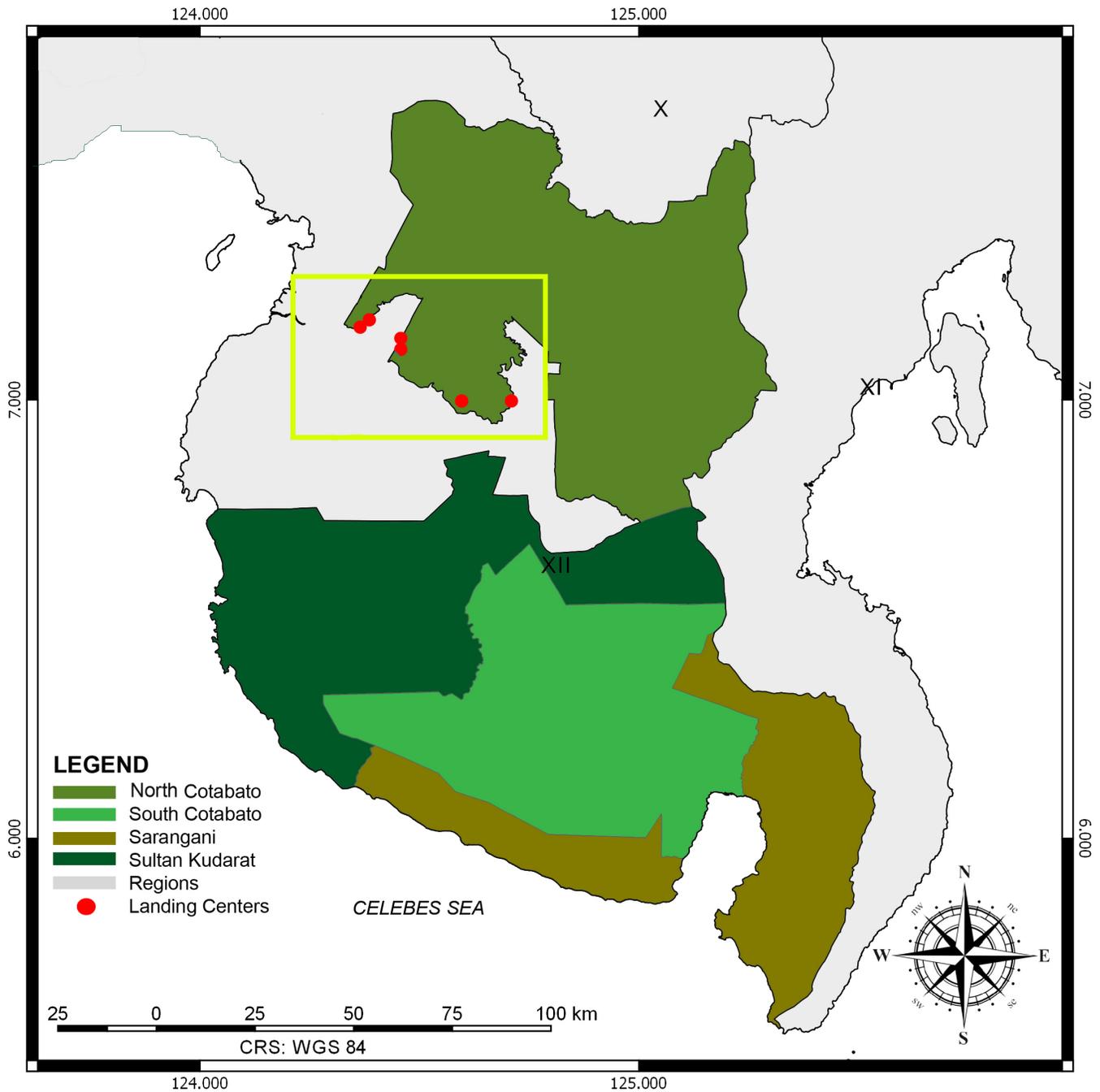
National Stock Assessment Project (NSAP) of Region 12 expansion program included the assessment for freshwater fishing areas. It was in July 2015 when the Liguasan marsh covered in the survey activities. Municipalities of Pikit, Pigcawayan and Midsayap were selected and there were six landing sites established namely: Ponol and Bangoinged in Pikit; Tombras and

Malingao of Midsayap; and Datu Mantil and Matilac for Pigcawayan.

Results of the study showed that there were 11 types of fishing gears used by fishermen operating in the marsh and electro-fishing was also noted as one of the practices in fishing in the area. Of the 11 types of gears, fish trap locally called “balyat” ranked one, followed by gill net (pukot), harvesting net or pukot also but differ in operation with the gillnet ranked third, fish corral or commonly called “tarik”, the fourth, fifth was fyke net and other gears (hook and line, encircling gill net, cast net, surface gill net and pole and line) with a total of 330 units of fishing boats were recorded. Most fishers used motorized boats than non-motorized one. (Unpublished NSAP Data, 2015-2016).

There are thirteen species monitored in the marsh with 579.14 MT catch landed. Major fish species recorded were *Cyprinus carpio* (karpa), *Oreochromis niloticus* (native tilapia), *Labeo rohita* (rohu), *Channa striata* (mudfish) and *Clarias batrachus* (hito), these top five species comprised the bulk of production in Liguasan marsh. *Cyprinus carpio* dominated the catch with 22.89 % of the total volume of catch and *Clarias batrachus* with 10.16% (Unpublished NSAP Data, 2015-2016).

Landing Centers, Catch Composition, and Gear Data



A. Liguasan Marsh Landing Centers

NORTH COTABATO

Bago-Inged, Pikit, North Cotabato
 Punol, Pikit, North Cotabato

Matilac, Pigcawayan, North Cotabato
 Datu Mantil, Pigcawayan, North Cotabato

Malingao, Midsayap, North Cotabato
 Tumbras, Midsayap, North Cotabato

B. Gear data

Fishing Gear	No. of Boats Landed	Fishing Gear	No. of Boats Landed
 Fish Trap	1563	 Cast net	28
 Gill net	835	 Fyke net	18
 Hook and Line	261	 Electrofishing	12
 Harvesting net	245	 Encircling gillnet	8
 Fish coral	191	 Pole and Line	1

Top 10 Landed Aquatic Species by Volume



1 *Cyprinus carpio*
Common carp
“Karpa”



2 *Oreochromis niloticus*
Nile tilapia
“Tilapia”



3 *Labeo rohita*
Rohu
“Mestisang bangus”, “Karpa”



4 *Channa striata*
Mudfish
“Haluan”, “Dalag”



5 *Clarias batrachus*
Walking catfish
“Hito”, “Katipa”



6 *Trichopodus pectoralis*
Snakeskin gourami
“Gorami”



7 *Anabas testudineus*
Climbing perch
“Poyo”, “Popoyo”



8 *Barbodes sirang*
Sirang
“Tumaginting”



9 *Clarias macrocephalus*
Native catfish
“Hito”



10 *Anguilla marmorata*
Giant mottled eel
“Igat”, “Kasili”

Top 3 Fishing Gears

Municipal



Fish trap
“Balyat”, “Bobo”



Gill net
“Pukot”



Harvesting net
“Ambit”

Enumerators

Laida Balabagan
Glem Hope Caballero
Jomar Maas

Landro Guiamel
Bryan Vargas
Bryan Gersalino



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NSAP REGION 13 - CARAGA (LAKE MAINIT)

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Lake Mainit (Fig. 1) is the fourth largest lake in the Philippines with a surface area of 17,060 hectares, a shoreline 62.1 km long, and a watershed area of 87,072 hectares (LMDA,2005). Twenty-eight river tributaries flow into the lake from surrounding upland areas, while only one outlet river, the 29-km long Kalinawan River, drains into Butuan Bay through Jabonga, Agusan del Norte. Lake Mainit falls within the political jurisdiction of the provinces of Agusan del Norte and Surigao del Norte in Northeastern Mindanao. Eight municipalities border the lake and comprise the Lake Mainit Watershed, namely; Tubod, Sison, Mainit, Alegria (in Surigao del Norte), Kitcharao, Jabonga, Santiago, and Tubay (in Agusan del Norte), with a total of 31 coastal or lakeshore barangays.

