

# Length-Based Stock Assessment Of A Species Complex In Deepwater Demersal Fisheries Targeting Snappers In Indonesia Fishery Management Area WPP 571

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**Table of contents**

|          |   |           |
|----------|---|-----------|
| <b>1</b> | <b>Introduction</b>   | <b>3</b>  |
| <b>2</b> | <b>Materials and methods for data collection, analysis and reporting</b>  | <b>7</b>  |
| 2.1      | Frame Survey . . . . .  | 7         |
| 2.2      | Vessel Tracking and CODRS . . . . .   | 7         |
| 2.3      | Data Quality Control . . . . .  | 8         |
| 2.4      | Length-Frequency Distributions, CpUE, and Total Catch . . . . .   | 8         |
| 2.5      | I-Fish Community . . . . .  | 29        |
| <b>3</b> | <b>Fishing grounds and traceability</b>   | <b>33</b> |
| <b>4</b> | <b>Length-based assessments of Top 20 most abundant species in CODRS samples including all years in WPP 571</b> | <b>37</b> |
| <b>5</b> | <b>Discussion and conclusions</b>   | <b>74</b> |
| <b>6</b> | <b>References</b>   | <b>81</b> |

## 1 Introduction

This report presents a length-based assessment of multi-species and multi gear demersal fisheries targeting snappers, groupers, emperors and grunts in fisheries management area (WPP) 571, covering the Malacca Strait and southern Andaman Sea, surrounded by Indian, Thai, Malaysian, Singaporean and Indonesian waters and territories. The southern Andaman Sea, in the northern part of WPP 571 lies in between Indian waters to the north and west, and Thai waters and territories to the northeast. The Malacca Strait in the southeast part of WPP 571 has the Indonesian island of Sumatra to the west and Malaysia and Singapore to the east (Figure 1.1).

The fishing grounds in WPP 571 (Figure 1.2) form a continuous habitat with the shelf area of the South China Sea and the Karimata Strait to the South and East and with Thai and Malaysian shelf waters to the North. Some fleet segments from WPP 571 sometimes operate in the adjacent WPPs and trips into foreign waters are not uncommon. Fishing boats in this area often cross International boundaries in the narrow Malacca Strait to the North into foreign waters, which results in pollution of supply lines here with IUU fish.

The majority of fleets and vessels on the fishing grounds in WPP 571 originate from North Sumatra, and they generally fish at depths ranging from 50 meters on the shelf to 150 meters down the deeper slopes in the north. Traps, drop lines and bottom long lines are by far the most important gear types in the fisheries targeting snappers, groupers, emperors and grunts, but deep set bottom gillnets are also used.

Many boats in WPP 571 use multiple gear types, even within single trips, in “mixed gear” fisheries. The drop line fishery is an active vertical hook and line fishery operating at depths from 50 to 250 meters, whereas long lines and traps are set horizontally along the bottom at depths usually ranging from 50 to 150 meters only.

The Indonesian deep demersal fisheries catches a large number of species, and stocks of 100 of the most common species are monitored on a continuous basis through a Crew Operated Data Recording System (CODRS). The current report presents the top 50 most abundant species of fish in CODRS samples (Tables 1.1 and 1.2) in WPP 571, and analyses length frequencies of the 50 most important species in the combined deep demersal catches in this fisheries management area. For a complete overview of the species composition with images of all 100 target species, please refer to the ID guide prepared for these fisheries<sup>1</sup>.

For further background on species life history characteristics, and data-poor length based assessment methods, as applied in this report, please refer to the assessment guide that was separately prepared for these fisheries<sup>2</sup>.

Data in this report represent complete catches by medium scale vessels from the above described fleets. All fish captured were photographed on measuring boards by fishing crew participating in our Crew Operated Data Recording System or CODRS. Images were analysed by project staff to generate the species specific length frequency distributions of the catches which served as the input for our length based assessment. Fishing grounds were recorded with SPOT tracers placed on contracted vessels.

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<sup>1</sup>[http://72.14.187.103:8080/ifish/pub/TNC\\_FishID.pdf](http://72.14.187.103:8080/ifish/pub/TNC_FishID.pdf)

<sup>2</sup><http://72.14.187.103:8080/ifish/pub/DeepSlopeSpeciesAssessmentTool.pdf>

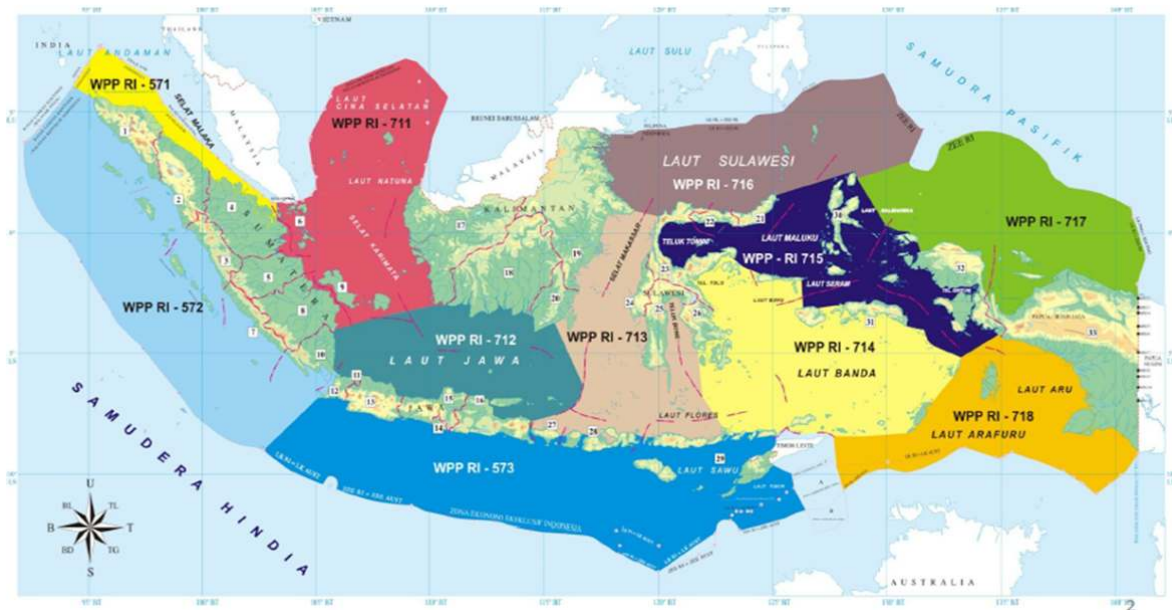


Figure 1.1: Fisheries Management Areas (*Wilayah Pengelolaan Perikanan* or WPP) in Indonesian marine waters.

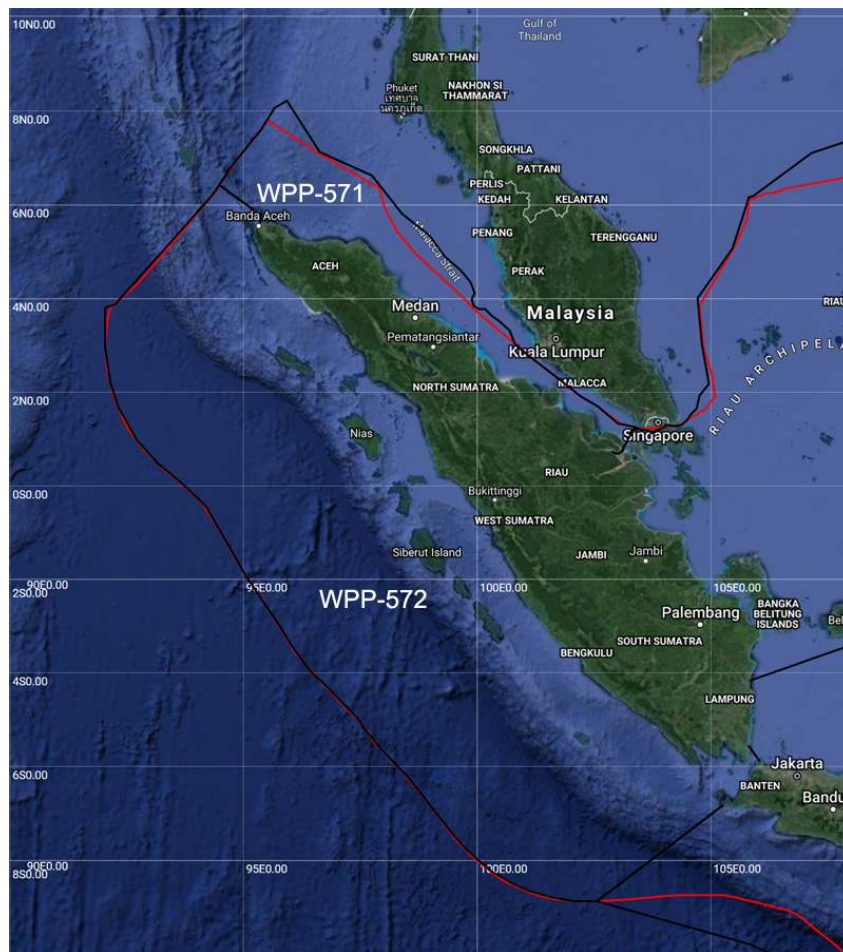


Figure 1.2: Bathymetric map of the WPP 571 including Malacca Strait, in Indonesia. Red lines are EEZ border, black lines are WPP border, blue lines are MPAs.

