# COUNTRY REPORT ON RESEARCH PLAN FOR FISHERIES RESOURCES SURVEY AND STUDY ON FISH STOCK IDENTIFICATION IN INDONESIA

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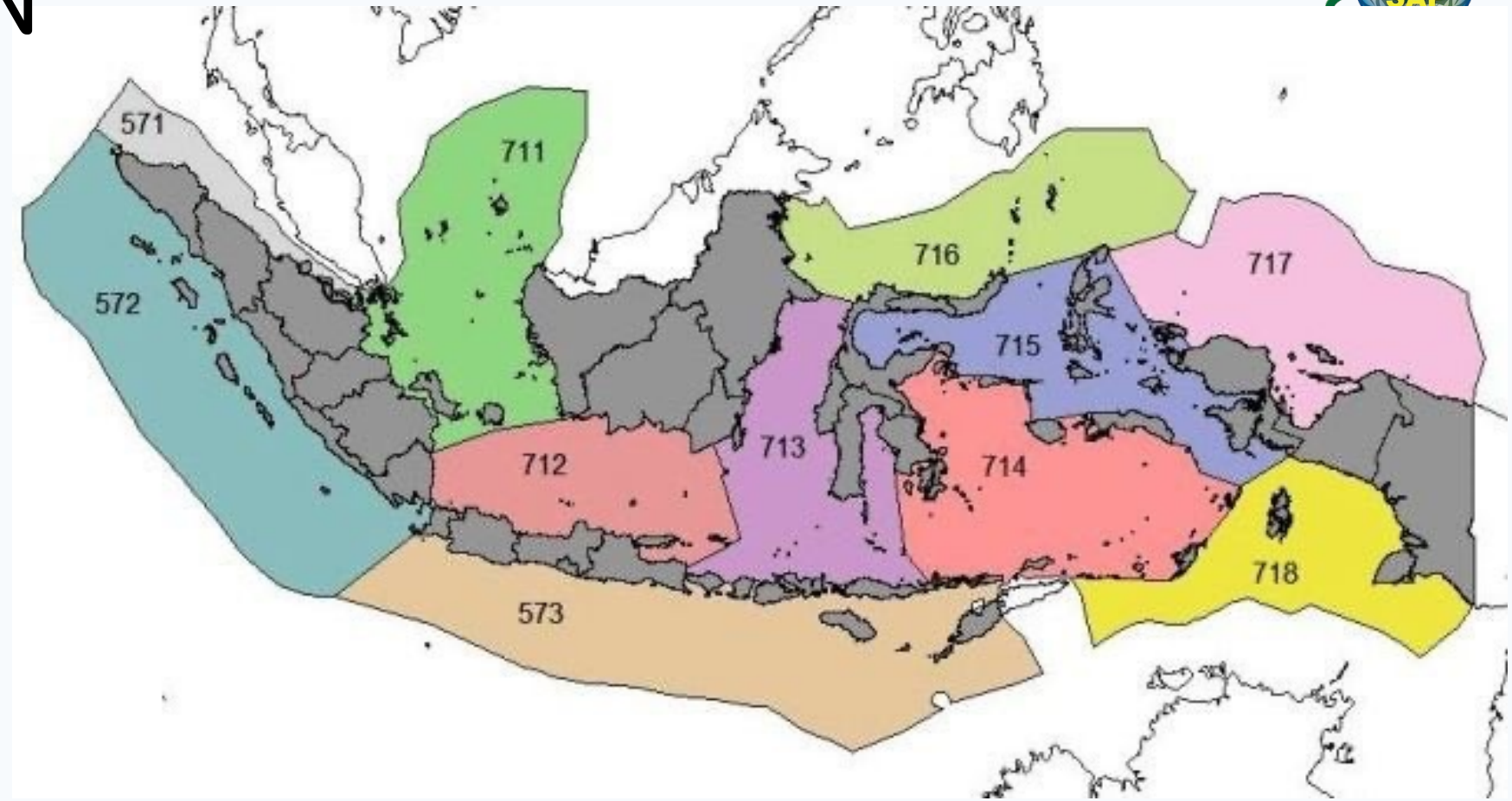
# OUTLINES

- Introduction
- Recent research in fish stock study
- Some fisheries information
- Marine Fisheries Production in Indonesia
- Research Plan

# INTRODUCTION




Indonesia's marine waters have a large area with diverse biological, ecological, social, and economic characteristics and divided into 11 Fisheries Management Areas (FMA) (the Regulation of the Minister of Marine Affairs and Fisheries No. 18 / Permen-KP / 2014). This measure is taken to optimize management in the framework of sustainable fisheries.

# MARINE AND FISHERIES RESEARCH DIRECTION

**Policy Direction**

Improvement of maritime, fisheries and marine management

(National Mid-Term Development Plan 2020-2024)

**STRATEGIES**

- **Strengthening Of Fish Resource Stock Data And Development In Fisheries Management Area**
- Fisheries Management In Inland Waters
- Completion Of Marine Zoning Plans
- Strengthening Management And Sustainable Use Of Marine Protected Areas
- Increasing The Use Of Marine Bioproducts And Biotechnology.
- Acceleration Of Aquaculture Production
- Digital-based Fisheries Development
- Salt Land Extensification And Intensification
- Development Of Marine And Fishery Centers
- Ease Of Business Facilitation And Investment In Providing Insurance For Fishermen And Fish Cultivators
- Digital-based Training And Counseling
- Strengthening Vocational Education
- Research And Innovation Development
- Strengthening Marine and fisheries database, etc

**The fundamental study in fisheries management is the study of fish stock (Begg & Waldman, 1999)**

# Recent Research in  Fish Stock Study

- **Catch data and fish biology analysis**

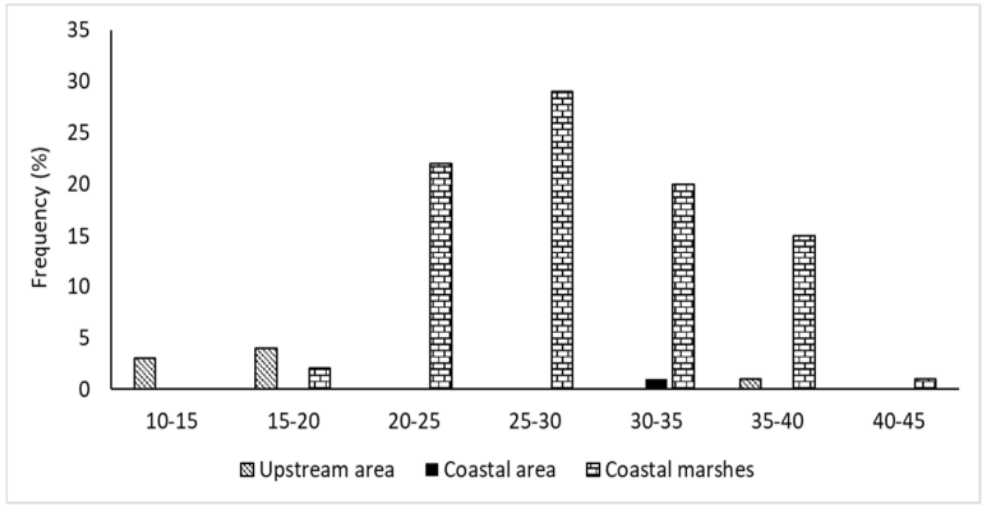
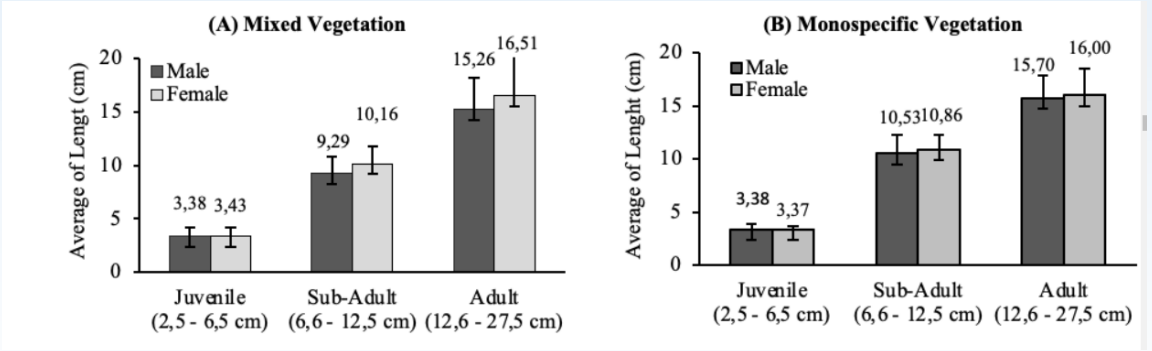
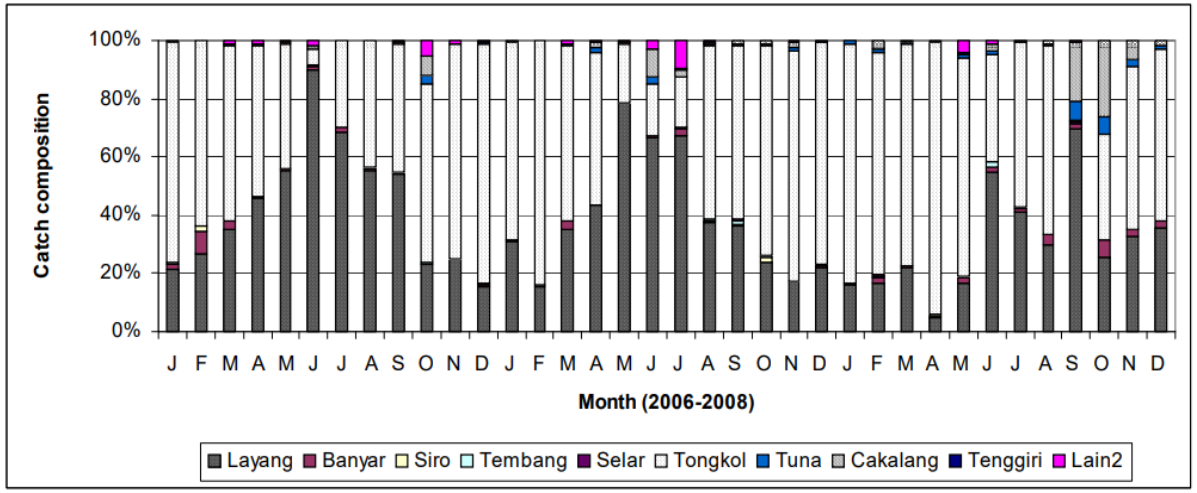