An ecological study of the lake (Tumanda, et al. 2004) has shown it to be oligotrophic with high transparency, sufficient nutrient supply to support high productivity and well-oxygenated freshwater of excellent quality to supply domestic uses (EMB, 2003). Lake Mainit supports a high diversity of aquatic fauna and a thriving freshwater fishery, particularly of commercially important gobies and Nile tilapia (Galicía and Lopez, 2000).

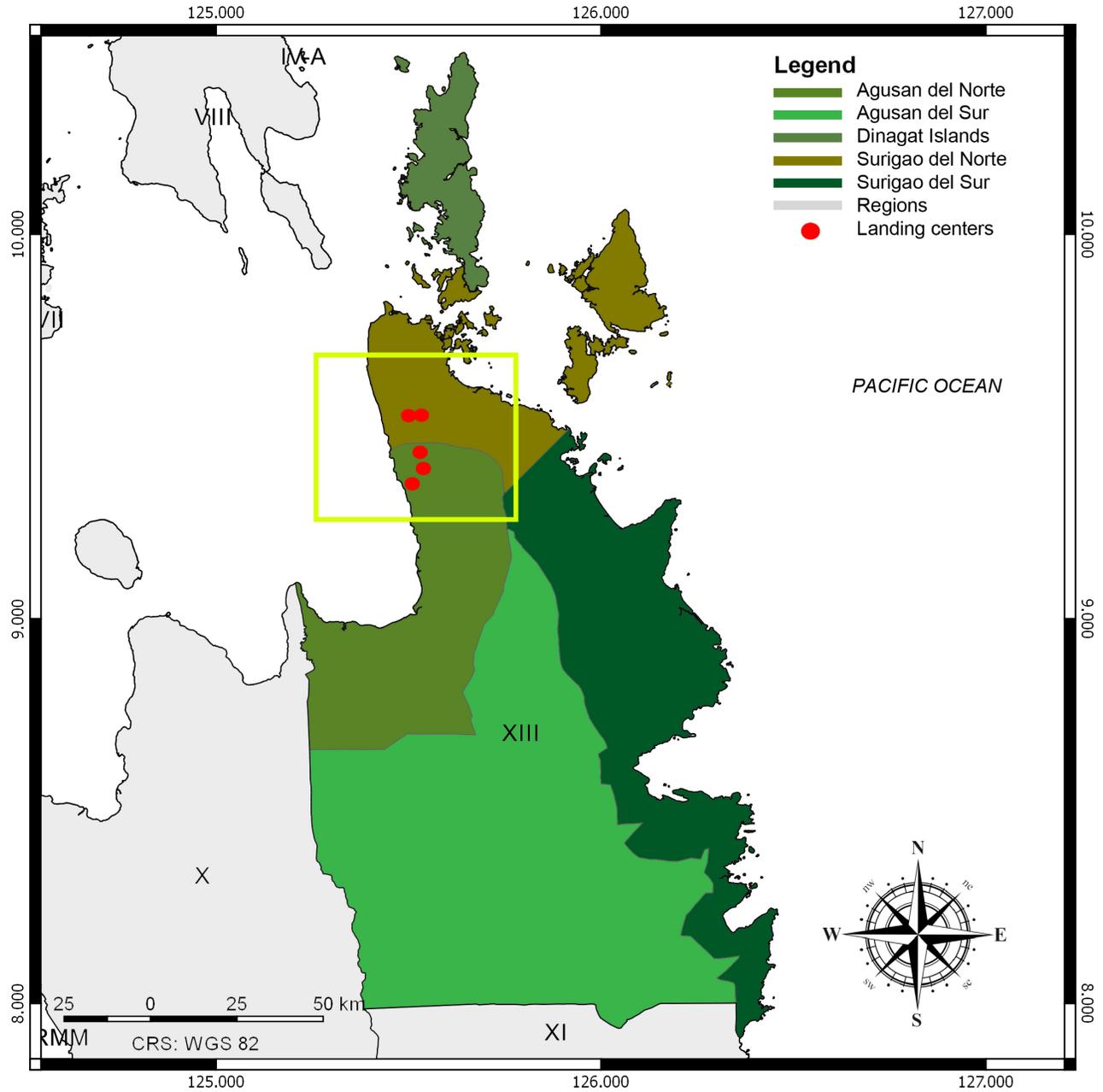
De Guzman, et al. (2008) conducted Sustainable Fisheries Management Program for Lake Mainit revealed that two species of goby, the *pijanga* (*Glossogobius giuris*) and *bugwan* (*Hypseleotris agilis*), are important native species of the lake, and still occurs but in much reduced abundance than around late 1990s (Galicía and Lopez, 2000).

Lake Mainit also faces threats of overfishing and habitat degradation due to pollution from agriculture and mining and destructive fishing practices (Walker, 2003).

In order to know the current information on the status of Lake Mainit fisheries, BFAR- Caraga, National Stock Assessment Program (NSAP) conducted the assessment in May 2014 to the present to generate reliable data as basis for the formulation of policies, management and conservation of freshwater resources to achieve sustainability. To support the management strategy, the study includes reproductive and gonadal pattern of *pijanga* and *bogwan* to understand their biology for conservation. The data collection were done by trained enumerators stationed in barangay Beltran and Poblacion Jabonga, San Roque, Kitcharao and Purok Lutos and Rosal, Mainit. Motorized and non-motorized bancas were operating which consist of 1,328 fisherfolk around the lake based on FishR.

In 2015, results show that 74% represents *pijanga* while *bogwan* only 0.82 percent which is much lower compared to the previous study. While others represent 15% and 3% for *Oreochromis niloticus* and *Cyprinus carpio*, respectively (Table 1). The area used multi-gears with eighteen types with this, boat castnets were the most dominant and most productive gear followed by set gillnets, set long lines, speargun and speargun with compressor. The most peak month which landed bulk of *pijanga* were during April, May and June, Figure 2.

