



**Establishment and Operation of a Regional System of  
Fisheries *Refugia* in the South China Sea and Gulf of Thailand**

**REPORT**

**FISHERIES LANDING SURVEY  
CORON, PALAWAN  
(2017-2020)**

Prepared by  
**NATIONAL FISHERIES RESEARCH AND DEVELOPMENT INSTITUTE  
PHILIPPINES**

---

SOUTHEAST ASIAN FISHERIES DEVELOPMENT CENTER  
TRAINING DEPARTMENT



First published in Phrasamutchedi, Samut Prakan, Thailand in October 2022 by the SEAFDEC-UNEP-GEF Fisheries Refugia Project, Training Department of the Southeast Asian Fisheries Development Center

Copyright © 2022, SEAFDEC-UNEP-GEF Fisheries *Refugia* Project

This publication may be reproduced in whole or in part and in any form for educational or non-profit purposes without special permission from the copyright holder provided acknowledgement of the source is made. The SEAFDEC-UNEP-GEF Fisheries *Refugia* Project would appreciate receiving a copy of any publication that uses this publication as a source.

No use of this publication may be made for resale or for any other commercial purpose without prior permission in writing from the SEAFDEC Secretary-General at.

Southeast Asian Fisheries Development Center  
Training Department  
P.O.Box 97, Phrasamutchedi, Samut Prakan, Thailand  
Tel: (66) 2 425 6100  
Fax: (66) 2 425 6110  
<https://fisheries-refugia.org> and  
<https://seafdec.or.th>

**DISCLAIMER:**

The contents of this report do not necessarily reflect the views and policies of the Southeast Asian Fisheries Development Center, the United Nations Environment Programme, and the Global Environment Facility.

For citation purposes this document may be cited as:

NFRDI/Philippines, 2022. Establishment and Operation of a Regional System of Fisheries Refugia in the South China Sea and Gulf of Thailand, Report of Fisheries Landing Survey in Coron, Palawan (2017-2020). Southeast Asian Fisheries Development Center, Training Department, Samut Prakan, Thailand; Fisheries Refugia Rep-PH68, 9 p.

## ABSTRACT

Investigating the fisheries status is a crucial step in understanding how to conserve the available resources. The present study was conducted to illustrate the catch composition, provide an overview of the fisheries status in the municipalities of Bolinao, Coron and Masinloc from 2018-2020, for the identification of priority commodities in support of the establishment of fisheries refugia in the Philippines. The study was carried out to cite fish species in each area to be prioritized for conservation. Results of the study showed the three (3) top species – *Thunnus albacares* (yellowfin tuna), *Spratelloides gracilis* (Silver-stripe round herring), and *Decapterus macarellus* (Mackarel scad) in Bolinao, Coron and Masinloc sites, respectively.

Keywords: Fisheries landing, catch composition, CPUE,

### I. Introduction

The South China Sea and Gulf of Thailand is a global centre of shallow water marine biological diversity, supporting a significant world fishery that is important to the food security of, and as a source of export income for, Southeast Asian countries. Landings from this area contribute approximately 10 percent of reported global fisheries production per annum and make significant contributions to the economies, of countries bordering the Gulf of Thailand and the South China Sea (UNEP, 2007a). Fish stocks in the South China Sea and Gulf of Thailand are subject to high levels of fishing effort, such that stocks of most economically important species are considered to be fully fished or overexploited. Increasing global demand for fisheries products; and the dependence of coastal communities on fish for food and income results in a continued increase in fishing effort. This has led to “fishing down the marine food chain in the region” (Christensen, 1998).

The South China Sea (SCS) portion of the Philippines is geographically delimited by western Luzon, Palawan, and Mindoro Occidental, covering administrative regions I and III, and parts of Region IV and the National Capital Region (NCR) (SEAFDEC, 2014). Coastal areas in the Philippines are attacked with one of the most critical challenges in the poverty of coastal communities along with the dwindling of natural resources and its habitat resulting to the increase fishing pressure therefore leading to the cumulative degradation of the fisheries resources. With the increasing demand and effort, many have resorted to targeting fish spawning and nursery grounds, despite a dearth of information of its probable location in the country.