**Fig. 2.** Eel's size distribution, based on three zones; upstream area, coastal area, and coastal marsh.

Eel's size distribution (Putri & Syamsudin, 2021)




Comparison average length *Siganus canaliculatus* in Ambon (Latuconsina *et al.*, 2022)




Monthly catch composition of the small purse seine from Kendari waters and surrounding (Hariati, 2011)

- **Acoustic method**

The application of the acoustic method in estimating fish stocks has several advantages: the production of data is fast, in situ, relatively accurate, and does not harm the fish resources observed (Priatna & Wijopriono, 2011)

- **Parasites occurrence**

The species composition and abundance of parasites may differ between fish stocks due to biogeography, differential environmental tolerances of parasites, differences in availability of intermediate hosts, and different life history characteristics of the fish stocks themselves (Begg and Waldman, 1999

Figure 2. *Didymosulcus* type 1, a didymozoid *in situ* in the gills.

Figure 3. *Didymosulcus* type 2, a didymozoid *in situ* in the gills..

Figure 4. *Didymosulcus* type 3, a didymozoid from the gills.

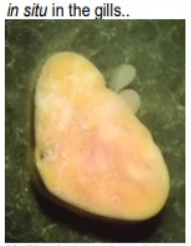
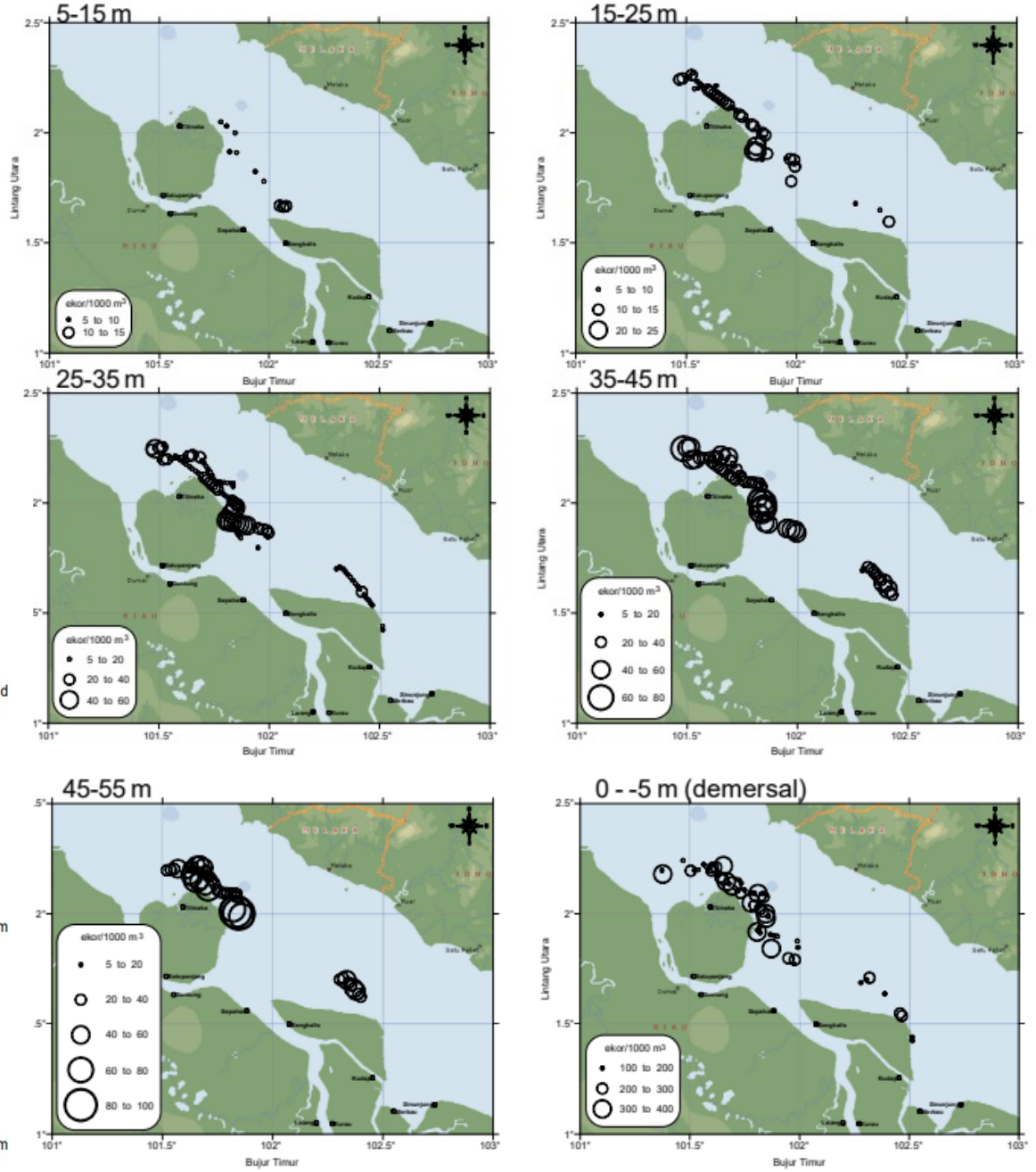


Figure 5. *Kollikeria* type 1, a didymozoid from the stomach wall.

Figure 6. *Kollikeria* type 2, a didymozoid *in situ* in the liver.