Landing Centers, Catch Composition, and Gear Data



A. Lake Mainit Landing Centers

AGUSAN DEL NORTE

San Roque, Kitcharao
 Beltran, Jabonga
 Poblacion, Jabonga

SURIGAO DEL NORTE

Purok Rosal, Quezon, Mainit
 Purok Lotus, Quezon, Mainit

B. Gear data

Fishing Gear	No. of Boats Landed	Fishing Gear	No. of Boats Landed
 Boat Castnet	8,887	 Electrofishing	581
 Gill net	4,515	 Bottom Set Gill Net	421
 Fish Trap	2,543	 Bottom Set Longline	336
 Spear gun	1,574	 Scoop net	74
 Longline	1,538	 Multiple hook and line	30

Top 10 Landed Aquatic Species by Volume



1 *Glossogobius giuris*
Tank goby
“Pijanga”



2 *Oerochromis niloticus*
Nile tilapia
“Tilapia”



3 *Cyprinus carpio*
Common carp
“Karpa”



4 *Glossogobius celebius*
Flathead goby
“Pijanga”



5 *Channa striata*
Snakehead Murrel
“Haluan”



6 *Macrobrachium rosenbergii*
Giant Freshwater Prawn
“Uwang”



7 *Giuris margaritacea*
Snakehead Gudgeon
“Bogwan”



8 *Anguilla marmorata*
Giant Mottled Eel
“Kasili”



9 *Clarias batrachus*
Walking Catfish
“Bangkok”



10 *Mugil cephalus*
Flathead Grey Mullet
“Banak”

Top 3 Fishing Gears

Commercial



Boat Castnet
“Laya”



Set gillnet
“Palutaw”



Speargun
“Pana”

Enumerators

Mendoza, John Jacob
Sabanal, Jerry
Mendoza, Madel
Cosido, Irish
Naïve, Junelyn
Mecompal, Jaycie Anne
Cadelina, Cerilo
Bernaldez, Florendo
Golosinda, Remeros
Epis, Nobey
Monteros, Junelyn
Baay, Jonah Mae
Brainerd Avenido
Lelibeth Gabutero

Avenido, Brainerd
Quijado, Jestoni
Castro, Jocelyn
Florendo Bernaldez
Remirose Golosinda
Mark Alfie Malano
Doligol, Mark Anthony
Huyo, Ellie Faye
Fidelis, Renie Boy
Exclamador, Sabino
Gabutero, Lilibeth
Sayson, Robert
Renato Abreu

Quiño, Seychem
Jamero, Novie
Castaño, Tristan
Saga, Remelou Joy
Perocho, Divina
Beltran, Jean
Garcia, Alexis
Barit, Gary
Bolanio, Brylle Adam
Junelyn Monteros
Mark John Roda
Reneboy Fediles
Cirilo Cadelina

Guiral, Mylene
Ronquillo, Zaila Mae
Tatad, Maria Luz
Sabarre, Jaimesita
Guillen, Vanissa
Sumaoy, Concordio
Dumas, Renie Mae
Balus, Jose Antonio
Navarro, Agustin
Charito Jandayan
Nobey Epis
Henry Nichol Obordo
Robert Sayson



The Philippine Journal of Fisheries

Corporate 101 Mo. Ignacia Ave., South Triangle,
Quezon City Philippines, 1103

Appendix I



Republic of the Philippines
DEPARTMENT OF AGRICULTURE
Office of the Secretary
Elliptical Road, Diliman, Quezon City



1 June 1997

SPECIAL ORDER
NO. 269
SERIES OF 1997

SUBJECT : Designation of Personnel

In view of the urgency to assess the status of our marine fishery resources and to constitute a core group of technical staff in the Region who will implement the National Stock Assessment Program of the Bureau of Fisheries and Aquatic Resources in the Department of Agriculture Regional Field Units, the following technical staff are designated to implement the above mentioned Program:

National Program Coordinator : Noel C. Barut
Assistant program Coordinator : Salud R. Ganaden

DA-Regional Field Unit	Project Leader	Co-Project Leader	Asst. Project Leader
RFU-1	Rosario Segundina P. Gaerlan	Noel C. Barut	Belmor C. Bugaoan
RFU-2	Leo Palolan	November A. Romena	Lalaine Estamo
RFU-3	Lilian Rueca	John Zartiga	Nelson Bien
RFU-4	Aida P. Luistro	Salud R. Ganaden	Myrna Candelario
RFU-5	Rolando Tiam	Fe L. Gonzales	Raul Tosoc
RFU-6	May Guanco	Homerto A. Riomasos	Hanani Torilla
RFU-7	Prudencio Belga Jr.	Luz B. Regis	Dino Nunal
RFU-8	Felicitas Alducente	Grace M. De Veyra	Jane Natan-Ayon
RFU-9	Said Kalbi	Noel C. Barut	Hader Ismael
RFU-10	Evie Lumingkit	Rosita R. Calvelo	Gigi C. Albor
RFU-11	Jose Villanueva	November A. Romena	Daisy Burgos
RFU-12	Ambutong Pautong	Mudjekeewis D. Santos	Abdelnasser Tarabasa
CARAGA	Miguel Baay	Eunice C. Bognot	Edgardo P. Balambao
ARMM	Macmod Mamalankap	Mudjekeewis D. Santos	Salma Sabdani

The Project Leader, Co-Project Leader and Assistant Project Leader will initially attend to the hiring and training of the enumerators who will collect catch and effort data needed for stock assessment with the supervision of the National and Assistant National Program Coordinator. As such members of the Program shall be entitled to charge all related expenses (Incentive allowance, travel, per diem and other operating and maintenance expenses) against the funds of the respective RFUs subject to the usual Government accounting procedures. Likewise, the Regional Director and the Assistant Regional Director for Fisheries is hereby ordered to extend full support to the National Stock Assessment Program.


SALVADOR H. ESCUDERO III
Secretary

Appendix II



Republic of the Philippines
Department of Agriculture
NATIONAL FISHERIES RESEARCH AND DEVELOPMENT INSTITUTE
101 Corporate Bldg., Mother Ignacia Avenue, Quezon City
Telefax. No. (02) 352-3596



April 16, 2014

FISHERIES OFFICE

ORDER NO. 36

Series of 2014

SUBJECT : **NFRDI-NSAP Team for the Project: "Expansion of the National Stock Assessment Program (NSAP)"**

In the exigency of the service, the following personnel are hereby instructed to participate in the activities of the project: "Expansion of the National Stock Assessment Program (NSAP)" as members of the NFRDI-NSAP Team.

National Program Coordinator: Noel C. Barut

Assistant National Program Coordinator: Mudjekeewis D. Santos, Ph.D.

Technical Team:

1. Grace V. Lopez
2. Fe L. Gonzales
3. Eunice C. Bognot
4. Francisco SB. Torres, Jr.
5. Marco Perez
6. Valeriano Manlulu
7. Graceous Von Yip
8. Billy Joel Catacutan

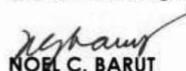
Administrative Team

1. Maria Aron C. Alcantara
2. Lilibeth C. Abina
3. John Dela Peña

This Order shall take effect immediately and remains in full force until revoked in writing.

All orders and/or memoranda inconsistent herewith are deemed revoked.

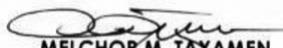
Recommending Approval:


NOEL C. BARUT
Interim Deputy Executive Director

**NFRDI-RECORDS
RECEIVED**

BY: 
DATE: 4/22/14 **TIME:** 16:04 PM

Approved:


MELCHOR M. TAYAMEN
Officer-in-Charge, NFRDI

Ensuring Sustainable Fisheries Through Research and Development



Glossary

Terminologies were acquired from Department of Agriculture's Comprehensive National Fisheries Industry Plan Medium-Term 2016-2020, (CNFIDP, 2016) and from Fisheries Code of 1998 or R.A. 8550 as amended by R.A. 10654.