Through the initiative of the United Nations Environment Programme (UNEP), funded by the Global Environment Facility (GEF) being administered by the Southeast Asian Fisheries Development Center (SEAFDEC), the project entitled, “Establishment and Operation of a Regional System of Fisheries Refugia in the South China Sea and Gulf of Thailand” was initiated in 2017, in order to improve the management of the fisheries resources and habitat. The fisheries *refugia* concept was defined by the RWG-F as “*Spatial and geographical, marine or coastal areas in which specific management measures are applied to sustain important species [fisheries resources] during critical stages of their life cycle, for their sustainable use*”

(UNEP, 2005) and was developed as a novel approach to the identification and designation of priority areas in which to integrate fisheries and habitat management.

The fisheries *refugia* concept focuses on the nature of the particular habitat and its critical significance to the life-history of the fished species. Management of *refugia* therefore focuses on the habitat rather than simply restricting access, either temporally or spatially, to fishing grounds. The process of identifying priority fisheries *refugia* in the Philippines was initiated via a RWG-F review of the above list of sites in relation to: information on the distribution and abundance of fish eggs and larvae in the South China Sea; and the outcomes of country consultations on the identification of fisheries *refugia*.

This assessment presents the most recent data on the status of the landed catch and effort in the West Philippine Sea. The main objective of this study is to assess the fisheries landed catch and effort in the proposed refugia sites in the Philippines in order to establish baseline data for the management of the priority species in the sites.

## II. Materials and Methods

### Study Site

The three proposed fisheries refugia sites in the Philippines were Bolinao, Pangasinan, Coron, Palawan and Masinloc, Zambales (Figure 1). Identification and selection of the sites involved a series of consultation participated by the representatives from local government units, academe, regional government agencies, law enforcers, fisherfolk organizations, non-governmental organizations, people's organization, and national fishery committee members to create an agreement with the local legislative bodies of each municipalities. For each site, there were both commercial and municipal landing centers which served as the sampling area.

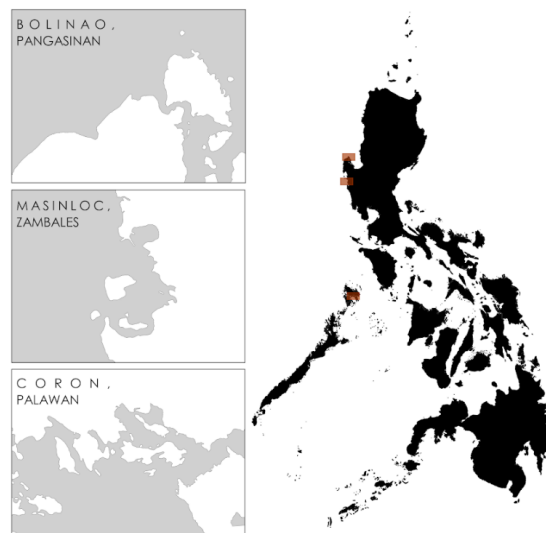


Fig. 1. Fisheries Refugia Sites in the Philippines

Survey Design (adapted from NSAP, 2017)

Catch and fishing effort were gathered by the technical enumerators assigned in each site. The sampling was conducted every other two days, regardless of the time of day, weekends and holidays. A total of twenty (20) sampling days were conducted throughout the month. Non-sampling days are utilized for report generation validation, and transferring of raw data to four (4) NSAP forms. After a month of sampling, the raw data is submitted to the data analyst for encoding in the NSAP Database.

#### Data Analysis

Selected performance indicators were analyzed using length frequency data of four selected species (*Decapterus macarellus*, *Spratelloides gracilis*, *Katsuwonus pelamis*, *Thunnus albacares*) from the collected data in Coron, Palawan and Masinloc, Zambales. FiSAT II software, Froese, Length average, and processed EDF's tool FISHE (Framework for Integrated Stock and Habitat Evaluation) were also used to determine Key Performance Indicators (KPIs): Average length, Fishing mortality, Percent mature, Length optimum (Lopt), Percent mega-spawners, Exploitation Rate, Catch per unit effort (CPUE). Fishing gear efficiency in terms of catch were used to analyze catch rate in three (3) fisheries refugia sites using catch/boat/year. Handline and spear gun were analyzed in Bolinao, Pangasinan; bagnet in Coron, Palawan, and ring net in Masinloc, Zambales.