Figure 7. *Kollikeria* type 3, a didymozoid from the pyloric caeca.

parasites found in Tuna (Lestari *et al.,* 2017)




Gambar 3. Sebaran spasial ikan pelagis dan demesal.
*Figure 3. Spatial distributions of pelagic and demersal fish.*

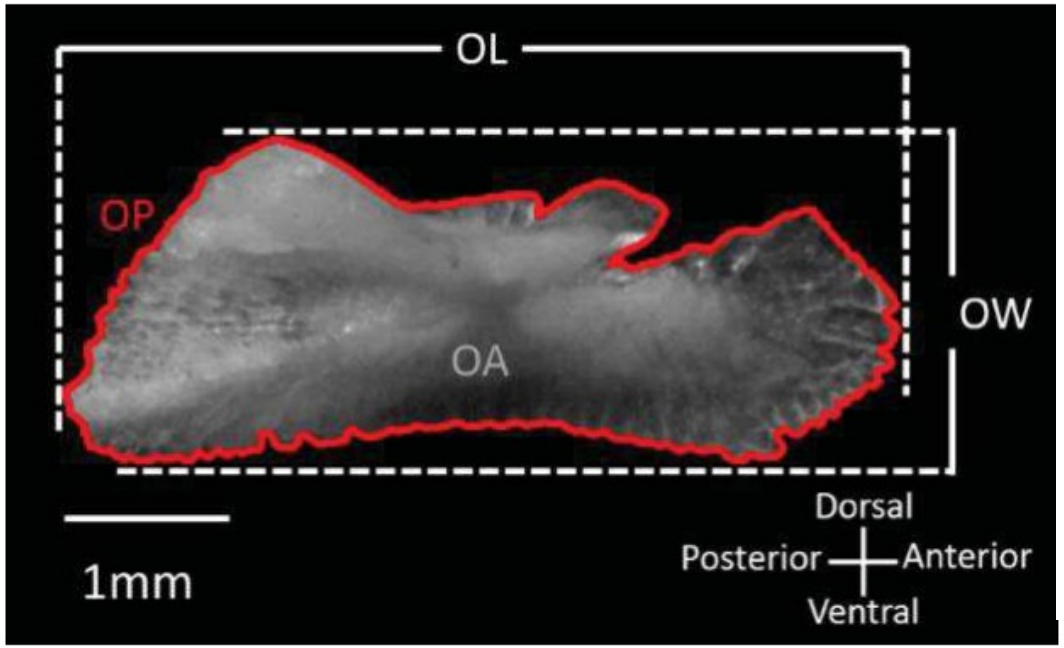
- **Morphology (Meristic and morphometric)**

Meristic and morphometric expression of fishes is controlled by genetic and environment factors (Begg & Waldman, 1999). The example from comparison between morphometric and meristic character of Decapterus macrosoma of Makassar Strait and Bone Bay, South Sulawesi, Indonesia that show differences of morphometric character (Dahlan *et al.*, 2014).

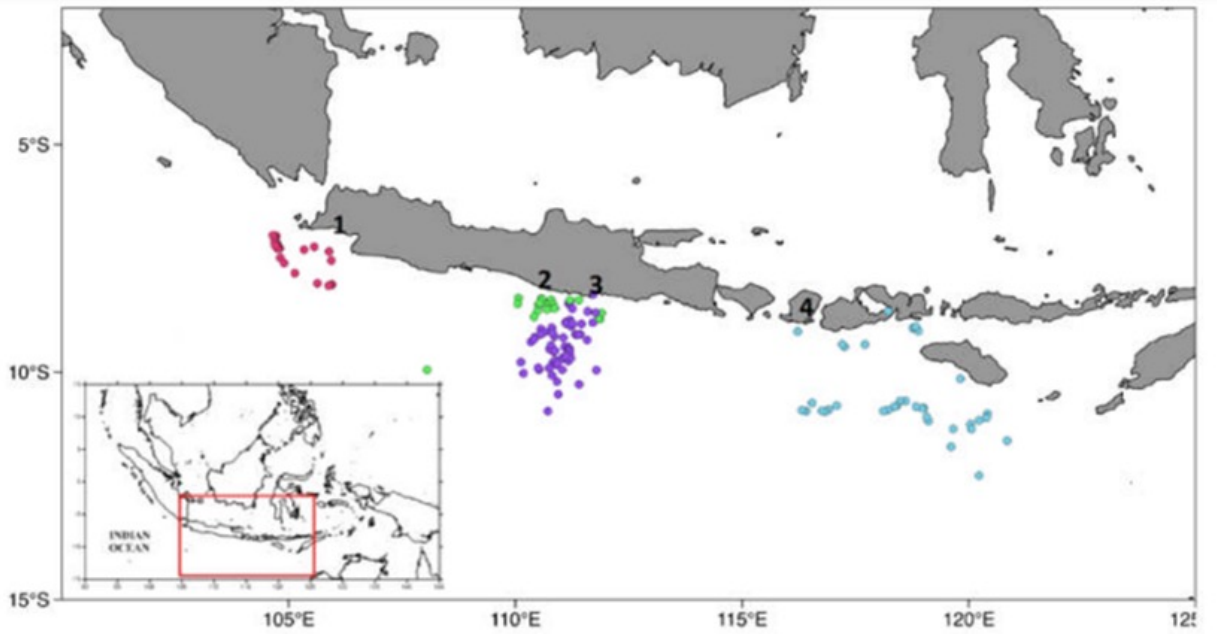
| Characterstic | Range (mm) | |
|---|---|---|
| | Makassar Strait | Bone Bay |
| Total length (mm) | 149 – 188 | 163 – 280 |
| Standard Length (mm) | 126 – 153 | 137 – 235 |
| **Counts:** | | |
| Dorsal fin rays | VIII + I, 32-35 | VIII + I, 32-34 |
| Anal fin rays | II, I 27 - 29 | II, I 27 – 30 |
| Caudal fin rays | 22- 24 | 22- 26 |
| Ventral fin rays | 12 - 14 | 12 – 14 |
| Pectoral fin rays | 22-23 | 22-23 |
| Scales on lateral line | 64 - 106 | 68 – 106 |
| Scales above lateral line | 14 -30 | 17 – 38 |
| Scales below lateral line | 28 - 70 | 32 – 65 |
| Scales before dorsal fin | 13 - 26 | 18 – 35 |
| Scales on caudal peduncle | 19 - 36 | 21 – 38 |
| **Measurement:** | | |
| Dorsal fin base length | 43.53 – 53.32 | 43.98 – 51.49 |
| Pectoral fin base length | 2.94 – 4.08 | 2.60 - 4.71 |
| Pelvic fin base length | 1.76 – 3.14 | 21.75 – 2.61 |
| Anal fin base length | 23.95 – 30.47 | 24.46 – 26.94 |
| Predorsal length | 28.41 – 34.87 | 29.24 – 32.33 |
| Caudal peduncle length | 3.47 – 4.72 | 4.82 – 6.22 |
| Preopercle length | 7.09- 10.31 | 6.15 – 9.14 |
| Body Depth | 13.9 – 18.52 | 14.11- 17.81 |
| Longest pectoral-fin length | 13.68 -16.51 | 12.21 – 15.31 |
| Longest pelvic-fin length | 8.35-10.19 | 7.11 – 9.00 |
| Longest dorsal-fin base length | 9.14 – 12.86 | 10.52 – 12.62 |
| Longest dorsal-fin rays length | 6.36 – 9.12 | 7.04 – 10.14 |
| Longest anal-fin spine length | 2.36 – 3.30 | 1.43- 2.50 |
| Longest anal-fin ray length | 7.11 – 8.93 | 6.51 – 7.48 |
| Caudal peduncle depth | 2.20 – 3.14 | 2.23 -3.47 |
| Head length | 18.27 – 24.81 | 19.61- 22.93 |
| Snout length | 4.14 – 5.22 | 2.99 – 3.55 |
| Postorbital length | 9.21 -11.00 | 9.63 – 11.21 |
| Upper jaw length | 5.60 -6.92 | 5.78 – 7.22 |
| Lower jaw length | 5.70 – 7.08 | 3.65 – 5.63 |
| Interorbital length | 1.14 – 1.98 | 0.98 – 1.61 |
| Head depth | 13.72 – 14.69 | 12.95 – 13.53 |
| Eye diameter | 1.66 – 2.91 | 1.94 – 2.84 |
| Head width | 8.45 – 10.00 | 10.64 – 12.20 |

- **Scale and otolith analyses**

The otolith shape analysis technique is still relatively rarely used in Indonesia, but is considered more efficient in terms of cost, labor, and length of analysis time. Wujdi et al. (2017), analyzed the structure of skipjack tuna stocks in the Indian Ocean using otolith shape analysis, and the result shows a single skipjack tuna in Indian Ocean




Measurement axes for otolith morphometry of skipjack tuna (*K. pelamis*) (Wujdi *et al.* 2018)