A

Ancillary Industries – firms or companies related to the supply, construction and maintenance of fishing vessels, gears, nets and other fishing paraphernalia; fishery machine shops; and other facilities such as hatcheries, nurseries, feed plants, cold storage, and refrigeration, processing plants and other pre-harvest and post-harvest facilities.

Appropriate Fishing Technology – adaptable technology, both in fishing and ancillary industries, that is ecologically sound, locally source-based and labor intensive.

Aquaculture – fishery operations involving all forms of raising and culturing fish and other fishery species in fresh, brackish and marine areas.

Aquatic Pollution – the introduction by human or machine, directly or indirectly, of substances or energy to the aquatic environment which result or is likely to result in such deleterious effects as to harm living and non-living aquatic resources, pose potential and/or real hazard to human health, hindrance to aquatic activities such as fishing and navigation, including dumping/disposal of waste and other marine litters, discharge of petroleum or residual products of petroleum or carbonaceous materials/substances and other radioactive, noxious or harmful liquid, gaseous or solid substances, from any water, land or air transport or other human-made structure. Deforestation, unsound agricultural practices such as the use of banned chemicals and excessive use of chemicals, intensive use of artificial fish feed, and wetland conversion, which cause similar hazards and deleterious effects shall also constitute aquatic pollution.

Aquatic resources – includes fish, all other aquatic flora and fauna and other living resources of the aquatic

environment, including but not limited to salt and corals.

Artificial Reefs – any structure of natural or man-made materials placed on a body of water to serve as shelter and habitat, source of food, breeding areas for fishery species and shoreline protection.

B

Bag Net – a box-like net operated from the outriggers or booms of a boat with the aid of light, implementing the capture of fish by its dipping and lifting motion. The net simulates and inverted mosquito net under the boat during the operation.

Beach/Drag Seine – a drag net, consisting of a bag or bunt and two long wings flanked on both sides. Attached to the upper rim of the net is a headrope provided with wooden/plastic floats and to the lower rim is a ground rope provided with claystone or lead sinkers. The float and sinker lines are extended to the wing bridles to which are attached wooden brails. Pull ropes are tied to the brails and used to draw the net to the beach.

Bioprospecting - the research, collection and utilization of biological and genetic resources for purposes of applying the knowledge derived therefrom solely for commercial purposes.

By-product or derivatives- means any part taken or substance extracted from wildlife, in raw or in processed form. This includes stuffed animals and herbarium specimens;

C

Captive-breeding/culture or propagation - the process of producing individuals under controlled conditions or with human interventions;

Cast Net – a conically shaped net usually operated by one man by casting motion to cover a small school of fish. With the base or rim heavily weighed, a retrieving line is attached at the conical tip or apical portion.

Catch Ceilings – refer to the annual catch limits allowed to be taken, gathered or harvested from any fishing area in consideration of the need to prevent overfishing and harmful depletion of breeding stocks of aquatic organisms.

Closed Season – the period during which the taking of specified fishery species by a specified fishing gear is prohibited in a specified area or areas in Philippine waters.

Coastal Area/Zone– is a band of dry land and adjacent ocean space (water and submerged land) in which terrestrial processes and uses directly affect oceanic processes and uses, and vice versa; its geographic extent may include areas within the landmark limit of one (1) kilometer from the shoreline at high tide to include mangrove swamps, brackish water ponds, nipa swamps, estuarine rivers, sandy beaches and other areas within a seaward limit of 200 meters isobath to include coral reefs, algal flats, seagrass beds and other soft-bottom areas.

Collection or collecting- the act of gathering or harvesting wildlife, its by-products or derivatives;

Commercial Fishing – the catching of fish with the use of fishing boats with a capacity of more than three gross tons for trade, business or profit beyond subsistence or sports fishing.

Commercial scale – a scheme of producing a minimum harvest per hectare per year of milkfish or other species including those raised in pens, cages, and tanks to be determined by the Department in consultation with the concerned sectors.

Community Service – means any service or activity that is performed for the benefit of the community or its institutions in lieu of payment of fine imposed as administrative or criminal penalty.(new provision in RA 10654) (n)

Conservation and Management Measures – means

measures to conserve and manage living marine resources that are adopted and applied consistently with the relevant rules of international law including those reflected in conventions, RFMO resolutions and laws of other coastal states where Philippine flagged vessels fish.(n)

Coral – hard calcareous substance made up of the skeleton of marine coelenterate polyps which includes reefs, shelves and atolls or any of the marine coelenterate animals living in colonies where their skeletons form a stony mass. They include: (a) skeletons of anthozoan coelenterates characterized as having a rigid axis of compact calcareous or horny spicules, belonging to the genus corallium as represented by the red, pink and white corals which are considered precious corals; (b) skeletons of anthozoan coelenterates characterized by thorny, horny axis such as the antipatharians represented by the black corals which are considered semi-precious corals; and (c) ordinary corals which are any kind of corals that are not precious nor semi-precious.

Coral Reef – a natural aggregation of coral skeleton, with or without living coral polyps, occurring in intertidal and subtidal marine waters.

Crab Lift Net –a square-framed, shallow lift net used for catching crabs, which is baited, sunk to the bottom by a line and weight, and once in a while hauled abruptly to the surface thus requiring little attention.

Critically endangered species- a species or subspecies that is facing extremely high risk of extinction in the wild in the immediate future;

D

Danish Seine – fishing gear, which has comparatively long wings with extremely long ropes that keep the mouth open. Its operation is based on the principle of dragging a net to capture bottom fishes. The gear, which is operated on board a banca, has a head rope with floats and ground rope with weights. The towing rope of “hulbot-hulbot” is very long and provided with a scaring device to drive the fish toward the net.

Demarcated areas – boundaries defined by markers and assigned exclusively to specific individuals or organizations for certain specified and limited uses

such as: a. Aquaculture, sea ranching and sea farming; b. Fish aggregating devices; c. Fixed and passive fishing gears; and a d. Fry and fingerling gathering.

Demersal Fish – fish species living on or close to the seabed, which are less mobile compared to the pelagic fishes.

Distant Water Fishing – means fishing in the high seas or in waters of other states.(n)

Dredge – a pulled or pushed fishing gear made up of non-textile webs or spints in which the capture of fish is effected by raking or scratching action in the bottom of rivers, lakes and seas.

Drive-In-Net – a type of live net operated with the use of a scareline. This gear may be triangular in form and made of netting with bamboo frame, or it may be rectangular with or without a bag and usually has no frame.

E

Economically important species- species which have actual or potential value in trade or utilization for commercial purpose;

Electrofishing– the use of electricity generated by batteries, electric generators and other source of electric power to kill, stupefy, disable or render unconscious fishery species, whether or not the same are subsequently recovered.

Endangered, Rare and/or Threatened Species – aquatic plants, including some varieties of corals and sea shells in danger of extinction as provided in existing fishery laws, rules and regulations or in the Protected Areas and Wildlife Bureau of the Department of Environment and Natural Resources (DENR) and in the Convention of the International Trade of Endangered Species of Flora and Fauna (CITES).