Table 1.1: Length-weight relationships, trading limits and total sample sizes (including all years) for the 50 most abundant species in CODRS samples from deep water demersal fisheries in 571

| Rank | #ID | Species                             | Reported                     | W = a L <sup>b</sup> |       | Length                        | Converted               | Plotted                  | Sample<br>Sizes |
|------|-----|-------------------------------------|------------------------------|----------------------|-------|-------------------------------|-------------------------|--------------------------|-----------------|
|      |     |                                     | Trade<br>Limit<br>Weight (g) | a                    | b     | Type<br>for a & b<br>TL-FL-SL | Trade<br>Limit<br>L(cm) | Trade<br>Limit<br>TL(cm) |                 |
| 1    | 50  | <i>Epinephelus coioides</i>         | 1500                         | 0.011                | 3.084 | TL                            | 46.94                   | 46.94                    | 16170           |
| 2    | 45  | <i>Epinephelus areolatus</i>        | 300                          | 0.011                | 3.048 | FL                            | 28.18                   | 28.77                    | 11853           |
| 3    | 46  | <i>Epinephelus bleekeri</i>         | 300                          | 0.009                | 3.126 | TL                            | 28.09                   | 28.09                    | 4810            |
| 4    | 27  | <i>Lutjanus vitta</i>               | 300                          | 0.017                | 2.978 | FL                            | 26.72                   | 27.64                    | 2492            |
| 5    | 7   | <i>Pristipomoides multidentis</i>   | 500                          | 0.020                | 2.944 | FL                            | 31.18                   | 34.92                    | 2438            |
| 6    | 80  | <i>Caranx sexfasciatus</i>          | 2000                         | 0.032                | 2.930 | FL                            | 43.43                   | 49.51                    | 646             |
| 7    | 39  | <i>Cephalopholis sonnerati</i>      | 300                          | 0.015                | 3.058 | TL                            | 25.78                   | 25.78                    | 594             |
| 8    | 17  | <i>Lutjanus malabaricus</i>         | 500                          | 0.009                | 3.137 | FL                            | 33.11                   | 33.11                    | 499             |
| 9    | 24  | <i>Lutjanus johnii</i>              | 300                          | 0.020                | 2.907 | FL                            | 27.28                   | 28.49                    | 499             |
| 10   | 91  | <i>Pomadasy kaakan</i>              | 300                          | 0.017                | 2.985 | TL                            | 26.57                   | 26.57                    | 405             |
| 11   | 25  | <i>Lutjanus russelli</i>            | 300                          | 0.020                | 2.907 | FL                            | 27.28                   | 28.49                    | 360             |
| 12   | 23  | <i>Pinjalo pinjalo</i>              | 300                          | 0.014                | 2.970 | FL                            | 28.42                   | 31.16                    | 341             |
| 13   | 55  | <i>Epinephelus epistictus</i>       | 1500                         | 0.009                | 3.126 | TL                            | 47.01                   | 47.01                    | 318             |
| 14   | 98  | <i>Rachycentron canadum</i>         | 1000                         | 0.003                | 3.088 | FL                            | 60.67                   | 67.28                    | 299             |
| 15   | 63  | <i>Lethrinus lentjan</i>            | 300                          | 0.020                | 2.986 | FL                            | 25.16                   | 26.35                    | 257             |
| 16   | 41  | <i>Epinephelus latifasciatus</i>    | 1500                         | 0.010                | 3.088 | TL                            | 48.00                   | 48.00                    | 211             |
| 17   | 78  | <i>Caranx ignobilis</i>             | 2000                         | 0.027                | 2.913 | FL                            | 46.78                   | 54.36                    | 204             |
| 18   | 15  | <i>Lutjanus argentimaculatus</i>    | 500                          | 0.034                | 2.792 | FL                            | 31.22                   | 31.78                    | 159             |
| 19   | 75  | <i>Carangoides chrysophrys</i>      | 1000                         | 0.027                | 2.902 | FL                            | 37.68                   | 42.12                    | 157             |
| 20   | 8   | <i>Pristipomoides typus</i>         | 500                          | 0.014                | 2.916 | TL                            | 36.16                   | 36.16                    | 150             |
| 21   | 90  | <i>Diagramma pictum</i>             | 500                          | 0.014                | 2.988 | FL                            | 33.08                   | 36.71                    | 117             |
| 22   | 72  | <i>Carangoides coeruleopinnatus</i> | 1000                         | 0.032                | 2.902 | FL                            | 35.35                   | 40.12                    | 99              |
| 23   | 97  | <i>Ostichthys japonicus</i>         | 300                          | 0.018                | 3.020 | FL                            | 25.10                   | 26.23                    | 91              |
| 24   | 95  | <i>Sphyaena putnamae</i>            | 1500                         | 0.008                | 2.931 | FL                            | 64.24                   | 70.92                    | 78              |
| 25   | 53  | <i>Epinephelus heniochus</i>        | 300                          | 0.061                | 2.624 | FL                            | 25.59                   | 25.59                    | 28              |
| 26   | 58  | <i>Epinephelus amblycephalus</i>    | 1500                         | 0.012                | 3.057 | TL                            | 45.99                   | 45.99                    | 23              |
| 27   | 94  | <i>Sphyaena forsteri</i>            | 500                          | 0.005                | 3.034 | FL                            | 43.51                   | 49.16                    | 23              |
| 28   | 26  | <i>Lutjanus lemniscatus</i>         | 300                          | 0.020                | 2.907 | FL                            | 27.28                   | 28.49                    | 17              |
| 29   | 65  | <i>Lethrinus nebulosus</i>          | 500                          | 0.019                | 2.996 | FL                            | 30.03                   | 32.14                    | 14              |
| 30   | 10  | <i>Pristipomoides sieboldii</i>     | 300                          | 0.022                | 2.942 | FL                            | 25.52                   | 29.21                    | 13              |
| 31   | 22  | <i>Pinjalo lewisi</i>               | 300                          | 0.014                | 2.970 | FL                            | 28.42                   | 29.64                    | 13              |
| 32   | 83  | <i>Seriola dumerili</i>             | 2000                         | 0.022                | 2.847 | TL                            | 54.74                   | 54.74                    | 13              |
| 33   | 49  | <i>Epinephelus malabaricus</i>      | 1500                         | 0.013                | 3.034 | TL                            | 46.85                   | 46.85                    | 12              |
| 34   | 42  | <i>Epinephelus radiatus</i>         | 300                          | 0.061                | 2.624 | FL                            | 25.59                   | 25.59                    | 11              |
| 35   | 18  | <i>Lutjanus sebae</i>               | 500                          | 0.009                | 3.208 | FL                            | 29.97                   | 31.26                    | 9               |
| 36   | 30  | <i>Lipocheilus carnolabrum</i>      | 500                          | 0.149                | 2.488 | FL                            | 26.13                   | 28.32                    | 8               |
| 37   | 81  | <i>Caranx tille</i>                 | 2000                         | 0.032                | 2.930 | FL                            | 43.43                   | 49.51                    | 8               |
| 38   | 76  | <i>Carangoides gymnostethus</i>     | 1000                         | 0.046                | 2.746 | FL                            | 37.88                   | 41.55                    | 7               |
| 39   | 1   | <i>Aphareus rutilans</i>            | 1000                         | 0.015                | 2.961 | FL                            | 42.20                   | 49.61                    | 6               |
| 40   | 37  | <i>Cephalopholis miniata</i>        | 300                          | 0.026                | 2.864 | TL                            | 26.35                   | 26.35                    | 5               |
| 41   | 9   | <i>Pristipomoides filamentosus</i>  | 500                          | 0.038                | 2.796 | FL                            | 29.70                   | 33.27                    | 4               |
| 42   | 73  | <i>Carangoides fulvoguttatus</i>    | 1000                         | 0.033                | 2.808 | FL                            | 39.51                   | 43.62                    | 4               |
| 43   | 92  | <i>Cookeolus japonicus</i>          | 300                          | 0.014                | 3.000 | TL                            | 27.58                   | 27.58                    | 4               |
| 44   | 59  | <i>Hyporthodus octofasciatus</i>    | 1500                         | 0.106                | 2.560 | TL                            | 41.82                   | 41.82                    | 3               |
| 45   | 82  | <i>Elagatis bipinnulata</i>         | 1000                         | 0.013                | 2.920 | FL                            | 46.53                   | 55.37                    | 3               |
| 46   | 89  | <i>Diagramma labiosum</i>           | 500                          | 0.014                | 2.988 | FL                            | 33.08                   | 36.71                    | 3               |
| 47   | 93  | <i>Sphyaena barracuda</i>           | 1500                         | 0.006                | 3.011 | FL                            | 61.48                   | 69.47                    | 3               |
| 48   | 44  | <i>Epinephelus poecilonotus</i>     | 500                          | 0.061                | 2.624 | FL                            | 31.09                   | 31.09                    | 2               |
| 49   | 66  | <i>Lethrinus olivaceus</i>          | 300                          | 0.029                | 2.851 | FL                            | 25.49                   | 27.50                    | 2               |
| 50   | 84  | <i>Seriola rivoliana</i>            | 2000                         | 0.006                | 3.170 | FL                            | 54.23                   | 60.03                    | 2               |