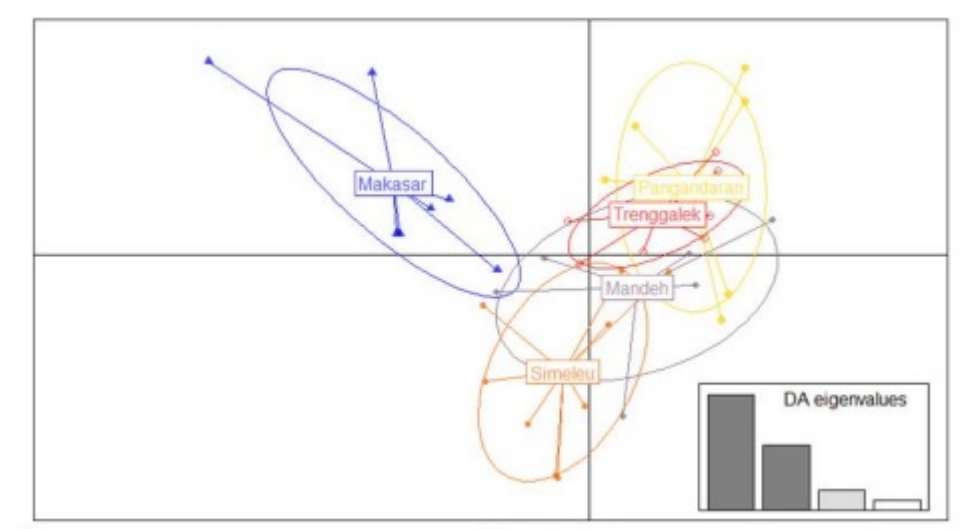


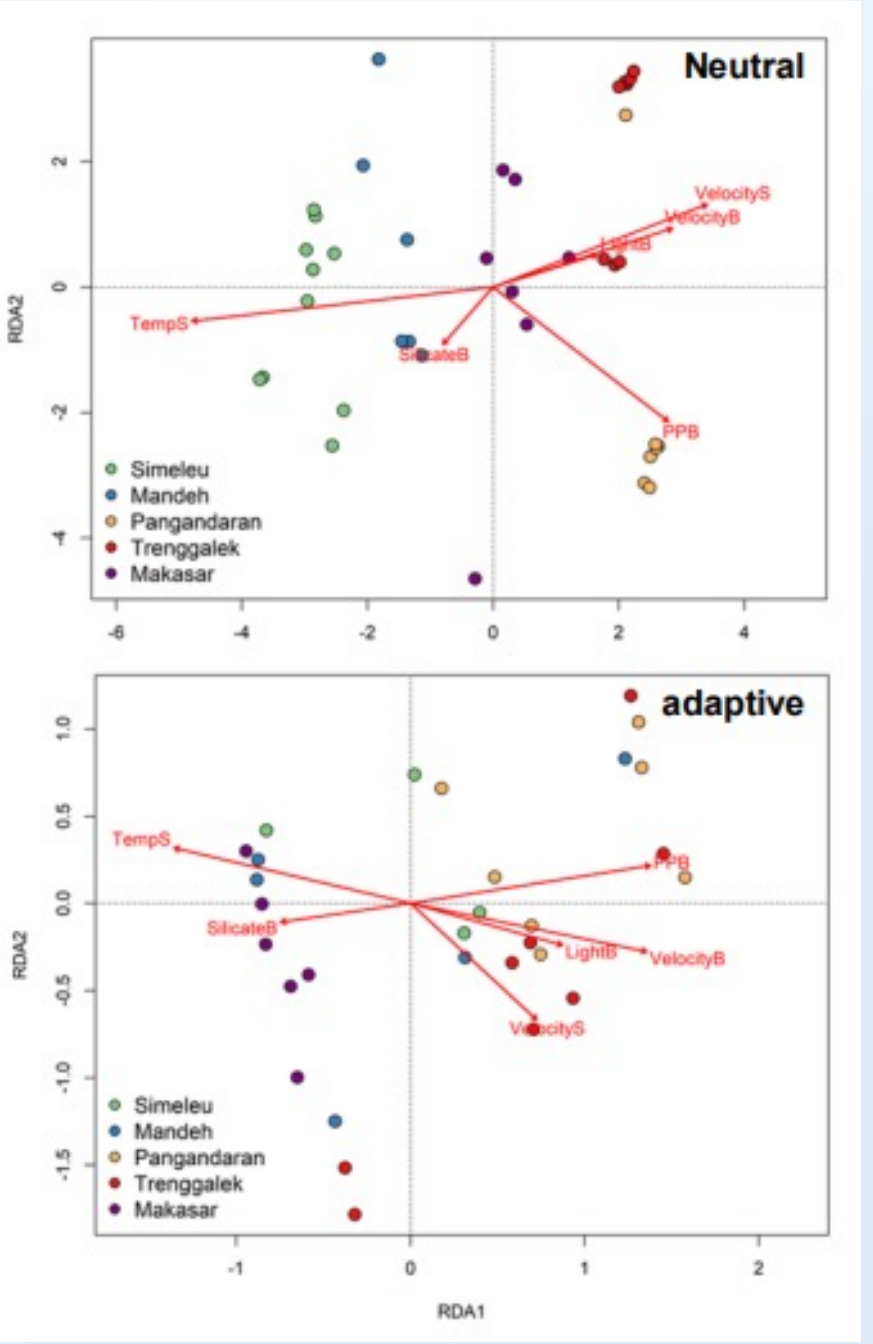

Sampling location for skipjack tuna (K. pelamis) otoliths:

(1) Binuangeun, (2) Sadeng, (3) Prigi, dan (4) Labuhan Lombok.

- **Genetics**

The identification of marine organism in Indonesia was also conducted using molecular approach. One of the genetic population study conducted on Spiny lobster (*Panulirus homarus*) using Whole Genome SNP (~33K SNP) revealed structured population indicated separated stock from several population as well as acquired information regarding the potential environment factors affected the population as the response of local adaptation (Indriatmoko, 2022).



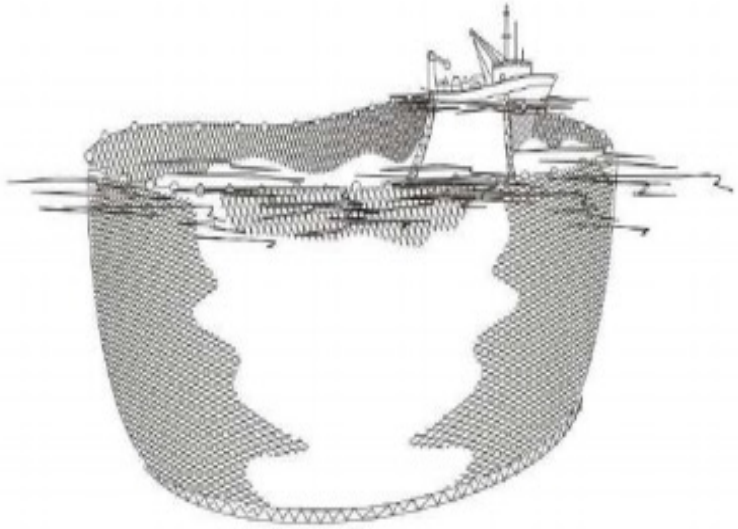



# FISHERIES INFORMATION

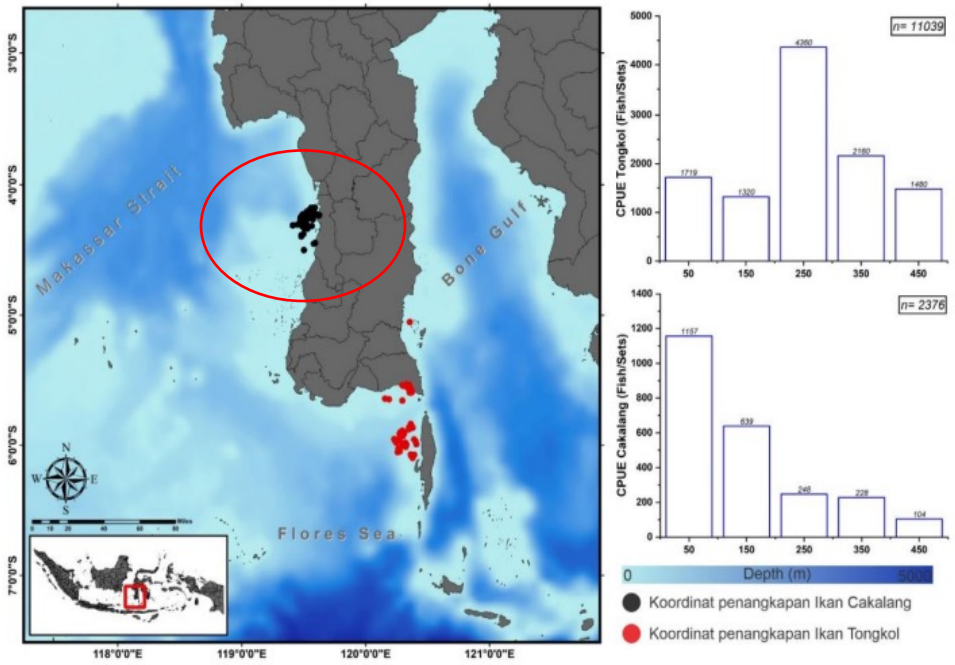
| No. | The types of fishing gear | Allowed fishing gears |
|---|---|---|
| 1. | Surrounding nets | 1. small pelagic fish purse seines with single boat; 2. Large pelagic fish purse seines with single boat; 3. Anchovy purse seines; 4. small pelagic fish purse seines with two boats; and 5. Without Purse Lines/Lampara |
| 2. | Seine nets | 1. Beach seines; 2. Border seines; 3. Payang seine nets; and 4. cod-end seine nets. |
| 3. | Trawls | 1. cod-end shrimp trawls; and 2. Cod-end fish trawls |
| 4. | Dredges | 1.Boat dredges; dan 2. Hand dredges. |
| 5. | Lift nets | 1. portable lift nets; 2. Boat lift nets; 3. Stick Held Deep Net; and 4. Stationary lift nets. |
| 6. | Falling gears | 1. Cast nets; 2. Falling gear |
| 7. | Gillnets and Entangling Nets | 1. set gillnets; 2. driftnets; 3. Encircling gillnets; 4. Fixed gillnets; 5. Trammel nets; dan 6. Combined gillnets and trammel nets. |
| 8. | Traps | 1. *set net*; 2. Pots; 3. Fyke pots; 4. Long bag set net; 5. Togo traps; 6. Ambai traps; 7. Tidal traps; 8. Pengerih traps; dan 9. Guiding barrier. |
| 9. | Hooks and lines | 1. handlines; 2. Handlines tuna; 3. Hand operated; 4. Squid jigging; 5. Mechanized squid jigging; 6. Kite lines; 7. Pole and lines; 8. Mechanized pole and lines; 9. Set longlines; 10. Longlines tuna; dan 11. Trolling lines. |
| 10. | Other fishing gears | 1. harpoons; 2. spears; 3. arrows; 4. Push nets; 5. Scoopnets; dan 6. *pocongan*. |