Endangered species- species or subspecies that is not critically endangered but whose survival in the wild is unlikely if the causal factors continue operating;

Endemic species- species or subspecies which is naturally occurring and found only within specific areas in the country;

Exclusive Economic Zone (EEZ)– an area beyond and adjacent to the territorial sea which shall not extend beyond 200 nautical miles from the baselines as defined under existing laws.

Exotic species - species or subspecies which do not naturally occur in the country;

Export permit - a permit authorizing an individual to bring out wildlife from the Philippines to any other country;

F

Farm-to-Market Roads – shall include roads linking the fisheries production sites, coastal landing points and other post-harvest facilities to major market and arterial roads and highways.

Filter Net –fixed, usually conical, bag net without non-return valves, set in flowing water and the capture is implemented by straining.

Fine Mesh Nets – net with mesh size of less than three centimeters (3 cm.) measured between two (2) opposite knots of a full mesh when stretched or as otherwise determined by the appropriate government agency.

Fish – includes all fishes and other aquatic animals such as crustaceans (crabs, prawns, shrimps, lobsters, etc.) and mollusks (clams, scallops, oyster, snails and other shellfish).

Fish and Fishery/Aquatic Products – include not only finfish but also mollusks, crustaceans, echinoderms, marine mammals, and all other species of aquatic flora and fauna and all other products of aquatic living resources in any form.

Fish Cage – an enclosure which is either stationary or floating made up of nets or screens sewn or fastened together and installed in the water with opening at the surface or covered and held in a place by wooden/ bamboo posts or various types of anchors and floats.

Fish Carrier – boat/vessel that carries or buys fish from the fishing ground and brings them to the landing center.

Fish Corral or “Baklad”– a stationary weir or trap devised to intercept and capture fish consisting of rows of bamboo stakes, plastic nets and other materials fenced with split bamboo mattings or wire mattings with one or more enclosures, usually with easy entrance but difficult exit, and with or without leaders to direct the fish to the catching chambers, purse or bags.

Fish Fingerlings– a stage in the life cycle of the fish measuring about 6-13 cm. depending on the species.

Fish Fry– a stage at which a fish has just been hatched usually with sizes from 1- 2.5 cm.

Fish pen– an artificial enclosure constructed within a body of water for culturing fish and fishery/aquatic resources made up of poles closely arranged in an enclosure with wooden materials, screen or nylon netting to prevent escape of fish.

Fish Pond – a land-based facility enclosed with earthen or stone material to impound water for growing fish.

Fish worker – a person regularly or not regularly employed in commercial fishing and related industries, whose income is either in wage, profit-sharing or stratified sharing basis, including those working in fish pens, fish cages, fish corrals/traps, fishponds, prawn 6 farms, sea farms, salt beds, fish ports, fishing boat or trawlers, or fish processing and/or packing plants. Excluded from this category are administrators, security guards and overseers.

Fisherfolk – people directly or personally and physically engaged in taking and/or culturing and processing fishery and/or aquatic resources.

Fisherfolk Cooperative – a duly registered association of fisherfolk with a common bond of interest, who have voluntarily joined together to achieve a lawful common social or economic end, making equitable contribution to the capital requirement and accepting a fair share of the risks and benefits of the undertakings in accordance with universally accepted cooperative principles.

Fisherfolk Organizations – an organized group, association, federation, alliance or an institution of fisherfolk which has at least fifteen (15) members, a set

of officers, a constitution and by-laws, an organizational structure and a program of action.

Fisheries – refers to all activities relating to the act or business of fishing, culturing, preserving, processing, marketing, developing, conserving and managing aquatic resources and the fishery areas, including the privilege to fish or take aquatic resource thereof.

Fisheries Observer – refers to a person duly authorized by the Philippine government or under a Regional Observer Program of the RFMO, to collect scientific, technical or fishing-related data, and other information that may be required by the government or the RFMO and/ or in compliance to a conservation and management measure.(n)

Fishermen – a classification of workers who catch, breed and raise fish and cultivate other forms of aquatic life for sale or delivery on a regular basis to wholesale buyers, marketing organizations or at markets.

Fishery Species – all aquatic flora and fauna including but not restricted to fish, algae, coelenterates, mollusks, crustaceans, echinoderms and cetaceans.

Fishing – the catching, gathering and culturing of fish, crustaceans, mollusks, and all other aquatic animals and plants in the seas or in inland waters. It includes the catching of fish and aquatic animals, the gathering of clams, snails, shells and seaweeds; and the culturing of fish and oysters. Sport fishing or small scale fishing pursued as a hobby, is excluded.

Fishing Boat – type of watercraft, such as motorized/ non-motorized banca, sailboat, motorboat, etc., either licensed or not, or used for fishing purposes. Carrier boat used for the purpose of transporting fish in the course of fishing shall also be considered a fishing boat.

Fishing Effort – a collective variable pertaining to manpower, machine power and technology employed in harvesting fishery resource, such as number of fishing hours spent in fishing, number of units of a particular gear used, number of hauls, number of hooks, etc.

Fishing Gear – instrument or device and its accessories utilized in catching and gathering fish and other fishery species with or without the use of boat.

Fishing Grounds – areas in any body of water where fish and other aquatic resources congregate and become target of capture.

Fishing Light Attractor – refers to a fishing aid which employs lights using, among others, mercury vapor, high pressure sodium vapor, standard tungsten, tungsten halogen, fluorescent or light-emitting diode, that are attached to a structure above water or suspended underwater to attract both fish and members of their food chain to specific areas in order to harvest them.(n)

Fishing Vessel/Gear License – refers to a permit to operate specific types of fishing vessel/gear for specific duration in areas beyond municipal waters for demersal or pelagic fishery resources. (aa) 5

Fishing with Explosives –the use of the dynamite, other explosives or other chemical compounds that contains combustible elements or ingredients which upon ignition by friction, concussion, percussion or detonation of all or parts of the compound, will kill, stupefy, disable or render unconscious any fishery species. It also refers to the use of any other substance and/or device which causes an explosion that is capable of producing the said harmful effects on any fishery species and aquatic resources and capable of damaging and altering the natural habitat.

Fishing with Noxious or Poisonous Substances – the use of any substance, plant extracts or juice thereof, sodium cyanide and/or cyanide compounds or other chemicals either in raw or processed form, harmful or harmless to human beings, which will kill, stupefy, disable or render unconscious any fishery species and aquatic resources and capable of damaging and altering the natural habitat.

Fishery Management Areas– a bay, gulf, lake or any other fishery area which may be delineated for fishery resource management purposes.

Fishery Operator– one who owns and provides the means including land, labor, capital, fishing gears, and vessels, but does not personally, engage in fishery.

Fishery Refuge and Sanctuaries– a designated area where fishing or other forms of activities which may

damage the ecosystem of the area is prohibited and human access may be restricted.

Fishery Reserve– a designated area where activities are regulated and set aside for educational and research purposes.

Food Security– refers to any plan, policy or strategy aimed at ensuring adequate supplies of appropriate food at affordable prices. Food security may be achieved through selfsufficiency (i.e. ensuring adequate food supplies from domestic production), through selfreliance (i.e. ensuring adequate food supplies through a combination of domestic production and importation), or through pure importation

Foreshore Land – a string of land margining a body of water, the part of a seashore between the low-water line usually at the seaward margin of a low tide terrace and the upper limit of wave wash at high tide usually marked by a beach scarp or berm.