Table 1.2: Sample sizes over the period 2016 to 2024 for the 50 most abundant species in CODRS samples of deepwater demersal fisheries in WPP 571

| Rank | Species                             | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | Total |
|------|-------------------------------------|------|------|------|------|------|------|------|------|------|-------|
| 1    | <i>Epinephelus coioides</i>         | 0    | 0    | 0    | 8813 | 7357 | 0    | 0    | 0    | 0    | 16170 |
| 2    | <i>Epinephelus areolatus</i>        | 0    | 0    | 0    | 5704 | 6149 | 0    | 0    | 0    | 0    | 11853 |
| 3    | <i>Epinephelus bleekeri</i>         | 0    | 0    | 0    | 2364 | 2446 | 0    | 0    | 0    | 0    | 4810  |
| 4    | <i>Lutjanus vitta</i>               | 0    | 0    | 0    | 1218 | 1274 | 0    | 0    | 0    | 0    | 2492  |
| 5    | <i>Pristipomoides multidens</i>     | 0    | 0    | 0    | 1258 | 1180 | 0    | 0    | 0    | 0    | 2438  |
| 6    | <i>Caranx sexfasciatus</i>          | 0    | 0    | 0    | 425  | 221  | 0    | 0    | 0    | 0    | 646   |
| 7    | <i>Cephalopholis sonnerati</i>      | 0    | 0    | 0    | 344  | 250  | 0    | 0    | 0    | 0    | 594   |
| 8    | <i>Lutjanus malabaricus</i>         | 0    | 0    | 0    | 332  | 167  | 0    | 0    | 0    | 0    | 499   |
| 9    | <i>Lutjanus johnii</i>              | 0    | 0    | 0    | 231  | 268  | 0    | 0    | 0    | 0    | 499   |
| 10   | <i>Pomadasys kaakan</i>             | 0    | 0    | 0    | 75   | 330  | 0    | 0    | 0    | 0    | 405   |
| 11   | <i>Lutjanus russelli</i>            | 0    | 0    | 0    | 188  | 172  | 0    | 0    | 0    | 0    | 360   |
| 12   | <i>Pinjalo pinjalo</i>              | 0    | 0    | 0    | 300  | 41   | 0    | 0    | 0    | 0    | 341   |
| 13   | <i>Epinephelus epistictus</i>       | 0    | 0    | 0    | 120  | 198  | 0    | 0    | 0    | 0    | 318   |
| 14   | <i>Rachycentron canadum</i>         | 0    | 0    | 0    | 188  | 111  | 0    | 0    | 0    | 0    | 299   |
| 15   | <i>Lethrinus lentjan</i>            | 0    | 0    | 0    | 145  | 112  | 0    | 0    | 0    | 0    | 257   |
| 16   | <i>Epinephelus latifasciatus</i>    | 0    | 0    | 0    | 127  | 84   | 0    | 0    | 0    | 0    | 211   |
| 17   | <i>Caranx ignobilis</i>             | 0    | 0    | 0    | 111  | 93   | 0    | 0    | 0    | 0    | 204   |
| 18   | <i>Lutjanus argentimaculatus</i>    | 0    | 0    | 0    | 92   | 67   | 0    | 0    | 0    | 0    | 159   |
| 19   | <i>Carangoides chrysophrys</i>      | 0    | 0    | 0    | 48   | 109  | 0    | 0    | 0    | 0    | 157   |
| 20   | <i>Pristipomoides typus</i>         | 0    | 0    | 0    | 68   | 82   | 0    | 0    | 0    | 0    | 150   |
| 21   | <i>Diagramma pictum</i>             | 0    | 0    | 0    | 51   | 66   | 0    | 0    | 0    | 0    | 117   |
| 22   | <i>Carangoides coeruleopinnatus</i> | 0    | 0    | 0    | 83   | 16   | 0    | 0    | 0    | 0    | 99    |
| 23   | <i>Ostichthys japonicus</i>         | 0    | 0    | 0    | 48   | 43   | 0    | 0    | 0    | 0    | 91    |
| 24   | <i>Sphyraena putnamae</i>           | 0    | 0    | 0    | 60   | 18   | 0    | 0    | 0    | 0    | 78    |
| 25   | <i>Epinephelus heniochus</i>        | 0    | 0    | 0    | 14   | 14   | 0    | 0    | 0    | 0    | 28    |
| 26   | <i>Epinephelus amblycephalus</i>    | 0    | 0    | 0    | 7    | 16   | 0    | 0    | 0    | 0    | 23    |
| 27   | <i>Sphyraena forsteri</i>           | 0    | 0    | 0    | 19   | 4    | 0    | 0    | 0    | 0    | 23    |
| 28   | <i>Lutjanus lemniscatus</i>         | 0    | 0    | 0    | 12   | 5    | 0    | 0    | 0    | 0    | 17    |
| 29   | <i>Lethrinus nebulosus</i>          | 0    | 0    | 0    | 9    | 5    | 0    | 0    | 0    | 0    | 14    |
| 30   | <i>Pristipomoides sieboldii</i>     | 0    | 0    | 0    | 3    | 10   | 0    | 0    | 0    | 0    | 13    |
| 31   | <i>Pinjalo lewisi</i>               | 0    | 0    | 0    | 13   | 0    | 0    | 0    | 0    | 0    | 13    |
| 32   | <i>Seriola dumerili</i>             | 0    | 0    | 0    | 7    | 6    | 0    | 0    | 0    | 0    | 13    |
| 33   | <i>Epinephelus malabaricus</i>      | 0    | 0    | 0    | 7    | 5    | 0    | 0    | 0    | 0    | 12    |
| 34   | <i>Epinephelus radiatus</i>         | 0    | 0    | 0    | 2    | 9    | 0    | 0    | 0    | 0    | 11    |
| 35   | <i>Lutjanus sebae</i>               | 0    | 0    | 0    | 5    | 4    | 0    | 0    | 0    | 0    | 9     |
| 36   | <i>Lipocheilus carnolabrum</i>      | 0    | 0    | 0    | 4    | 4    | 0    | 0    | 0    | 0    | 8     |
| 37   | <i>Caranx tille</i>                 | 0    | 0    | 0    | 8    | 0    | 0    | 0    | 0    | 0    | 8     |
| 38   | <i>Carangoides gymnostethus</i>     | 0    | 0    | 0    | 6    | 1    | 0    | 0    | 0    | 0    | 7     |
| 39   | <i>Aphareus rutilans</i>            | 0    | 0    | 0    | 0    | 6    | 0    | 0    | 0    | 0    | 6     |
| 40   | <i>Cephalopholis miniata</i>        | 0    | 0    | 0    | 4    | 1    | 0    | 0    | 0    | 0    | 5     |
| 41   | <i>Pristipomoides filamentosus</i>  | 0    | 0    | 0    | 3    | 1    | 0    | 0    | 0    | 0    | 4     |
| 42   | <i>Carangoides fulvoguttatus</i>    | 0    | 0    | 0    | 4    | 0    | 0    | 0    | 0    | 0    | 4     |
| 43   | <i>Cookeolus japonicus</i>          | 0    | 0    | 0    | 4    | 0    | 0    | 0    | 0    | 0    | 4     |
| 44   | <i>Hyporthodus octofasciatus</i>    | 0    | 0    | 0    | 3    | 0    | 0    | 0    | 0    | 0    | 3     |
| 45   | <i>Elagatis bipinnulata</i>         | 0    | 0    | 0    | 3    | 0    | 0    | 0    | 0    | 0    | 3     |
| 46   | <i>Diagramma labiosum</i>           | 0    | 0    | 0    | 3    | 0    | 0    | 0    | 0    | 0    | 3     |
| 47   | <i>Sphyraena barracuda</i>          | 0    | 0    | 0    | 2    | 1    | 0    | 0    | 0    | 0    | 3     |
| 48   | <i>Epinephelus poecilonotus</i>     | 0    | 0    | 0    | 0    | 2    | 0    | 0    | 0    | 0    | 2     |
| 49   | <i>Lethrinus olivaceus</i>          | 0    | 0    | 0    | 0    | 2    | 0    | 0    | 0    | 0    | 2     |
| 50   | <i>Seriola rivoliana</i>            | 0    | 0    | 0    | 2    | 0    | 0    | 0    | 0    | 0    | 2     |

## 2 Materials and methods for data collection, analysis and reporting

### 2.1 Frame Survey

A country-wide frame survey was implemented to obtain complete and detailed information on the deep demersal fishing fleet in Indonesia, using a combination of satellite image analysis and ground truthing visits to all locations where either satellite imagery or other forms of information indicated deep demersal fisheries activity. During the frame survey, data were collected on boat size, gear type, port of registration, licenses for specific FMAs, captain contacts and other details, for all fishing boats in the fleet. Following practices by fisheries managers in Indonesia, we distinguished 4 boat size categories including “nano” (<5 GT), “small” (5-< 10 GT), “medium” (10-30 GT), and “large” (>30 GT). We also distinguished 4 gear types used in these fisheries, including vertical drop lines, bottom set long lines, deep water gillnets and traps. A 5th category of gear classification was needed to record operations using “mixed gear” when 2 or more of the gear types were used on the same trip and catches were not separated.

Frame survey data are continuously updated to keep records of the complete and currently active fishing fleet in the deep demersal fisheries. Fleet information is summarized by registration port and home district (Table 2.14), while actual fishing grounds are determined by placing SPOT Trace units on all fishing boats participating in the program. By late 2019, most (over 80%) of the Indonesian coastline had been surveyed and a majority of the fleet was on record. The total fleet in each WPP is a dynamic number, as boats are leaving and being added to the local fleet all the time, and therefore the fleet survey data need to be updated continuously.

### 2.2 Vessel Tracking and CODRS

Vessel movement and fishing activity as recorded with SPOT data generates the information on fleet dynamics. When in motion, SPOT Trace units automatically report an hourly location of each fishing boat in the program, and when at rest for more than 24 hours, they relay daily status reports. Data on species and size distributions of catches, as needed for accurate length based stock assessments, are collected via Crew Operated Data Recording Systems or CODRS. This catch data is georeferenced as the CODRS works in tandem with the SPOT Trace vessel tracking system. Captains were recruited for the CODRS program from across the full range of boat size and gear type categories.