The regulation on the utilization of fisheries resources is stated in the **Regulation of the Minister of Marine Affairs and Fisheries of the Republic of Indonesia No. 18 of 2021 concerning the Arrangement of Fishing Equipment and Fishing Aids in the Fisheries Management Area of the Republic of Indonesia and the High Seas and the Arrangement of Fishing Andon**. This ministerial regulation regulates fishing routes, gears, and locations for fishing activities.

# Purse seines in Makassar strait

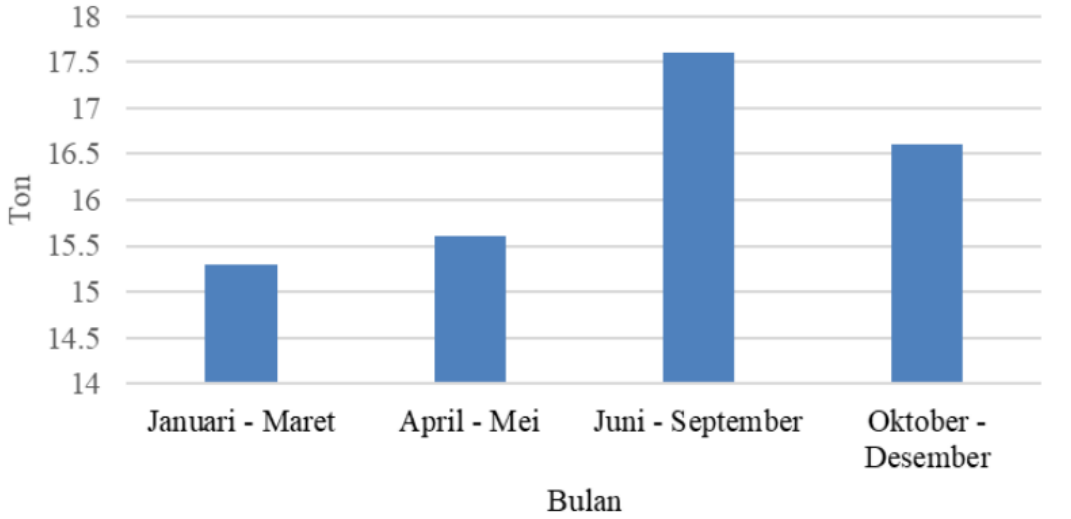


- Main fish catch: *Katsuwonus pelamis* (Scombridae)




Gambar 4. Daerah Penangkapan Ikan Cakalang dan Tongkol dengan Menggunakan Purse Seine pada Bulan Januari – Juni 2021.

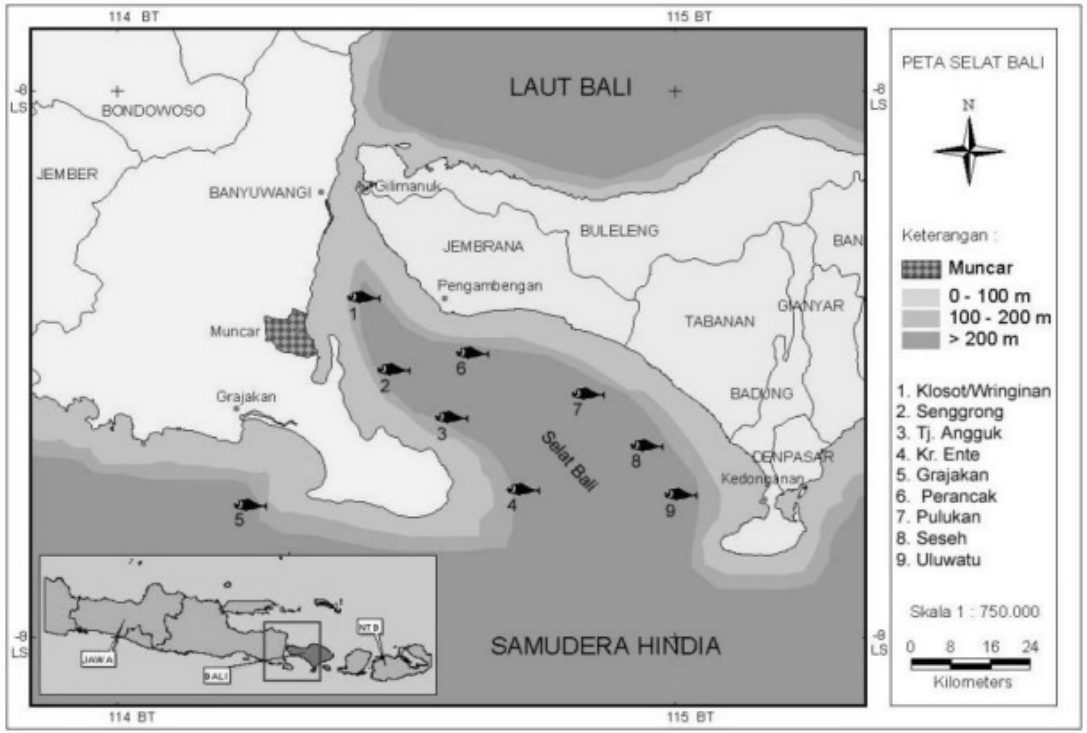
Fishing ground (Saprudin, 2022)

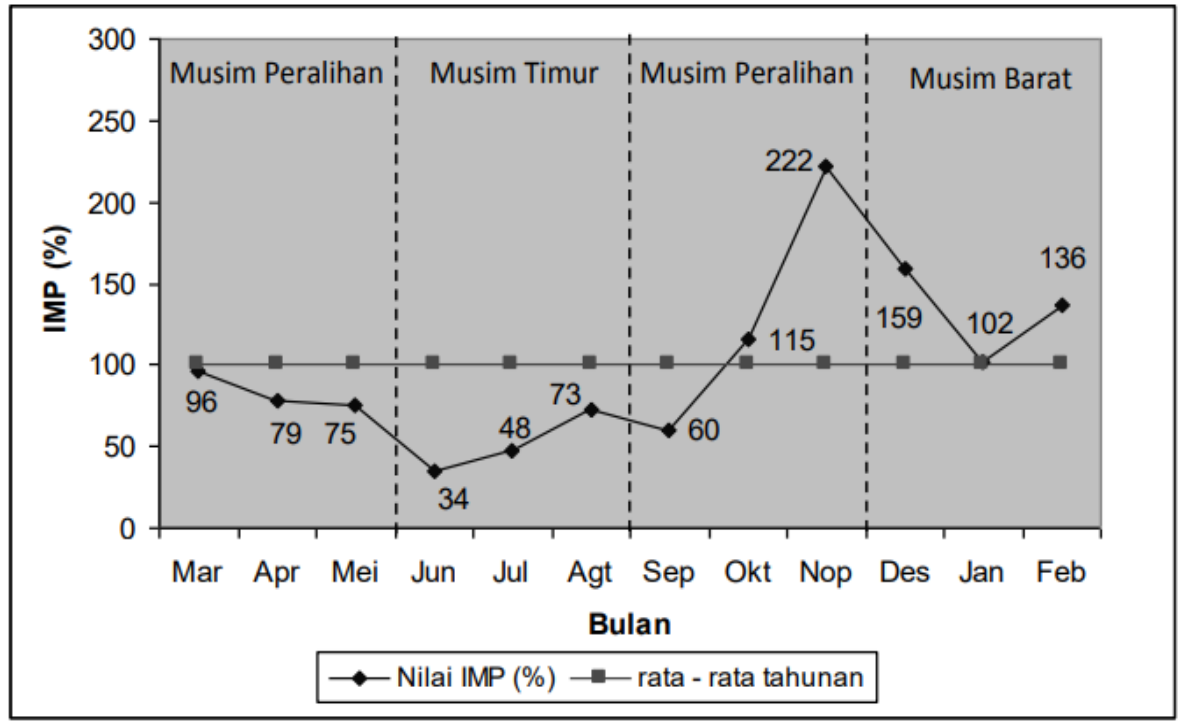



Fishing month (Huda *et al.,* 2019)