Fully-developed Fishpond Area – a clean leveled area enclosed by dikes, at least one foot higher than the highest floodwater level in the locality and strong enough to resist pressure at the highest flood tide; consists of at least a nursery pond, a transition pond, a rearing pond or a combination of any or all said classes of ponds, and a functional water control system and producing in a commercial scale.

G

Gill Net – curtain-like net consisting of one or more pieces of rectangular nets in which, fish capture is implemented by entanglement on the meshes of the net.

Gratuitous permit - permit issued to any individual or entity engaged in noncommercial scientific or educational undertaking to collect wildlife.

Gross Tonnage – includes the underdeck tonnage, permanently enclosed spaces above the tonnage deck, except for certain exemptions. In broad terms, all of the vessel's 'closed-in' spaces expressed in volume terms on the basis of one hundred cubic feet (that equals one gross ton).

H

Habitat - a place or environment where a species or subspecies naturally occur or has naturally established its population.

Harvest Control Rules – refers to actions or set of actions to be taken to achieve a medium or long term target reference point while avoiding reaching or breaching a limit reference point.(n)

Hook & Line – a kind of fishing gear consisting of a line, hook, and sinker that used baits of all kinds and such as worms, frogs, spiders, meat, artificial baits, etc.

I

Illegal Fishing – means fishing activities conducted by Philippine fishing vessels operating in violation of Philippine laws, Regional Fisheries Management Organization resolutions, and laws of other coastal states.(n)

Import permit- to a permit authorizing an individual to bring in wildlife from another country.

Indigenous wildlife- species or subspecies of wildlife naturally occurring or has naturally established population in the country.

Inland Fishery – the freshwater fishery and brackishwater fishponds.

Introduction - bringing species into the wild that is outside its natural habitat.

L

Lake – an inland body of water, an expanded part of a river, a reservoir formed by a dam, or a lake basin intermittently or formerly covered by water.

Limited Access – a fishery policy by which a system of equitable resource use and allocation is established by law through fishery rights granting and licensing procedure as provided by this Code.

Landing Center – place where the fish catch and other aquatic products are unloaded and traded.

Long Line – an extremely long line with a large series of baited hooks, either set or drifting and requiring only periodical attention at more or less fixed time intervals.

M

Mangroves– a community of intertidal plants including all species of trees, shrubs, vines and herbs found on coasts, swamps, or border of swamps.

Marine Protected Area – means a defined area of the sea established and set aside by law, administrative regulation, or any other effective means in order to conserve and protect a part of or the entire enclosed environment through the establishment of management guidelines. It is considered a generic term that includes all declared areas governed by specific rules or guidelines in order to protect and manage activities within the enclosed area.(n)

Maximum Sustainable Yield (MSY) – is the largest average quantity of fish that can be harvested from a fish stocks/resource within a period of time (e.g. one year) on a sustainable basis under existing environmental conditions.

Migratory species – refers to any fishery species which in the course of their life could travel from freshwater to marine water or vice versa, or any marine species which travel over great distances in waters of the ocean as part of their behavioral adaptation for survival and speciation: 7 (a) Anadromous species – marine fishes which migrate to freshwater areas to spawn; (b) Catadromous species – freshwater fishes which migrate to marine areas to spawn.

Monitoring, Control and Surveillance – a) Monitoring – the requirement of continuously observing: (1) fishing effort which can be expressed by the number of days or hours of fishing, number of fishing gears and number of fisherfolk; (2) characteristics of fishery resources; and (3) resource yields (catch); b) Control– the regulatory conditions (legal framework) under which the exploitation, utilization and disposition of the resources may be conducted; and c) Surveillance – the degree and types of observations required to maintain compliance with regulations.

Municipal fisherfolk– persons who are directly or

indirectly engaged in municipal fishing and other related fishing activities.

Municipal fishing– refers to fishing within municipal waters using fishing vessels of three (3) gross tons or less, or fishing not requiring the use of fishing vessels.

Municipal waters – include not only streams, lakes, inland bodies of water and tidal waters within the municipality which are not included within the protected areas as defined under Republic Act No. 7586 (The NIPAS Law), public forest, timber lands, forest reserves or fishery reserves, but also marine waters included between two (2) lines drawn perpendicular to the general coastline from points where the boundary lines of the municipality touch the sea at low tide and a third line parallel with the general coastline including offshore islands and fifteen (15) kilometers from such coastline. Where two (2) municipalities are so situated on opposite shores that there is less than thirty (30) kilometers of marine waters between them, the third line shall be equally distant from opposite shore of the respective municipalities.

N

Non-governmental organization (NGO) – an agency, institution, a foundation or a group of persons whose purpose is to assist peoples organizations/associations in various ways including, but not limited to, organizing, education, training, research and/or resource accessing.

P

Payao – a fish aggregating device consisting of a floating raft anchored by a weighted line with suspended materials such as palm fronds to attract pelagic and schooling species common in deep waters.

Pearl Farm Lease – public waters leased for the purpose of producing cultured pearls.

People's Organization – a bonafide association of citizens with demonstrated capacity to promote the public interest and with identifiable leadership, membership and structure. Its members belong to a sector/s voluntarily band themselves together to work for and by themselves for their own upliftment, development and greater good.

Person– natural or juridical entities such as individuals, associations, partnership, cooperatives or corporations.

Philippine waters – include all bodies of water within the Philippine territory such as lakes, rivers streams, creeks, brooks, ponds, swamps, lagoons, gulfs, bays and seas and other bodies of water now existing or which may hereafter exist in the provinces, cities, municipalities, and barangays and the waters around, between and connecting the islands of 8 the archipelago regardless of their breadth and dimensions, the territorial sea, the sea beds, the insular shelves, and all other waters over which the Philippines has sovereignty and jurisdiction including the 200-nautical miles Exclusive Economic Zone and the continental shelf.

Port State Measures – refers to the requirements established or interventions undertaken by port states, which a Philippine flagged or foreign fishing vessel must comply with as a condition for the use of ports within the port state.(n)

Post-harvest facilities– these facilities include, but are not limited to, fishport, fishlanding, ice plants and cold storages, fish processing plants.

Purse Seine– a form of encircling net having a line at the bottom passing through rings attached to the net, which can be drawn or pursed. In general, the net is set from a boat or pair of boats around the school of fish. The bottom of the net is pulled closed with the purse line. The net is then pulled aboard the fishing boat or boats until the fish are concentrated in the bunt or fish bag.

Push Net – a triangular framed, collapsible net operated by one man or a motorized boat. The capture of fish is effected by a forward horizontal motion along the bottom of the waters.

R

Reexport permit - refers to a permit authorizing an individual to bring out of the country a previously imported wildlife.

Reference Points – means benchmark values often based on indicators such as fishery stock size or the level of fishing that serves as standard to compare

estimates of a fishery stock size and fishing mortality over time depending on the biological characteristics of the species. Reference points can mark: (a) a limit or a level that should be avoided; (b) a target, which should be achieved and maintained; or (c) a trigger that signals the need to take prescribed actions.(n)

Regional Fisheries Management Organization (RFMO) – means a multi-lateral organization with responsibility to coordinate management and establish conservation and management measures for highly migratory fish stocks, fish stocks that straddle national fisheries management boundaries and other high seas species.(n)

Resource Rent– the difference between the value of the products produced from harvesting a publicly owned resource less the cost of producing it, where cost includes the normal return to capital and normal return to labor.