The CODRS approach involves fishers taking photographs of the fish in the catch, displayed on measuring boards, while the SPOT tracking system records the positions. Data recording for each CODRS fishing trip begins when the boat leaves port with the GPS recording the vessel tracks while it is steaming out. After reaching the fishing grounds, fishing will start, changing the track of recorded positions into a pattern that shows fishing instead of steaming. During the fishing activity, fish is collected on the deck or in chiller boxes on deck. The captain or crew will then take pictures of the fish, positioned over measuring boards (Figure 2.1), before moving the fish from the deck or from the chiller to the hold (to be stored on ice) or to the freezer. The process is slightly different on some of the “nano” boats (around 1 GT), where some crew take pictures upon landing instead of at sea. In these situations, the timestamps of the photographs are still used as an indication of the fishing day, even though most fishing may have happened on the day before.



At the end of the trip, the storage chip from the camera is handed over for processing of the images by expert staff. Processing includes ID of the species and measurement of the length of the fish (Figure 2.2), double checking by a second expert, and data storage in the IFish data base. Sets of images from fishing trips with unacceptable low quality photographs were not further processed and not included in the dataset. Body weight at length could be calculated for all species using length-weight relationships to enable estimation of total catch weights as well as catch weights per species for individual fishing trips by CODRS vessels. Weight converted catch length frequencies of individual catches could therewith be verified against sales records of landings. These sales receipts or ledgers represent a fairly reliable estimate of the total weight of an individual catch (from a single trip, and including all species) that is independent from CODRS data.

### **2.3 Data Quality Control**

With information from sales records we verified that individual catches were fully represented by CODRS images and we flagged catches when they were incomplete, judging from comparison with the weight converted catch size frequencies. When estimated weights from CODRS were above 90% of landed weights from receipts, they were considered complete and accepted for use in length-based analysis and calculations of CpUE. CpUE is calculated on a day by day basis, in kg/GT/day, using only those days from the trip when images were actually collected. Medium size and larger vessels (10 GT and larger) do trips of at least a week up to over a month. There may be some days on which weather or other conditions are such that no images are collected, but sufficient days with images, within those trips usually remain for daily CpUE estimates and to supply samples for length-based analysis. For boats of 10 GT and above, incomplete data sets with 30% to 90% coverage were still used for analysis, using only those days on which images were collected. For boats below 10 GT (doing day trips or trips of just a few days) only complete data sets are used for CpUE calculations. All data sets on catches with less than 30% coverage were rejected and were not used in any analysis.

### **2.4 Length-Frequency Distributions, CpUE, and Total Catch**

By the end of 2019, more than 400 boats participated in the CODRS program (Figure 2.3) across all fishing grounds in Indonesia, with close to 40 boats enrolled in each WPP (Table 2.1). Recruitment of captains from the overall fleet into the CODRS program was not exactly proportional to composition of the fleet in terms of vessel size, gear type and the FMA where the boat normally operates. Actual fleet composition by boat size and gear type, and activity in terms of numbers of active fishing days per year for each category, are therefore used when CODRS data are used for CpUE and catch calculations. Species composition in the catch is also not exactly the same as species composition in the CODRS samples. Catch information by WPP and by fleet segment from CODRS samples needs to be combined with fleet composition and activity information to obtain accurate annual catch information and species composition for each segment of the fleet.

Converted weights from catch size frequencies on individual fishing days, in combination with activity data from onboard trackers were used to estimate catch per unit of effort (CpUE) by fleet segment (boat size \* gear type), by FMA, by species, and over time. Plotted data show clear differences between CpUE values for different gear types and different boat size categories (Figure 2.4) and we therefore work with separated gear

types and boat size categories to generate CpUE values for each distinct segment of the fleet (Table 2.2 and Table 2.3). Activity data from onboard trackers on more than 400 fishing boats were used to estimate the number of active fishing days per year for each segment of the fleet (Table 2.4) and the total (hull) Gross Tonnage in each fleet segment was combined with fleet activity to establish a measure of effort. With this information, CpUE could be precisely defined in kg per GT per active fishing day for each type of gear and each category of boat size in each FMA. Annual averages of CpUE by fleet segment were plotted for the top 7 species in each FMA (Figures 2.5 through 2.11), as indicators for stock health, and to compare with indicators from length-based analysis (i.e. Spawning Potential Ratio and percentage of immature fish in the catch).

Information on fleet activity, fleet size by gear type and boat size, and average size frequencies by species (per unit of effort) are used to estimate total catch. Fishing effort in terms of the average number of active fishing days per year for each gear type and boat size category (Table 2.4), was derived from SPOT data looking at movement patterns. Fleet size by gear type and boat size category (Table 2.5) was obtained from field surveys, where each vessel was recorded in a data base with estimated GT. Average size frequency distributions by fleet segment and species for each FMA, in combination with the information on effort by fleet segment, were thus used to estimate CATCH LFD (over the entire fleet) from average CODRS LFD by fleet segment. Only annual sample sizes larger than 200 fish per species and 50 fish per fleet segment were used for further calculations. Numbers per size class for each species in the catch were multiplied with weights per size class from length-weight relationships, to calculate catches by fleet segment (Table 2.7), species distribution in the total catch (Table 2.8), as well as catch by species for each gear type separately (Tables 2.9 through 2.13).

As the CODRS program is still in development, some parts for the fleet (“fleet segments”, a combination of WPP, gear type, and boat size category) are not yet represented. For those missing fleet segments, we applied the following approach to estimate annual catch. First, within each WPP, we estimated the total catch and the total effort for all fleet segments where we had representation by CODRS. We expressed annual effort as “tonnage-days”, ie, the GT of each vessel times the annual number of fishing days. Then, we calculated the average catch-per-unit-effort, over all fleet segments that have CODRS representation within each WPP (in metric tons per tonnage-day). This resulted in one catch-per-unit-effort estimate for each WPP (CPUE-estimate-per-WPP). Then, we calculated the effort, in tonnage-days, for the fleet segments where we did not have CODRS representation, and we multiplied this effort with CPUE-estimate-per-WPP to get the estimated total annual catch for that fleet segment. This means that, within each WPP, fleet segments that do not have CODRS representation all have the same CPUE estimate-per-WPP, but their total catch estimates vary because effort between those fleet segments vary. We applied this approach for total catch as well as total catch by species.

Trends in CpUE by species and by fleet segment (Figures 2.5 through 2.11) can be used as indicator for year-on-year changes in status of the stocks, for as far as time series are available within each fleet segment. Note, however, that these time series sometimes are incomplete or interrupted. This is due to variations in the presence of fleet segments between years in each WPP, and sometimes the CODRS vessels representing a fleet segment may disappear from one WPP and show up in another WPP. This may happen due to problems with processing permits at local authorities, but also due to the emerging differences in efficiencies between gear types and boat size categories, as well as due to perceptions on opportunities in other WPPs.



Figure 2.1: Fishing crew preparing fish on a measuring board.



Figure 2.2: Fish photographed by fishing crew on board as part of CODRS.

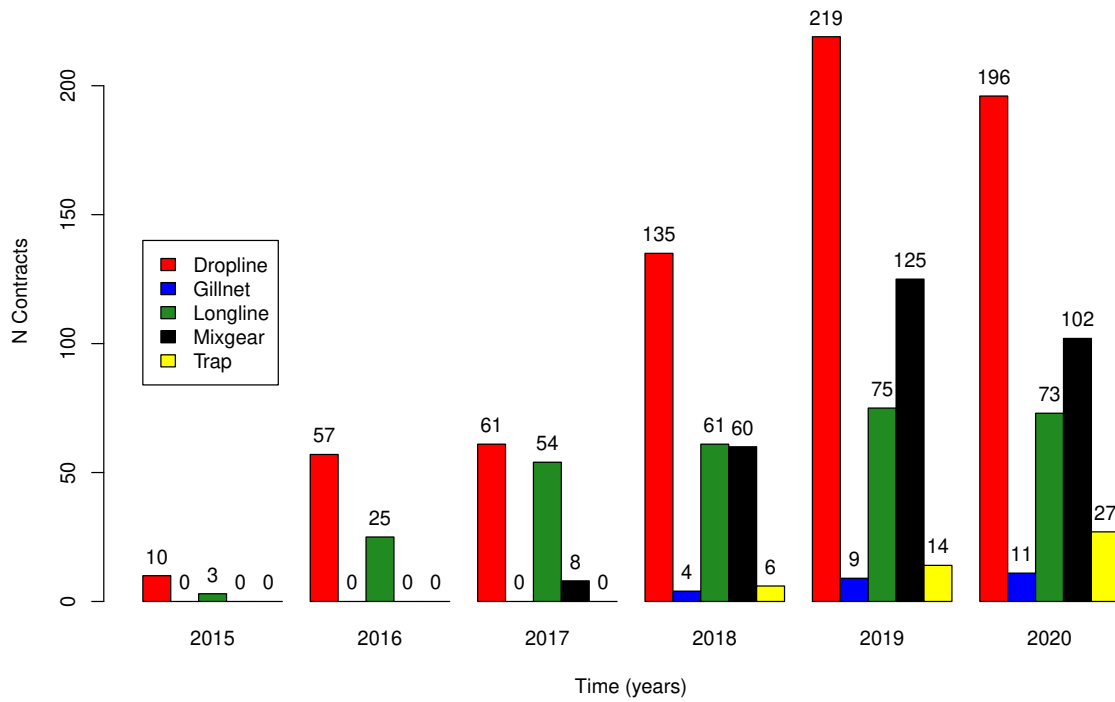


Figure 2.3: Number of CODRS contractors by gear type actively fishing in Indonesian waters.