### III. Results

#### A. Coron, Palawan

##### a) Landed Catch and Effort Monitoring

A total landed catch of 1058 mt was recorded from the 3 fishing ground in Coron Palawan being monitored by the Technical Data Enumerators from 2017 to 2020. The highest catch was observed in Coron Bay (868 mt) followed by West Philippine Sea with 146 mt then Culion Bay (44 mt) as the least.

##### b) Relative Abundance

Coron Bay consistently contributed the highest landed catches in 2017 to 2020. It was followed by the West Philippine Sea with only 10 months data collection covered from 2018 to 2020. The least catch was recorded in Culion Bay due insufficient collected data (Figure 2). Abrupt decrease of catch in 2020 was affected by *CoronaVirus Disease-2019 (CoViD-19)* pandemic.

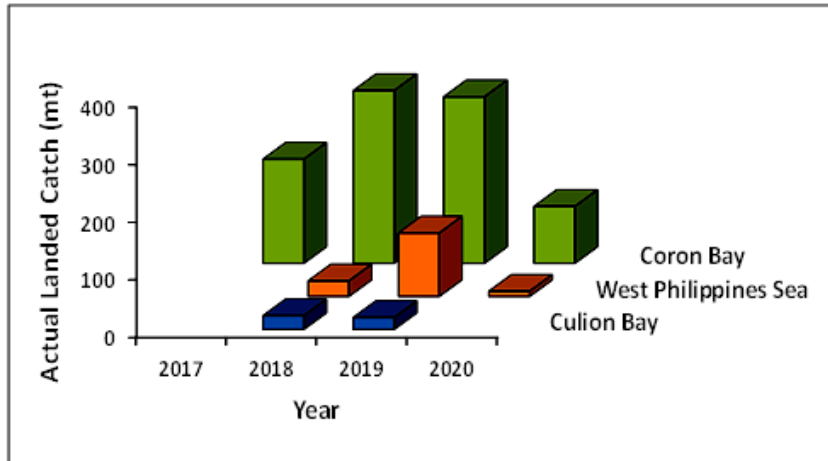


Fig. 2. Actual landed catch from different fishing grounds in Coron, Palawan (2017-2020)

A total of 19 types of fishing gear were recorded operating in Coron Palawan dominated by bag net (57%) followed by hand line (8%), spear gun and multiple handline equally shared about 7%. Bag net was the major fishing gear used by the fishermen in Coron bay while in West Philippine Sea was hand line with payao and bottom gillnet in Culion bay. Handlines with payao, bagnet, and bottom gillnet were all selective and passive gear.

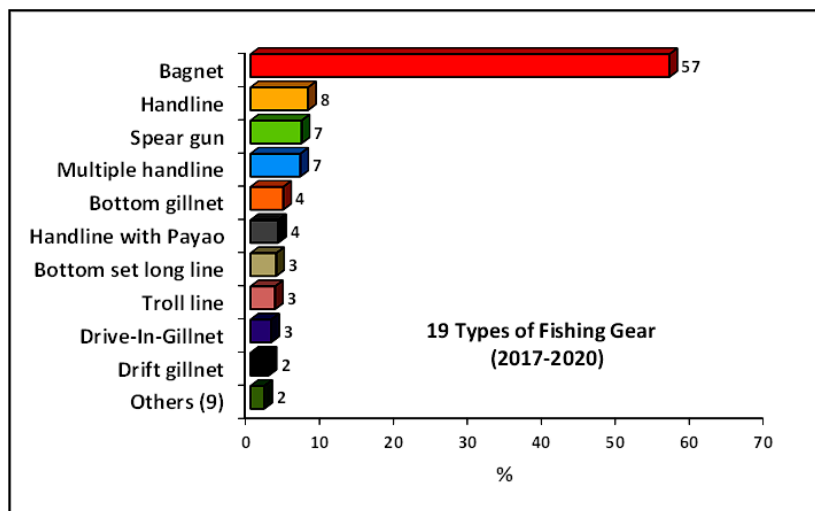


Fig. 3. Catch contribution of fishing gears in Coron, Palawan (2017-2020)

A total of 435 types of species under 6 species group were recorded in the landed catch of Coron Palawan it was dominated by demersal fishes (62%) followed by pelagic fishes (24%) then oceanic tuna (9%). However in terms of species catches, pelagic fishes were the most dominant with 5 types included in the top 10 dominant species. *Spratelloides gracilis* (silver-stripe round herring) dominated the catch which shared about 30% of the total catch followed by *Thunnus albacares* (yellowfin tuna, 6%), and *Encrasicholina punctifer* (buccaneer anchovy, 5%). The other top ten species are shown in Figure 4.