Ring Net - a tuck seine, which in structure combines the features of the round haul seine (that has the bunt at the center and is flanked by 2 wings) and the purse seine (that has a regular pursing device or purse rings).

Round Haul Seine – seine payed out (the cashing of the net on setting operation) in a circle or an arch of a circle, thereby surrounding the school of fish; ends of the wings are then pulled on board by one or more boats until the catch is concentrated in the bag or bunt (a part of ring net or purse seine wherein the catch is concentrate) from winch (a deck equipment used for hauling ropes such as purse line, towing rope, anchor rope of ring net, trawl and purse seine) it is brailed out. It is characterized by gear movement and/or the pursuit of target species.

S

Scoop or Dip Net – framed small bag net, with or without a handle and is used entirely by hand or partly by a dipping or scooping motion.

Sea farming – the stocking of natural or hatchery-produced marine plants or animals, under controlled conditions, for purposes of rearing and harvesting, but not limited to commercially-important fishes, mollusks (such as pearl and giant clam culture), including

seaweeds and seagrass.

Sea ranching – the release of the young of fishery species reared in hatcheries and nurseries into natural bodies of water for subsequent harvest at maturity or the manipulation of fishery habitat, to encourage the growth of the wild stocks.

Serious Violation – means any of the following violations of the provisions of this Code: (a) Fishing without a valid license, authorization or permit; (b) Fishing without reporting the catch or misreporting the catch; (c) Fishing in a closed area or during a closed season; (d) Fishing of prohibited species; (e) Fishing with the use of prohibited gear or methods; (f) Falsifying, concealing or tampering with vessel markings, identity or registration to conceal vessel identity or lack of registration; (g) Concealing, tampering or disposing of evidence relating to an investigation of a violation; (h) Assaulting, resisting, intimidating, harassing, seriously interfering with, or unduly obstructing or delaying a fisheries law enforcer, authorized inspector or observer or other duly authorized government officer; (i) Intentionally tampering with or disabling the vessel monitoring system; and 9 (j) Committing multiple violations which taken together constitute a serious disregard of this Code.(n)

Superlight– also called magic light, refers to a type of light using halogen or metal halide bulb which may be located above the sea surface or submerged in the water. It consists of a ballast, regulator, electric cable and socket. The source of energy comes from a generator, battery or dynamo coupled with the main engine. (aa)

T

Threatened species - general term to denote species or subspecies considered as critically endangered, endangered, vulnerable or other accepted categories of wildlife whose population is at risk of extinction.

Total Allowable Catch (TAC) – the maximum harvest allowed to be taken during a given period of time from any fishery area, or from any fishery species or group of fishery species, or a combination of area and species and normally would not exceed the MSY.

Trade - the act of engaging in the exchange, exportation

or importation, purchase or sale of wildlife, their derivatives or by-products, locally or internationally.

Traditional use - utilization of wildlife by indigenous people in accordance with written or unwritten rules, usage, customs and practices traditionally observed, accepted and recognized by them.

Transshipment – refers to the transfer of all or any fish or fishery product from one fishing vessel to another.(n)

Transport permit - issued authorizing an individual to bring wildlife from one place to another within the territorial jurisdiction of the Philippines.

Trawl – an active fishing gear consisting of a bag shaped net with or without otter boards to open its opening which is dragged or towed along the bottom or through the water column to take fishery species by straining them from the water, including all variations and modifications of trawls (bottom, mid-water, and baby trawls) and tow nets.

Troll Line – long handline with a hook or hooks at the free end baited with natural baits or artificial lure, and the whole arrangement is drawn or towed behind the boat in motion.

U

Unregulated Fishing –refers to fishing activities conducted by: (a) Vessels without nationality but operated by Filipino and/or Filipino corporation; (b) Philippine flagged fishing vessels operating in areas managed by RFMOs to which the Philippines is not

a party to; or (c) Philippine flagged fishing vessels operating in areas or fish stocks where there are no applicable conservation and management measures.(n)

Unreported Fishing – refers to fishing activities which have not been reported, or have been misreported to the Department, in contravention of national laws and regulations of the Philippines, or undertaken in the area of competence of a relevant RFMO which have not been reported or have been misreported, in contravention of the reporting procedures of that organization and further elaborated by regulations to be promulgated by the Department.(n)

V

Vulnerable species - to species or subspecies that is not critically endangered nor endangered but is under threat from adverse factors throughout their range and is likely to move to the endangered category in the near future.

W

Wildlife - wild forms and varieties of flora and fauna, in all developmental stages, including those which are in captivity or are being bred or propagated.

Wildlife collector's permit - take or collect from the wild certain species and quantities of wildlife for commercial purpose.

Wildlife farm/culture permit - develop, operate and maintain a wildlife breeding farm for conservation, trade and/or scientific purposes.

Reference

- Aragon, M.A., Ame, E.C., Villarao, V.B., and Ayson, J.P. 2008. Status of Fisheries Resources in Babuyan Channel, Region 2, 1999-2010.
- Barut N.C., M.D. Santos, L.L. Mijares, R. Subade, N.B. Armada and L.R. Garces. Philippine Coastal Fisheries Situation. 2003. p.885-914. *In* G. Silvestre, L. Garces, I. Stobutzki, M. Ahmed, R.A. Valmonte-Santos, C. Luna, L. Lachica-Alino, P. Munro, V. Christensen, and D. Pauly (eds.). Assessment, Management and Future Directions for Coastal Fisheries in Asian Countries. WorldFish Center Conference Proceedings 67: 1120 p
- Barut N. 2004. The National Stock Assessment Program. In: DA-BFAR.,(Department of Agriculture, Bureau of Fisheries and Aquatic Resources), In Turbulent Seas: the status of Philippine marine fisheries. Coastal Resources Management Project (CRMP), Cebu, City., p. 194.
- BFAR (Bureau of Fisheries and Aquatic Resources). 2016. Comprehensive National Fisheries Industry Development Plan: Medium Term 2016 - 2020. Bureau of Fisheries and Aquatic Resources, Quezon City, Philippines. 84 pp.
- BFAR. 1987. Fishing Boat. Technology Packaging and Information Production Section, Fisheries Extension Division, BFAR, Quezon Avenue, Quezon City.
- BFAR. 1994. Philippine Fishing Gears. Fishing Technology Division, BFAR, Quezon Ave., Q.C.
- Cabral RB, PM Aliño, ACM Balingit, CM Alis, HO Arceo, CL Nañola Jr., RC Geronimo, and MSN partners. 2014. The Philippine Marine Protected Area (MPA) Database. Philippine Science Letters. p. 300-308
- Carpenter KE, VG Springer (2004) The center of the center of marine shore fish biodiversity: the Philippine Islands. *Environmental Biology of Fish* 72: 467- 480.
- Carpenter, KE and V.G. Springer. 2005. The center of the center of marine shore fish biodiversity: The Philippine Islands. *Environmental Biology of Fishes* (2005) 72: 467–480
- Carpenter, K.E., P. H. Barber, E. D. Crandall, M. C. A. Ablan-Lagman, Ambariyanto, G. N. Mahardika, B. M. Manjaji-Matsumoto, M. A. Juinio-Meñez, M. D. Santos, C. Starger, A. H. A. Toha. 2010. Comparative phylogeography of the coral triangle and implications for marine management. *Journal of Marine Biology*. Volume 2011. Article No. 396982. 14 pages, 2011. doi:10.1155/2011/396982.
- Collette, B. & C. Nauen. 1983. FAO Species Catalogue. Scombrids of the World. FAO Fisheries Synopsis No. 125, Vol. 2. Rome.
- DENR (Department of Environment and Natural Resources), UNDP (United Nations Development Program), ACB (Asean Center for Biodiversity) and ADMU (Ateneo de Manila University). 2009. Assessing Progress Towards the 2010 Biodiversity Target; The 4th National Report to the Convention on Biological Diversity. Republic of the Philippines. 108 pp.
- FAO Species Identification Sheets for Fishery Purposes. Western Indian Ocean (Fishing Area 51). Edited by: W. Fischer & G. Bianchi. Rome, 1984. Vols. 1 to 4.
- Fox, Peter. 1985. Recommended Procedures for Collection and Processing of Raw Data for Fish Stock Assessment. RRDP Fish Stock Assessment programme.
- Garces LR, GT Silvestre, I Stobutzki, FC Gayanilo Jr., F Valdez, M Saupi, T Boonvanich, M Roongratri, P Thouc, Purwanto, I Haroon, KN Kurup, M Srinath, HAB Rodrigo, MD Santos, FSB Torres Jr., MK Tan, D Pauly. 2006. A regional database management system – the fisheries resource information system and tools (FiRST): Its design, utility and future directions. *Fisheries Research* 78. p.119-129