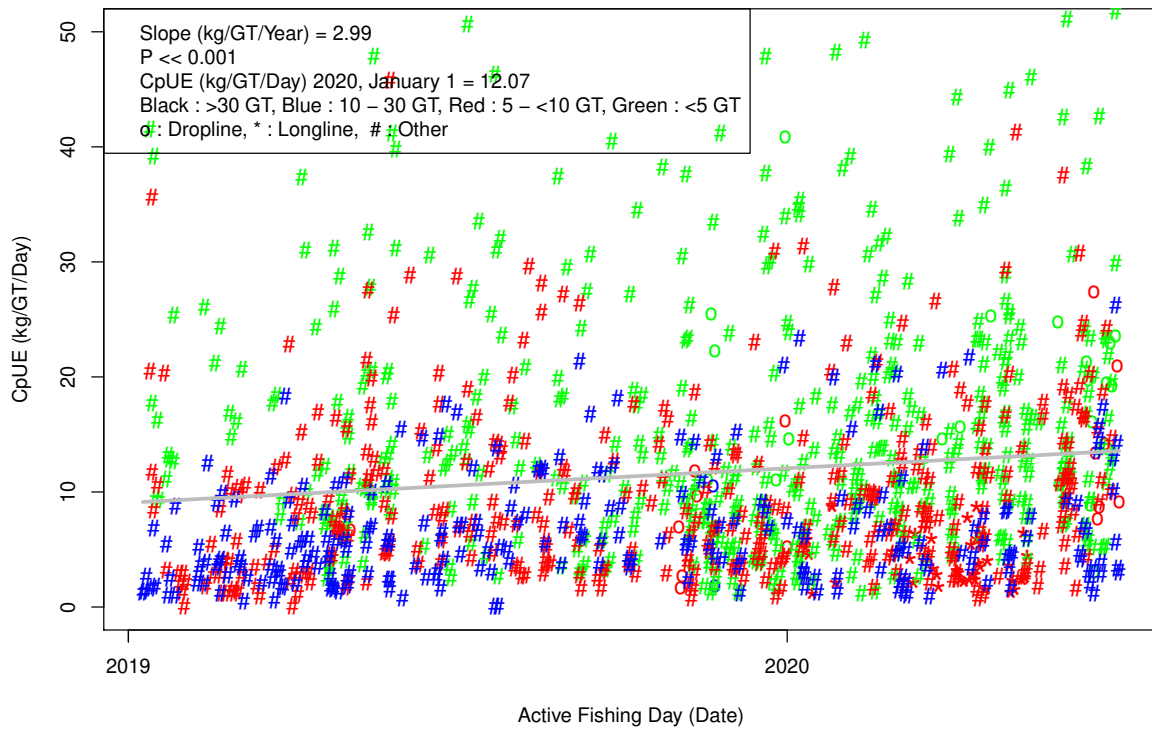


Figure 2.4: Catch per Unit of Effort in WPP 571.

Table 2.1: Number of CODRS deployed by gear type and boat size category in WPP 571

| N      | Dropline | Longline | Gillnet | Trap | Mix Gear | Total |
|--------|----------|----------|---------|------|----------|-------|
| Nano   | 0        | 0        | NA      | 1    | 8        | 9     |
| Small  | NA       | 4        | NA      | NA   | 12       | 16    |
| Medium | NA       | NA       | NA      | NA   | 3        | 3     |
| Large  | NA       | NA       | NA      | NA   | NA       | 0     |
| Total  | 0        | 4        | 0       | 1    | 23       | 28    |

**Nano** less than 5 GT. **Small** 5 - <10 GT. **Medium** 10 - 30 GT. **Large** >30 GT.

Table 2.2: CpUE by fishing gear and boat size category in WPP 571 for the most recent 365 days

| kg/GT/Day | Dropline | Longline | Gillnet | Trap  | Mix Gear |
|-----------|----------|----------|---------|-------|----------|
| Nano      | 26.04    | 13.06    | NA      | 14.46 | 16.57    |
| Small     | NA       | 4.06     | NA      | NA    | 12.64    |
| Medium    | NA       | NA       | NA      | NA    | 8.93     |
| Large     | NA       | NA       | NA      | NA    | NA       |

**Nano** less than 5 GT. **Small** 5 - <10 GT. **Medium** 10 - 30 GT. **Large** >30 GT.

Table 2.3: Number of CODRS observations that contribute to CpUE value in WPP 571 for the most recent 365 days

| N      | Dropline | Longline | Gillnet | Trap | Mix Gear |
|--------|----------|----------|---------|------|----------|
| Nano   | 22       | 800      | NA      | 261  | 98       |
| Small  | 14       | 38       | NA      | 160  | 75       |
| Medium | 2        | NA       | NA      | 70   | 60       |
| Large  | NA       | NA       | NA      | NA   | NA       |

**Nano** less than 5 GT. **Small** 5 - <10 GT. **Medium** 10 - 30 GT. **Large** >30 GT.

Table 2.4: Average active-fishing days per year by fishing gear and boat size category in all WPP

| Days / Year      | Dropline | Longline | Gillnet | Trap | Mix Gear |
|------------------|----------|----------|---------|------|----------|
| Nano Dedicated   | 201      | 235      | 224     | 194  | 265      |
| Nano Seasonal    | 100      | 118      | 112     | 97   | 133      |
| Small Dedicated  | 213      | 258      | 247     | 277  | 241      |
| Small Seasonal   | 107      | 129      | 124     | 139  | 121      |
| Medium Dedicated | 204      | 213      | 258     | 219  | 202      |
| Medium Seasonal  | 102      | 107      | 129     | 110  | 101      |
| Large Dedicated  | 166      | 237      | 151     | 185  | 185      |
| Large Seasonal   | 83       | 119      | 75      | 92   | 92       |

**Nano** less than 5 GT. **Small** 5 - <10 GT. **Medium** 10 - 30 GT. **Large** >30 GT.

Table 2.5: Current number of boats in the fleet by fishing gear and boat size category in WPP 571

| Number of Boat   | Dropline | Longline | Gillnet | Trap | Mix Gear | Total |
|------------------|----------|----------|---------|------|----------|-------|
| Nano Dedicated   | 4        | 7        | 0       | 6    | 78       | 95    |
| Nano Seasonal    | 0        | 0        | 0       | 0    | 0        | 0     |
| Small Dedicated  | 0        | 10       | 0       | 0    | 25       | 35    |
| Small Seasonal   | 0        | 0        | 0       | 0    | 0        | 0     |
| Medium Dedicated | 0        | 0        | 0       | 0    | 4        | 4     |
| Medium Seasonal  | 0        | 0        | 0       | 0    | 0        | 0     |
| Large Dedicated  | 0        | 0        | 0       | 0    | 0        | 0     |
| Large Seasonal   | 0        | 0        | 0       | 0    | 0        | 0     |
| Total            | 4        | 17       | 0       | 6    | 107      | 134   |

**Nano** less than 5 GT. **Small** 5 - <10 GT. **Medium** 10 - 30 GT. **Large** >30 GT.

Table 2.6: Current total gross tonnage of all boats in the fleet by fishing gear and boat size category in WPP 571

| Total GT         | Dropline | Longline   | Gillnet  | Trap      | Mix Gear   | Total      |
|------------------|----------|------------|----------|-----------|------------|------------|
| Nano Dedicated   | 6        | 11         | 0        | 14        | 278        | 310        |
| Nano Seasonal    | 0        | 0          | 0        | 0         | 0          | 0          |
| Small Dedicated  | 0        | 96         | 0        | 0         | 141        | 237        |
| Small Seasonal   | 0        | 0          | 0        | 0         | 0          | 0          |
| Medium Dedicated | 0        | 0          | 0        | 0         | 49         | 49         |
| Medium Seasonal  | 0        | 0          | 0        | 0         | 0          | 0          |
| Large Dedicated  | 0        | 0          | 0        | 0         | 0          | 0          |
| Large Seasonal   | 0        | 0          | 0        | 0         | 0          | 0          |
| <b>Total</b>     | <b>6</b> | <b>107</b> | <b>0</b> | <b>14</b> | <b>469</b> | <b>596</b> |

Table 2.7: Total catch in metric tons per year by fishing gear and boat size category in WPP 571 for the most recent 365 days

| Total Catch      | Dropline  | Longline   | Gillnet  | Trap      | Mix Gear    | Total       |
|------------------|-----------|------------|----------|-----------|-------------|-------------|
| Nano Dedicated   | 31        | 34         | 0        | 40        | 1222        | 1327        |
| Nano Seasonal    | 0         | 0          | 0        | 0         | 0           | 0           |
| Small Dedicated  | 0         | 101        | 0        | 0         | 430         | 531         |
| Small Seasonal   | 0         | 0          | 0        | 0         | 0           | 0           |
| Medium Dedicated | 0         | 0          | 0        | 0         | 89          | 89          |
| Medium Seasonal  | 0         | 0          | 0        | 0         | 0           | 0           |
| Large Dedicated  | 0         | 0          | 0        | 0         | 0           | 0           |
| Large Seasonal   | 0         | 0          | 0        | 0         | 0           | 0           |
| <b>Total</b>     | <b>31</b> | <b>134</b> | <b>0</b> | <b>40</b> | <b>1741</b> | <b>1946</b> |