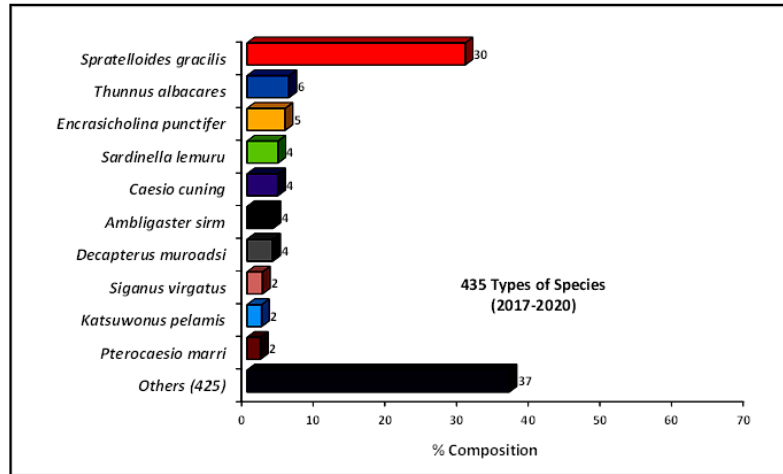


Fig. 4. Percent contribution of fish species caught in Coron, Palawan (2017-2020)

Variation in species dominance by fishing ground was observed. In Coron bay, the top dominant species were *Spratelloides gracilis* (silver-stripe round herring, 37%) followed by *Encrasicholina punctifer* (buccaneer anchovy, 6%) and *Sardinella lemuru* (bali sardinella, 5%). In West Philippine Sea, the catch was dominated by *Thunnus albacares* (yellowfin tuna) which shared about 40% of the total catch followed by *Decapterus maruadsi* (Japanese scad, 21%), *Katsuwonus pelamis* (skipjack tuna, 12%), while in Culion bay it was also dominated with these siganids species *Siganus canaliculatus* (white-spotted spinefoot) which shared about 15% of the total catch followed by *Siganus guttatus* (orange-spotted spinefoot, 12%) and *Amblygaster sirm* (spotted sardinella, 8%) (Figure 5).

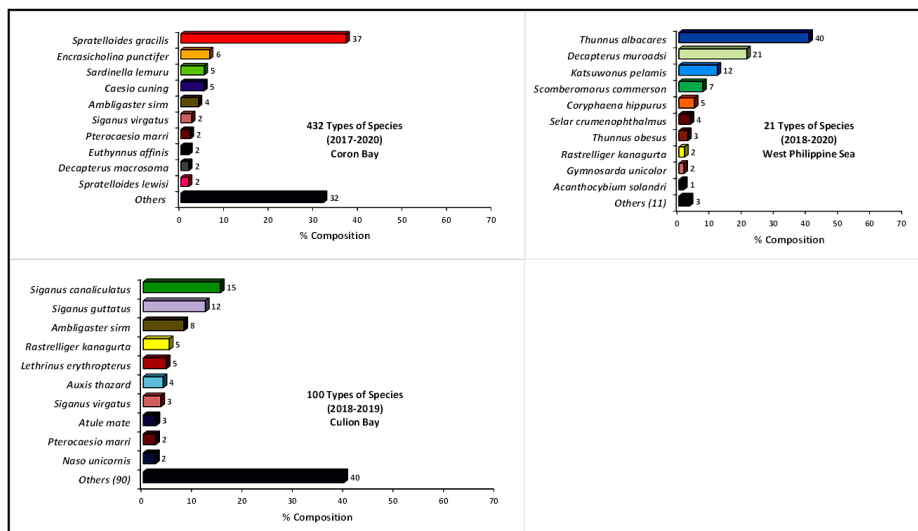


Fig. 5. Relative abundance of top ten dominant species in Coron, Palawan by fishing ground (2017-2020)

c) Catch rate (CPUE)