- Gayanilo, F.C., Jr. & D. Pauly (eds.). 1997. FAO-ICLARM Stock Assessment Tools (FiSAT). Reference Manual. FAO Computerized Information Series (Fisheries) No. 8. Rome, FAO. 262p.
- Gayanilo, F. C. Jr., Jose A. Razon, III, & N. B. Barreta. 2001. Philippines Fish Fauna Checklist. Data Management Center Doc. Ser. 12. Department of Agriculture, Bureau of Fisheries and Aquatic Resources, Quezon City, Philippines, 318p.
- Gonzales, B.J. 2004. Fisheries management in Honda Bay. p. 305-311. In DA-BFAR (Department of Agriculture-Bureau of Fisheries and Aquatic Resources). In Turbulent Seas: The Status of Philippine Marine Fisheries. Coastal Resource Management Project, Cebu City, Philippines. 378 p
- Guangco M.R., Mesa S.V., Belga P.B., and Nunal DR.M. 2009. Assessment of the Commercial Fisheries of Western and Central Visayan Sea. BFAR-NFRDI Technical Paper Series. 12 (1): 1 – 44. 101 Mo. Ignacia Ave., Quezon City, Philippines.
- Gulland, J. A. 1966. Manual of Sampling and Statistical Methods for Fisheries Biology. Part 1. Sampling Methods. FAO, Rome.
- Gulland, J.A. 1971. The fish resources of the oceans. FAO/ Fishing News Books, Surrey, United Kingdom.
- Herre, Albert. 1953. Check List of Philippine Fishes. Research Report 20. United States Printing Office, Washington 25, D.C.
- Ingles, J. and D. Pauly, 1984. An Atlas of the Growth, Mortality and Recruitment of Philippine Fishes. ICLARM Technical Reports 13: 137
- Manual for Statistical Data Collection on Tuna and Tuna-Like Species in the Indo-Pacific Region. IPTP Manual No. 2. Feb. 1984. IPTP, Colombo, Sri Lanka.
- Miyake, Makoto. 1990. FIELD MANUAL for Statistics and Sampling of Atlantic Tunas and Tuna-Like Fishes. 3rd Ed. International Commission for the Conservation of Atlantic Tunas.
- Myers N, RA Mittermeier, CG Mittermeier, GAB da Fonseca, J Kent. 2000. Biodiversity hotspots for conservation priorities. *Nature* 403: p. 853–858
- Olaño V.L., Vergara M.B. and Gonzales F.L., 2009. Assessment of the fisheries of Sorsogon Bay (Region 5). BFAR-NFRDI Technical Paper Series. 12 (4): 1 – 33. 101 Mo. Ignacia Ave., Quezon City, Philippines.
- Olaño V.L., Vergara M.B. and Gonzales F.L., 2009. Assessment of the fisheries of Lagonoy Gulf (Region 5). BFAR NFRDI Technical Paper Series. 12 (5) .101 Mo. Ignacia Ave., Quezon City, Philippines.
- Pauly D. 1984. Fish population dynamics in tropical waters: a manual for use with programmable calculators. *ICLARM Studies and Reviews*, 8, 325 p.
- Quantum GIS Development Team. 2012. *Quantum GIS Geographic Information System: QGIS 2.14.3 Essen*. Open Source Geospatial Foundation Project. <http://qgis.osgeo.org>
- Ramos M.H., Candelario M.B., Mendoza E.M., and Gonzales F.L., 2009. The Honda Bay fisheries: An assessment. BFAR NFRDI Technical Paper Series. 12 (2) .101 Mo. Ignacia Ave., Quezon City, Philippines.
- Rueca L.M., Bien N.B., Bathan R.M., Yuzon J.I. and Salamat G.B., 2009. Fish stock assessment in Northern Zambales Coast. BFAR NFRDI Technical Paper Series. 12 (3) .101 Mo. Ignacia Ave., Quezon City, Philippines.
- Russel, Barry. C. 1990. FAO Species Catalogue. Nemipterid Fishes of the World. FAO Fisheries Synopsis No. 125, Vol. 12. Rome.
- Sanciango JC, Carpenter KE, Etnoyer PJ, Moretzsohn F (2013) Habitat availability and heterogeneity and the Indo-Pacific warm pool as predictors of marine species richness in the tropical Indo-Pacific. *PLoS ONE* 8(2): e56245. doi:10.1371/journal.pone.0056245
- Santos MD and NC Barut (eds). 2017. National Stock Assessment Program: The Philippine Capture Fisheries Atlas. Bureau of Fisheries and

- Aquatic Resources - National Fisheries Research and Development Institute. Quezon City Philippines. *In press*.
- SEAFDEC & BFAR. 1995. Fishing Gear & Methods in Southeast Asia: III. Philippines. (A joint efforts of the Fishing Gear Technologists from SEAFDEC & BFAR). TD/RES/38.
- Sparre, Per & S. Venema. 1992. Introduction to Tropical Fish Stock Assessment. Part I – Manual. FAO Fish. Tech. Paper 306/1, Rev. 1.
- Sulu Sulawesi Marine Ecoregion Tri-National Committee. 2013. Strategic Action Program for the Sulu-Celebes Sea Large Marine Ecosystem. Prepared for the Sulu-Celebes Sea Sustainable Fisheries Management Project under GEF/UNDP/UNOPS. 19 pp.
- The Collection of Catch and Effort Statistics. 1980. FAO Fisheries Circular No. 730. FAO of the U.N. Rome.
- Umali, A. 1950. Guide to the Classification of Fishing Gear in the Philippines. Research Report 17. Fish & Wildlife Service, United States Department of the Interiors. U.S. Government Printing Office.

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