**Nano** less than 5 GT. **Small** 5 - <10 GT. **Medium** 10 - 30 GT. **Large** >30 GT.

Table 2.8: Top 20 species by volume in deepwater demersal fisheries with % immature fish in the catch in WPP 571 for the most recent 365 days.

| Species                      | Weight<br>MT | Weight<br>% | Cumulative<br>% Weight | Immature<br>% Number | Immature<br>% Weight | Risk<br>Immature |
|------------------------------|--------------|-------------|------------------------|----------------------|----------------------|------------------|
| Epinephelus coioides         | 727          | 37          | 37                     | 24                   | 10                   | Med              |
| Pristipomoides multidens     | 374          | 19          | 57                     | 17                   | 6                    | Med              |
| Epinephelus bleekeri         | 230          | 12          | 68                     | 11                   | 3                    | Med              |
| Epinephelus areolatus        | 139          | 7           | 76                     | 2                    | 0                    | Low              |
| Epinephelus epistictus       | 96           | 5           | 80                     | 3                    | 0                    | Low              |
| Caranx sexfasciatus          | 74           | 4           | 84                     | 10                   | 3                    | Low              |
| Epinephelus latifasciatus    | 58           | 3           | 87                     | 8                    | 2                    | Low              |
| Lutjanus johnii              | 37           | 2           | 89                     | 27                   | 13                   | Med              |
| Lutjanus malabaricus         | 27           | 1           | 91                     | 36                   | 18                   | High             |
| Pomadasys kaakan             | 26           | 1           | 92                     | 2                    | 1                    | Low              |
| Lutjanus vitta               | 24           | 1           | 93                     | 7                    | 3                    | Low              |
| Caranx ignobilis             | 21           | 1           | 94                     | 82                   | 72                   | High             |
| Rachycentron canadum         | 19           | 1           | 95                     | 61                   | 40                   | High             |
| Lutjanus argentimaculatus    | 14           | 1           | 96                     | NA                   | NA                   |                  |
| Cephalopholis sonnerati      | 12           | 1           | 96                     | 1                    | 0                    | Low              |
| Lethrinus lentjan            | 12           | 1           | 97                     | 2                    | 0                    | Low              |
| Carangoides chrysophrys      | 10           | 0           | 98                     | 62                   | 33                   | High             |
| Pristipomoides typus         | 9            | 0           | 98                     | NA                   | NA                   |                  |
| Pinjalo pinjalo              | 6            | 0           | 98                     | 19                   | 10                   | Med              |
| Lutjanus russelli            | 6            | 0           | 99                     | NA                   | NA                   |                  |
| <b>Total Top 20 Species</b>  | <b>1919</b>  | <b>99</b>   | <b>99</b>              | <b>13</b>            | <b>7</b>             | <b>Medium</b>    |
| <b>Total Top 100 Species</b> | <b>1946</b>  | <b>100</b>  | <b>100</b>             | <b>13</b>            | <b>7</b>             | <b>Medium</b>    |

Table 2.9: Top 20 species by volume in Dropline fisheries with % immature fish in the catch in WPP 571 for the most recent 365 days.

| Species                   | Weight<br>MT | Weight<br>% | Cumulative<br>% Weight | Immature<br>% Number | Immature<br>% Weight | Risk<br>Immature |
|---------------------------|--------------|-------------|------------------------|----------------------|----------------------|------------------|
| Caranx sexfasciatus       | 12           | 39          | 39                     | 1                    | 0                    | Low              |
| Pristipomoides multidens  | 6            | 18          | 57                     | 18                   | 7                    | Med              |
| Epinephelus coioides      | 5            | 15          | 73                     | 31                   | 12                   | High             |
| Lutjanus johnii           | 2            | 6           | 79                     | 30                   | 18                   | Med              |
| Epinephelus bleekeri      | 1            | 5           | 84                     | 14                   | 4                    | Med              |
| Caranx ignobilis          | 1            | 4           | 88                     | NA                   | NA                   |                  |
| Epinephelus epistictus    | 1            | 3           | 90                     | NA                   | NA                   |                  |
| Epinephelus areolatus     | 1            | 2           | 92                     | 2                    | 0                    | Low              |
| Epinephelus latifasciatus | 0            | 1           | 94                     | NA                   | NA                   |                  |
| Lutjanus argentimaculatus | 0            | 1           | 95                     | NA                   | NA                   |                  |
| Lethrinus lentjan         | 0            | 1           | 95                     | NA                   | NA                   |                  |
| Carangoides chrysophrys   | 0            | 1           | 96                     | NA                   | NA                   |                  |
| Sphyraena putnamae        | 0            | 1           | 97                     | NA                   | NA                   |                  |
| Epinephelus amblycephalus | 0            | 1           | 97                     | NA                   | NA                   |                  |
| Pristipomoides typus      | 0            | 1           | 98                     | NA                   | NA                   |                  |
| Rachycentron canadum      | 0            | 0           | 98                     | NA                   | NA                   |                  |
| Cephalopholis sonnerati   | 0            | 0           | 99                     | NA                   | NA                   |                  |
| Seriola dumerili          | 0            | 0           | 99                     | NA                   | NA                   |                  |
| Lutjanus russelli         | 0            | 0           | 99                     | NA                   | NA                   |                  |
| Epinephelus malabaricus   | 0            | 0           | 100                    | NA                   | NA                   |                  |
| Total Top 20 Species      | 31           | 100         | 100                    | 14                   | 5                    | Medium           |
| Total Top 100 Species     | 31           | 100         | 100                    | 14                   | 5                    | Medium           |

Table 2.10: Top 20 species by volume in Longline fisheries with % immature fish in the catch in WPP 571 for the most recent 365 days.

| Species                      | Weight<br>MT | Weight<br>% | Cumulative<br>% Weight | Immature<br>% Number | Immature<br>% Weight | Risk<br>Immature |
|------------------------------|--------------|-------------|------------------------|----------------------|----------------------|------------------|
| Epinephelus coioides         | 34           | 26          | 26                     | 32                   | 13                   | High             |
| Pomadasys kaakan             | 23           | 17          | 43                     | 2                    | 1                    | Low              |
| Lutjanus vitta               | 20           | 15          | 58                     | 7                    | 3                    | Low              |
| Epinephelus areolatus        | 15           | 11          | 69                     | 1                    | 0                    | Low              |
| Pristipomoides multidens     | 8            | 6           | 75                     | NA                   | NA                   |                  |
| Rachycentron canadum         | 6            | 4           | 79                     | NA                   | NA                   |                  |
| Lethrinus lentjan            | 6            | 4           | 83                     | 2                    | 0                    | Low              |
| Caranx sexfasciatus          | 4            | 3           | 86                     | NA                   | NA                   |                  |
| Epinephelus bleekeri         | 4            | 3           | 90                     | NA                   | NA                   |                  |
| Lutjanus johnii              | 3            | 2           | 92                     | NA                   | NA                   |                  |
| Lutjanus russelli            | 2            | 2           | 93                     | NA                   | NA                   |                  |
| Diagramma pictum             | 2            | 1           | 95                     | NA                   | NA                   |                  |
| Epinephelus epistictus       | 2            | 1           | 96                     | NA                   | NA                   |                  |
| Caranx ignobilis             | 1            | 1           | 97                     | NA                   | NA                   |                  |
| Epinephelus latifasciatus    | 1            | 1           | 97                     | NA                   | NA                   |                  |
| Lutjanus argentimaculatus    | 1            | 1           | 98                     | NA                   | NA                   |                  |
| Lutjanus malabaricus         | 1            | 0           | 98                     | NA                   | NA                   |                  |
| Sphyraena putnamae           | 0            | 0           | 99                     | NA                   | NA                   |                  |
| Carangoides coeruleopinnatus | 0            | 0           | 99                     | NA                   | NA                   |                  |
| Cephalopholis sonnerati      | 0            | 0           | 99                     | NA                   | NA                   |                  |
| Total Top 20 Species         | 133          | 99          | 99                     | 6                    | 4                    | Low              |
| Total Top 100 Species        | 134          | 100         | 100                    | 6                    | 4                    | Low              |





Table 2.13: Top 20 species by volume in Mixgears fisheries with % immature fish in the catch in WPP 571 for the most recent 365 days.

| Species                   | Weight<br>MT | Weight<br>% | Cumulative<br>% Weight | Immature<br>% Number | Immature<br>% Weight | Risk<br>Immature |
|---------------------------|--------------|-------------|------------------------|----------------------|----------------------|------------------|
| Epinephelus coioides      | 654          | 38          | 38                     | 24                   | 9                    | Med              |
| Pristipomoides multidens  | 359          | 21          | 58                     | 17                   | 6                    | Med              |
| Epinephelus bleekeri      | 223          | 13          | 71                     | 11                   | 3                    | Med              |
| Epinephelus areolatus     | 122          | 7           | 78                     | 2                    | 0                    | Low              |
| Epinephelus epistictus    | 93           | 5           | 83                     | 3                    | 0                    | Low              |
| Caranx sexfasciatus       | 58           | 3           | 87                     | 11                   | 3                    | Med              |
| Epinephelus latifasciatus | 56           | 3           | 90                     | 8                    | 2                    | Low              |
| Lutjanus johnii           | 32           | 2           | 92                     | 26                   | 12                   | Med              |
| Lutjanus malabaricus      | 26           | 1           | 93                     | 35                   | 17                   | High             |
| Caranx ignobilis          | 18           | 1           | 94                     | 82                   | 72                   | High             |
| Rachycentron canadum      | 13           | 1           | 95                     | 61                   | 40                   | High             |
| Lutjanus argentimaculatus | 13           | 1           | 96                     | NA                   | NA                   |                  |
| Cephalopholis sonnerati   | 11           | 1           | 96                     | 1                    | 0                    | Low              |
| Carangoides chrysophrys   | 9            | 1           | 97                     | 62                   | 33                   | High             |
| Pristipomoides typus      | 9            | 0           | 97                     | NA                   | NA                   |                  |
| Lethrinus lentjan         | 6            | 0           | 98                     | NA                   | NA                   |                  |
| Pinjalo pinjalo           | 6            | 0           | 98                     | 19                   | 10                   | Med              |
| Ostichthys japonicus      | 5            | 0           | 98                     | NA                   | NA                   |                  |
| Epinephelus amblycephalus | 4            | 0           | 99                     | NA                   | NA                   |                  |
| Lutjanus russelli         | 4            | 0           | 99                     | NA                   | NA                   |                  |
| Total Top 20 Species      | 1720         | 99          | 99                     | 14                   | 7                    | Medium           |
| Total Top 100 Species     | 1741         | 100         | 100                    | 14                   | 7                    | Medium           |