# Purse Seines Small Pelagic (Bali strait)

Main Fish: *Sardinella lemuru* (Clupeidae)




Fishing grounds and months of *Sardinella lemuru* (Clupeidae) (Simbolon *et al.,* 2011)

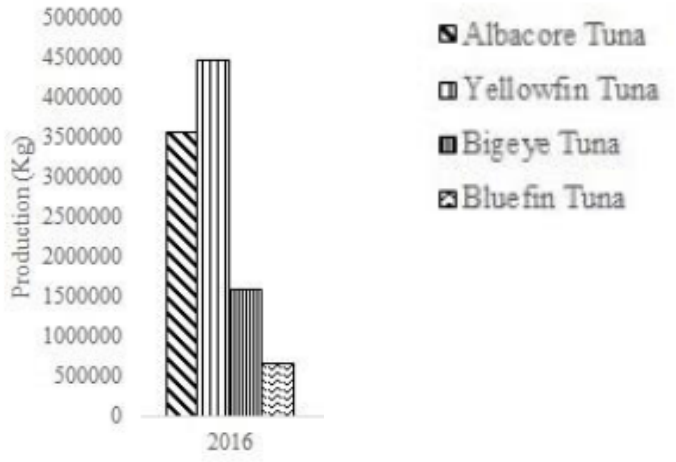
# Purse Seines *Waring* in Java Sea

- The main catch is anchovy (*Stolephorus* spp, Engraulidae) (Lestari *et al.,* 2015).
- The fishing season for anchovy takes place around the east / southeast season (May-July)

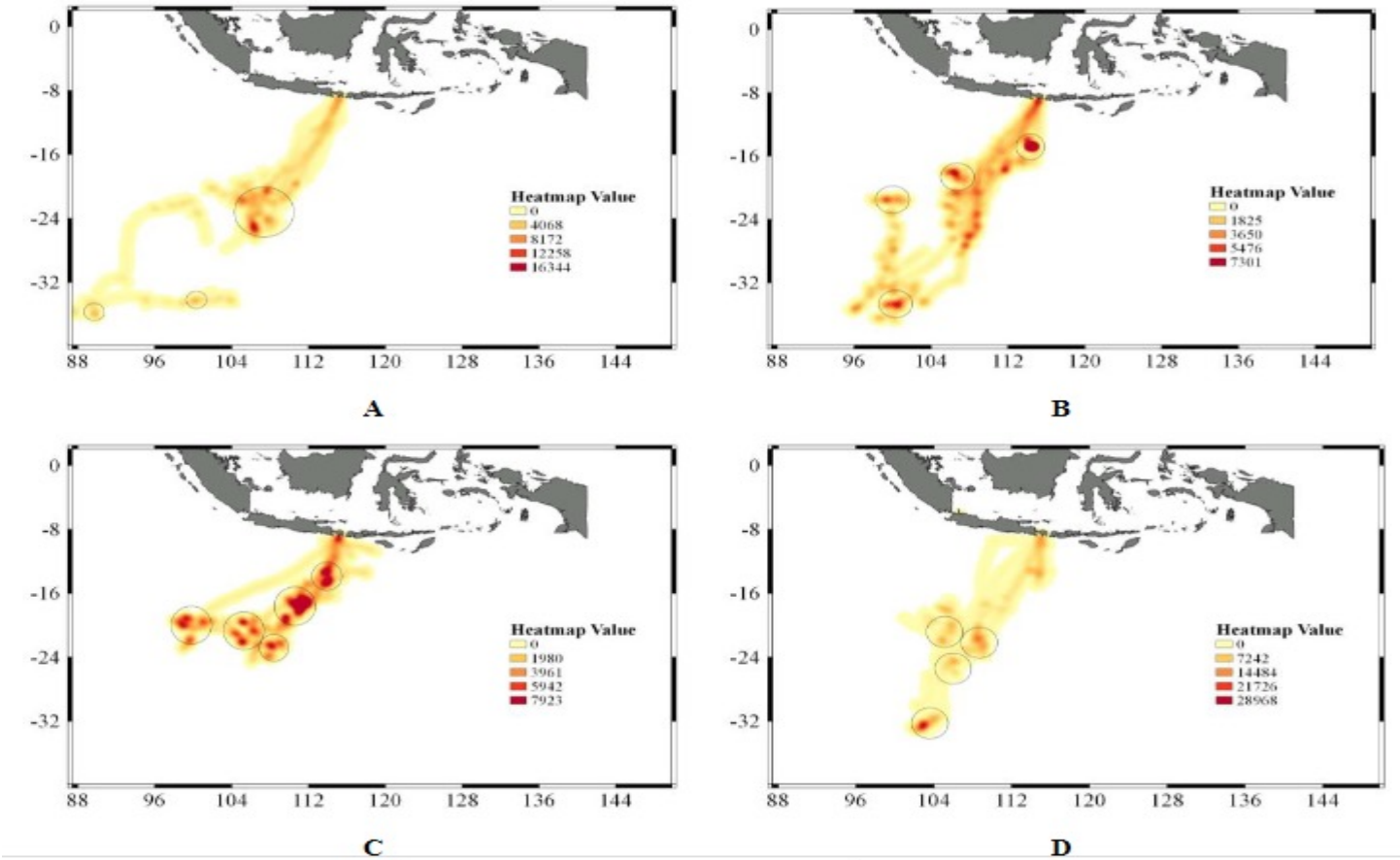

Gambar 2. Daerah penangkapan ikan teri di pantai utara Jawa dan Selat Madura.
*Figure 2. Fishing ground of anchovy in north coast of Java and Madura Strait.*

Fishing ground of purse seine waring (Zamroni *et al.,* 2020)

# Longlines Tuna






Distribution of fishing activity for longline tuna vessels based in Benoa Bali A. January -March; B. April -June; C. July - September; D.October -December

Albacore and yellow fin tuna productivity fluctuates every month.