Catch per unit effort bag net was used to compute the catch per unit effort. The CPUE annual average was 3.75 catch/boat/year with an annual average effort of 44 fishing boats or 1 fishing boat per day. Decreasing trend of CPUE was observed

with increasing fishing effort from 2017 to 2019. However, data collected in 2020 was limited covering only a few months. Still, the results indicate fishing pressure using this selective gear (Figure 6).

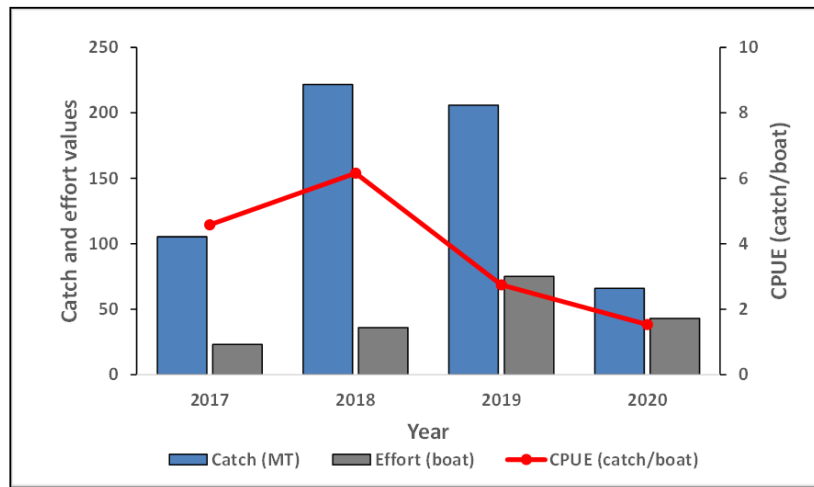


Fig. 6. Catch per unit effort (CPUE) (catch/boat/year) of bag net in Coron, Palawan (2017-2020)

**d) Estimation of Growth, Mortality Parameter and selected Performance Indicators (PIS)**

Table 1. Estimation of Growth, Mortality Parameter and selected Performance Indicators (PIS) of *Spratelloides gracilis* (Silver-stripe round herring) from 2017-2020 in Coron Bay.

Performance Indicators	Target Reference Point	Trigger Reference Point	Limit Reference Point	Results				Inter-pretation	Assessment Method
				2017	2018	2019	2020		
Average Length (cm), where Lm=6.9	Above Lm and Increasing	Decreasing	Below Lm and Decreasing	5.61	5.96	5.59	6.37	∞	LBAR/LF Data
Fishing Mortality	F=M or F/M ≤ 1		F=M or F/M ≥ 1 or 2	3.82	4.98	1.78	1.79	∞	FROESE
Percent Mature	90-100% mature;	51%-89%	50% mature and less;	0.02	0.24	0.10	1.21	∞	
±10% of Length Optimum, where Lopt=7.9 cm	100%	81%-99%	80% and less	56.76	43.23	56.44	30.95	∞	
Percent Megaspawner	30-40% megaspawner		20% megaspawner	34.44	51.71	31.75	67.96	∞	LBAR/LF Data
Exploitation	E = 0.5		E = 0.6	0.79	0.83	0.64	0.64	∞	

A total of 22,223 pieces of *Spratelloides gracilis* (Silver-stripe round herring) caught using bagnet in Coron Bay were measured and analyzed to determine the length-based estimates of growth parameters, mortality estimates and selected performance indicators which used to measure and assess the fishery status of this species. The collected samples have a size ranging from 2.75 cm – 8.75 cm. Table 1 shows the results of selected PIs wherein the average length, fishing mortality, percent mature, length optimum, and exploitation rate were already in limit reference point or



in danger zone. However, an increasing trend of percent mega-spawners were observed, this is evidence that old or large fish play a vital role in the long-term survival of the population and appropriate fisheries management is necessary to improve performance of this species.

#### IV. Documentation