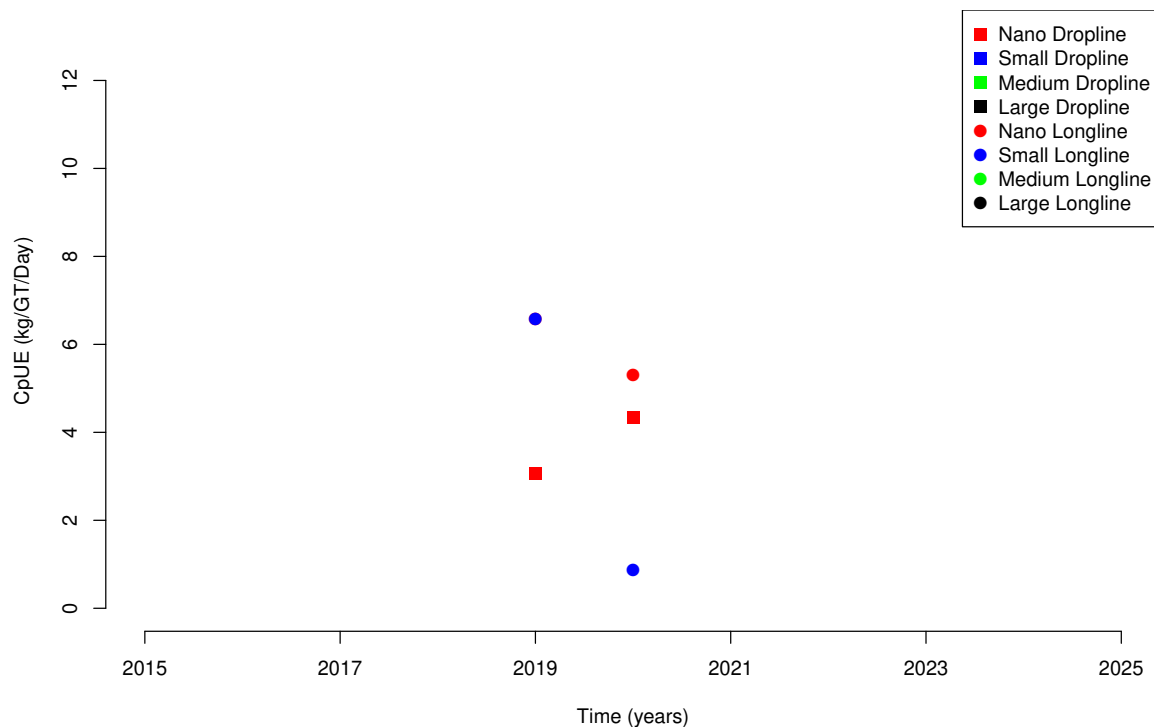


Figure 2.5: Catch per Unit of Effort per calendar year for Epinephelus coioides in WPP 571 for Dropline and Longline catches by fleet segment. Solid lines and dashed lines for trends in Dropline CpUE and Longline CpUE respectively.

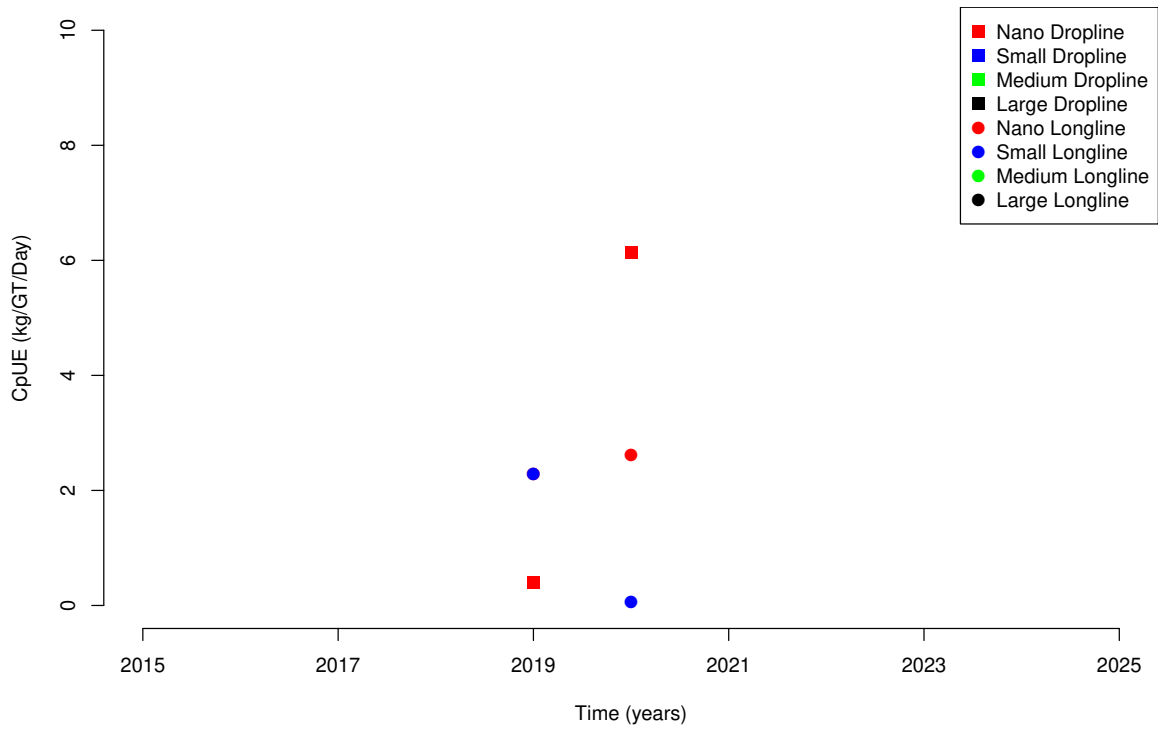


Figure 2.6: Catch per Unit of Effort per calendar year for *Pristipomoides multidens* in WPP 571 for Dropline and Longline catches by fleet segment. Solid lines and dashed lines for trends in Dropline CpUE and Longline CpUE respectively.

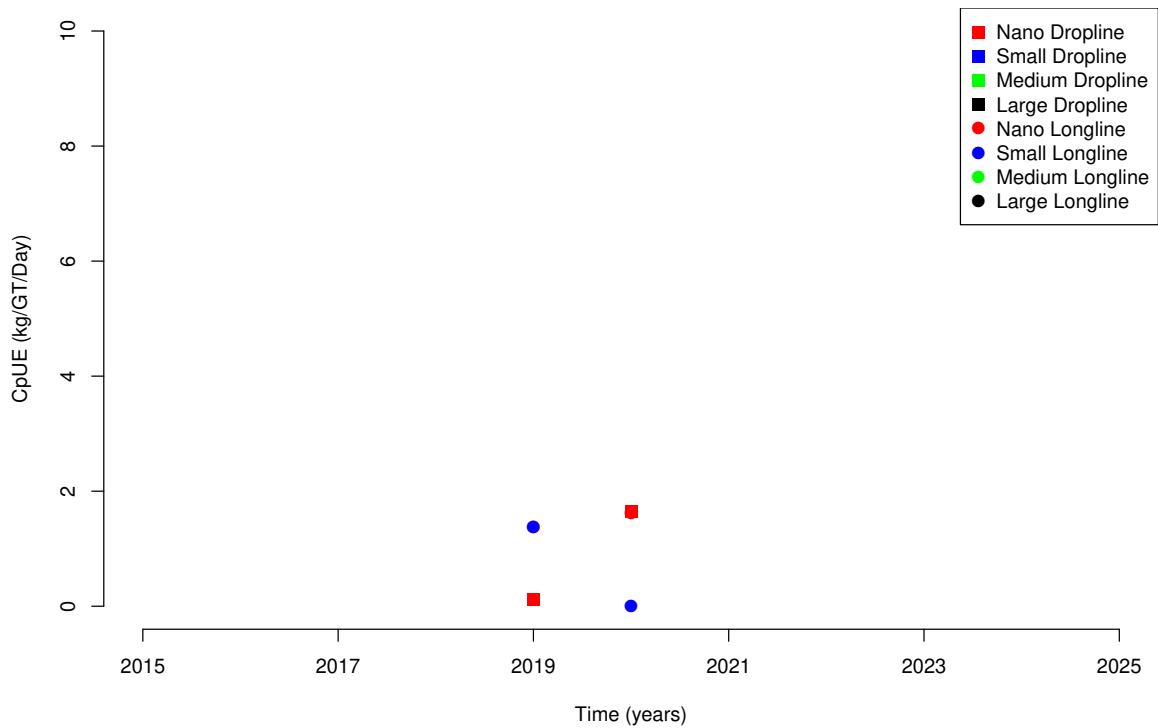


Figure 2.7: Catch per Unit of Effort per calendar year for *Epinephelus bleekeri* in WPP 571 for Dropline and Longline catches by fleet segment. Solid lines and dashed lines for trends in Dropline CpUE and Longline CpUE respectively.