# Bottom long line

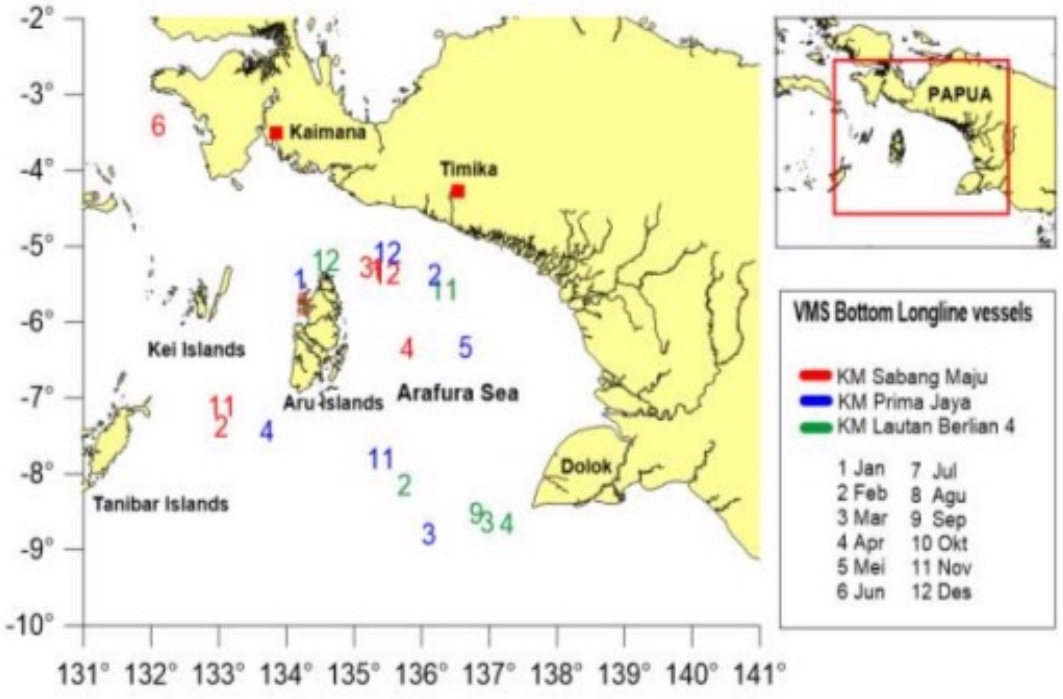
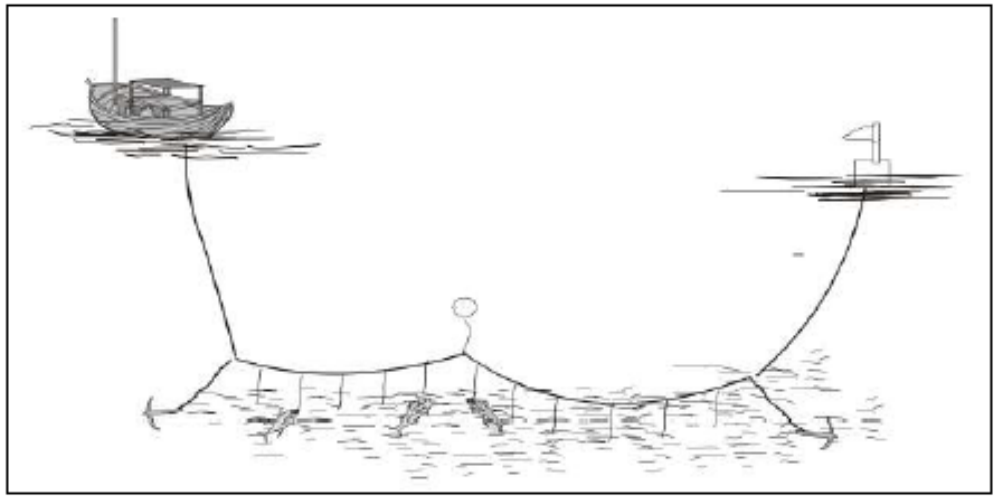



**Figure 2.** Fishing ground of bottom longline in Arafura Waters based VMS FP Probolinggo (Parhe et al., 2020)



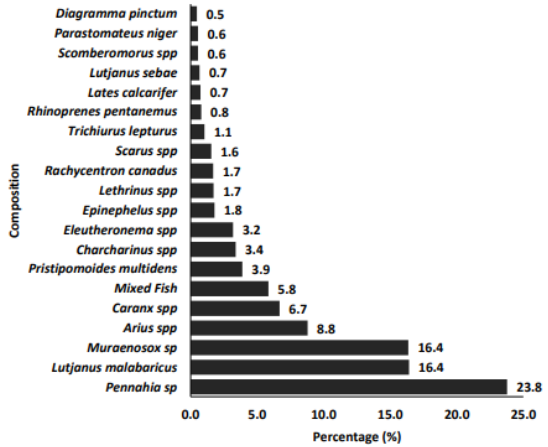
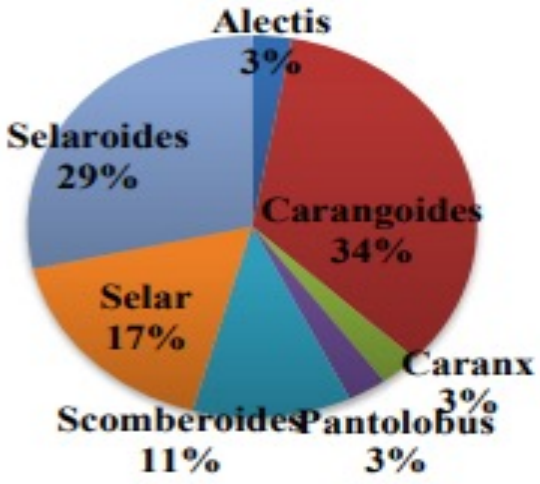


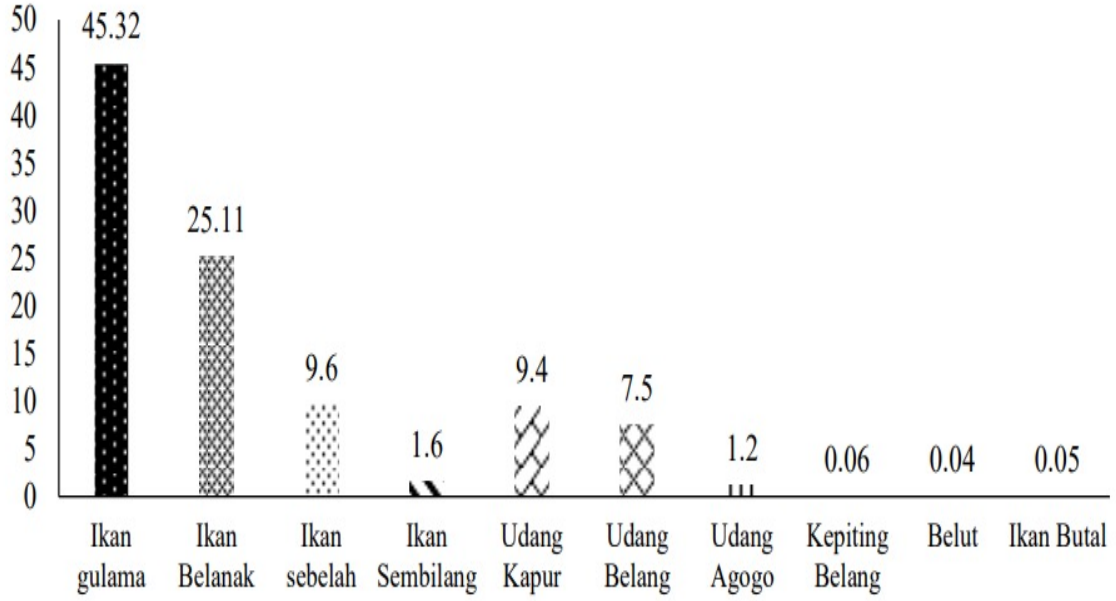

**Figure 6**. Catch composition of bottom longline landing in Probolinggo, 2017

- In Pulau Maya, West Kalimantan, **red snapper (Lutjanidae)** is the main fish catch of bottom longline. This fisihing gear operated along the year (Wibowo & Sahari, 1999

# Traps

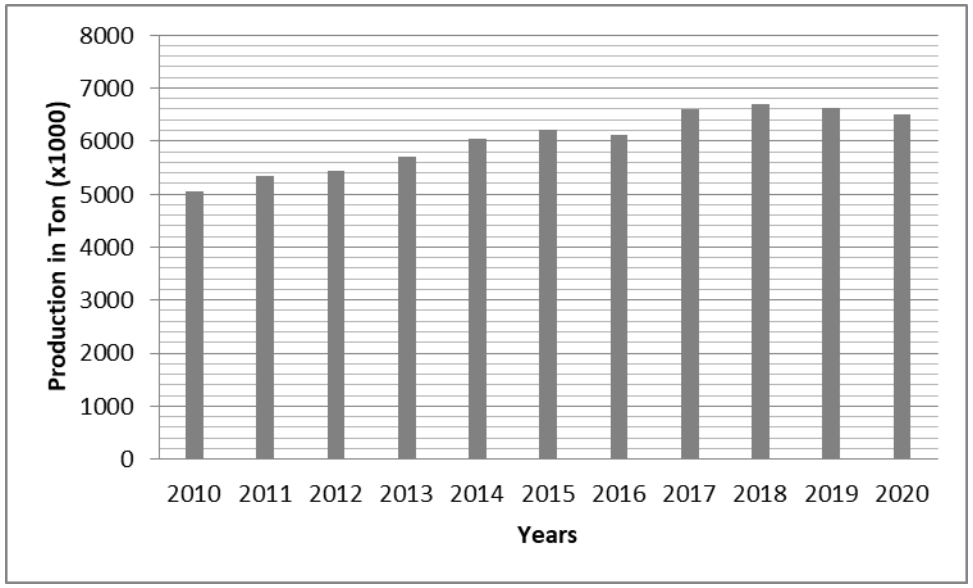
- Main fish catch depends on location. In Estuary of Tanjung Jabung timur (Irawan, et al. 2021), dominated by *Johnius tracypelatus* (Sciaenidae), while in seagrass beds of Bontang, East Kalimantan (Rosadi *et al., 2022)* dominated by *Carangoides* (Carangidae)



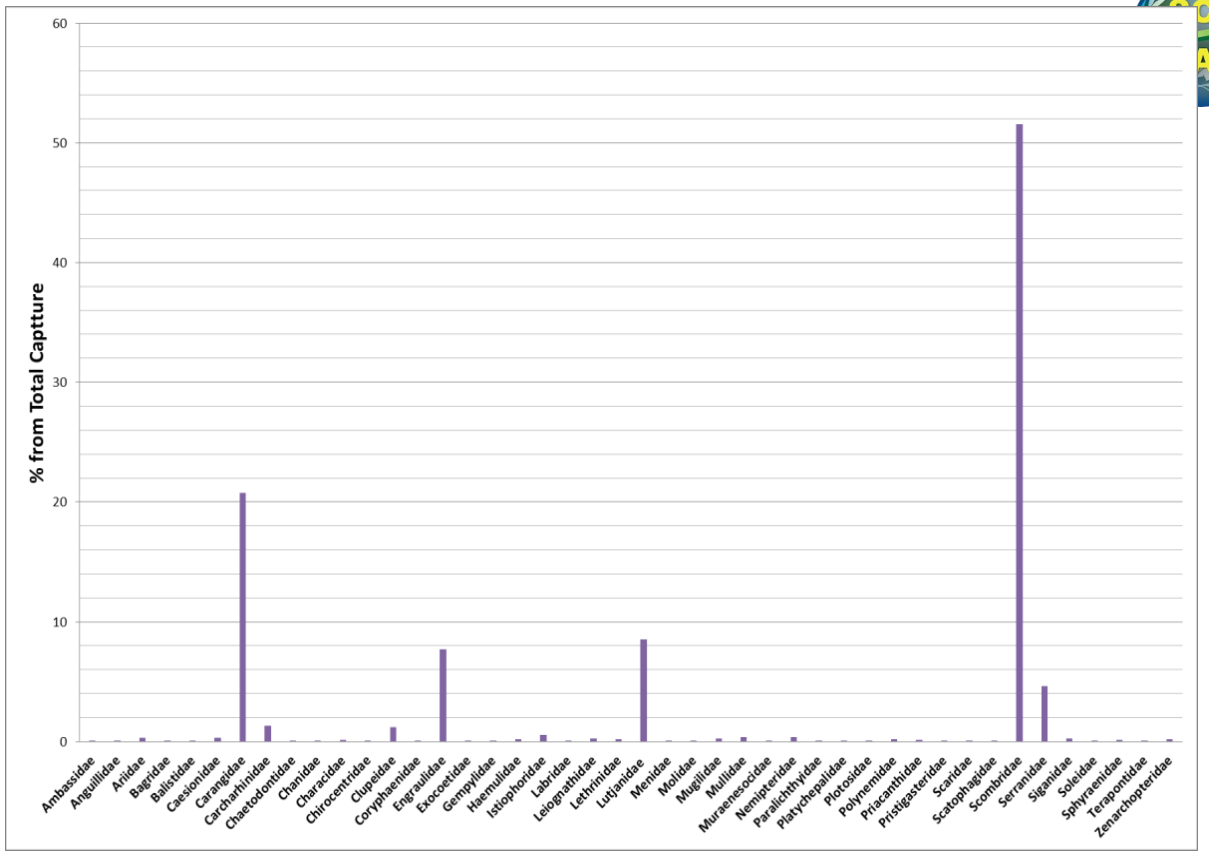




Gambar 2. Komposisi Hasil Tangkapan (%)

# Marine Fisheries Production in Indonesia




Marine capture fisheries production in Indonesia from 2010 to 2020(https://statistik.kkp.go.id)



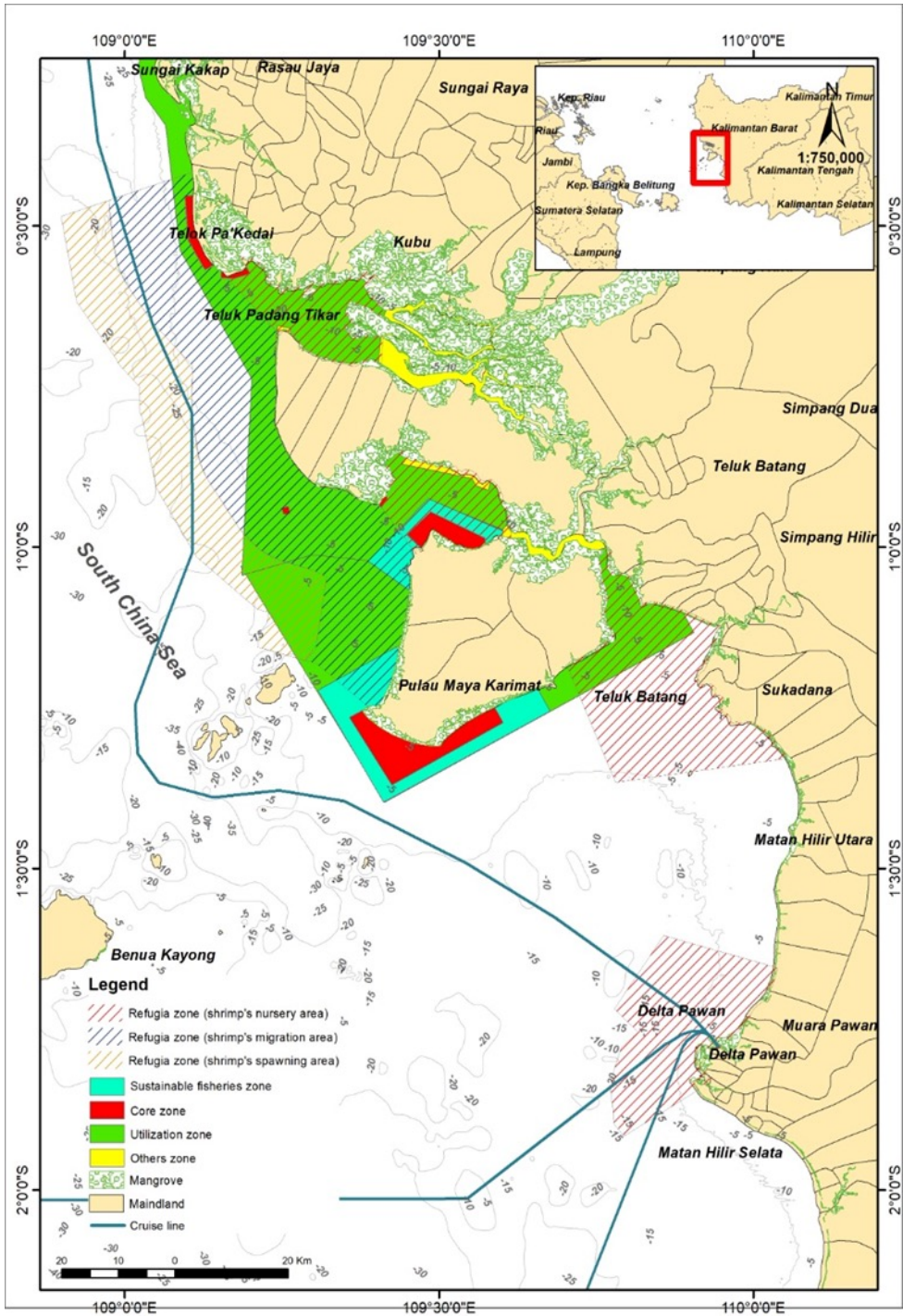

Percentage of capture volume among all fish families (https://statistik.kkp.go.id).

Most of the fish were dominated by **Scrombidae (51,54%)**, Carangidae (20,73%), Lutjanidae (8,54%), Engraulidae (7,69%), and Serranidae (4,64%)

# ICHTYOPLANKTON SURVEY IN INDONESIA

- About 50 articles on ichtyoplankton studies in Indonesia
- No database for Indonesia larva fish
- Very few researchers conducted a study in ichtyoplankton

Prof Augy-NRIA of Indonesia



# FUTURE RESEARCH PLAN

- Inventory of ichtyoplankton as novel scientific approach in determining spawning area
- Establishing quota based fisheries by considering species specific commodity and habitat protection
- To replicate fisheries refugia,we proposed a research project in Belitung for squids, and will propose for lobster in sorong-Papua, grouper in Wakatobi-Sulawesi, and snapper in Aru

# THANK YOU