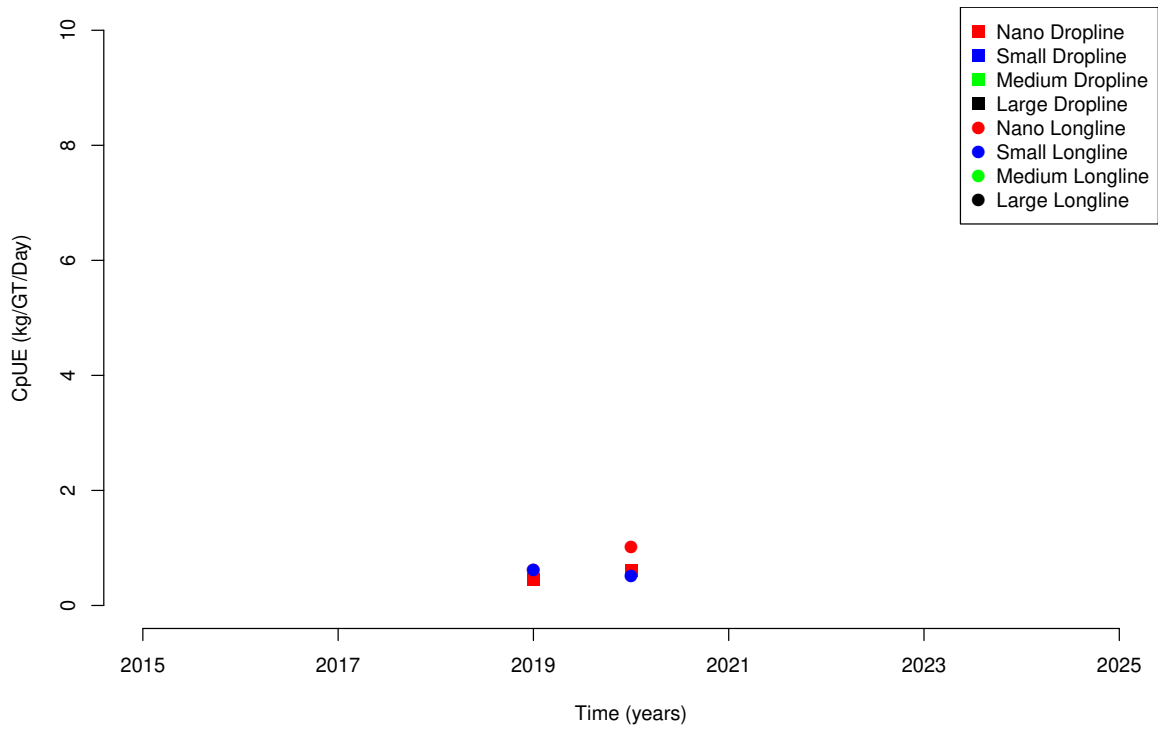


Figure 2.8: Catch per Unit of Effort per calendar year for *Epinephelus areolatus* in WPP 571 for Dropline and Longline catches by fleet segment. Solid lines and dashed lines for trends in Dropline CpUE and Longline CpUE respectively.

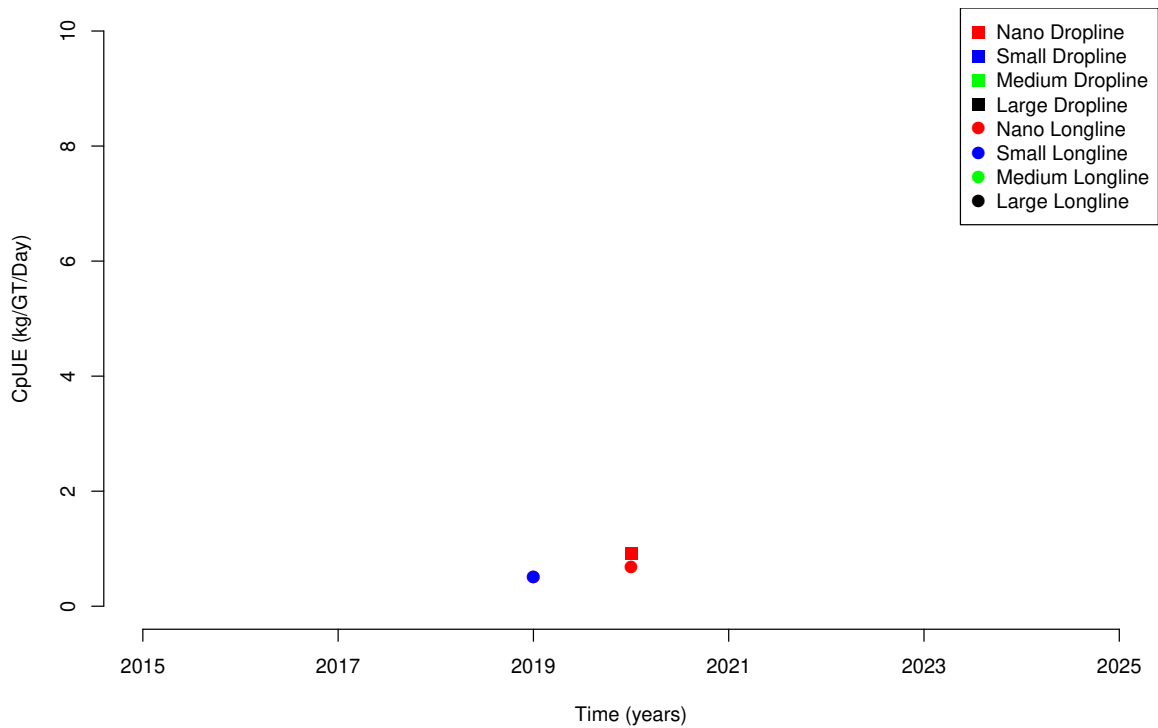


Figure 2.9: Catch per Unit of Effort per calendar year for *Epinephelus epistictus* in WPP 571 for Dropline and Longline catches by fleet segment. Solid lines and dashed lines for trends in Dropline CpUE and Longline CpUE respectively.

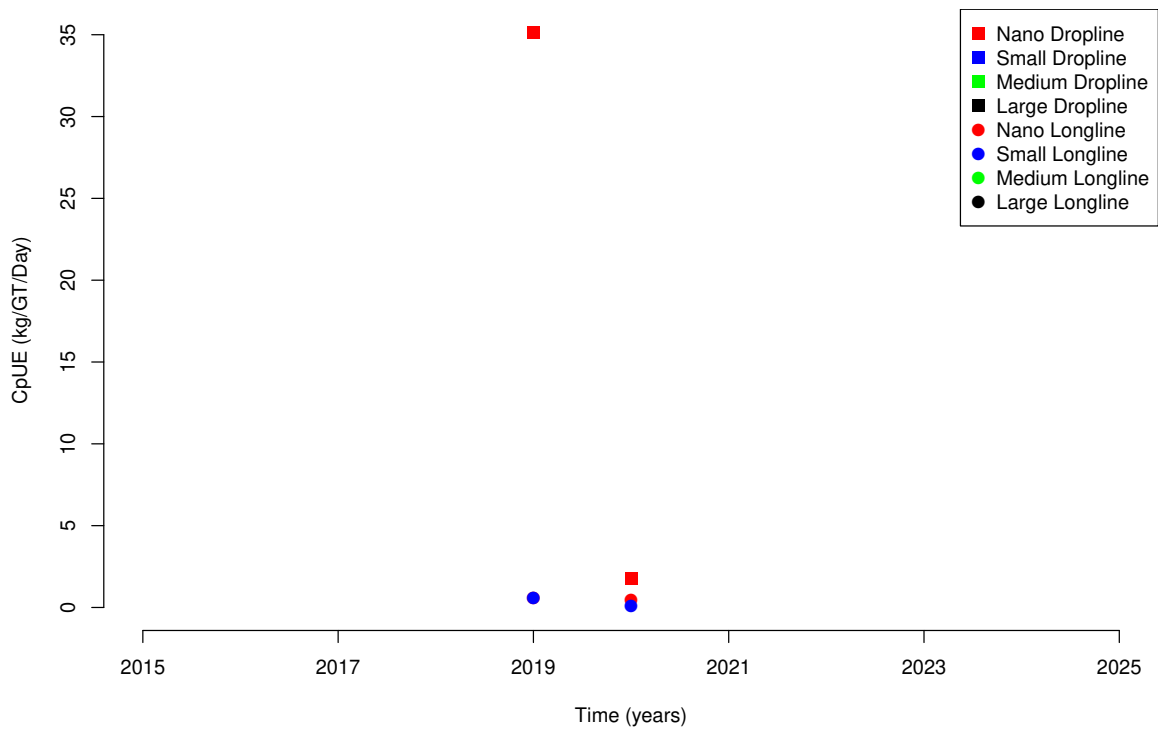


Figure 2.10: Catch per Unit of Effort per calendar year for *Caranx sexfasciatus* in WPP 571 for Dropline and Longline catches by fleet segment. Solid lines and dashed lines for trends in Dropline CpUE and Longline CpUE respectively.

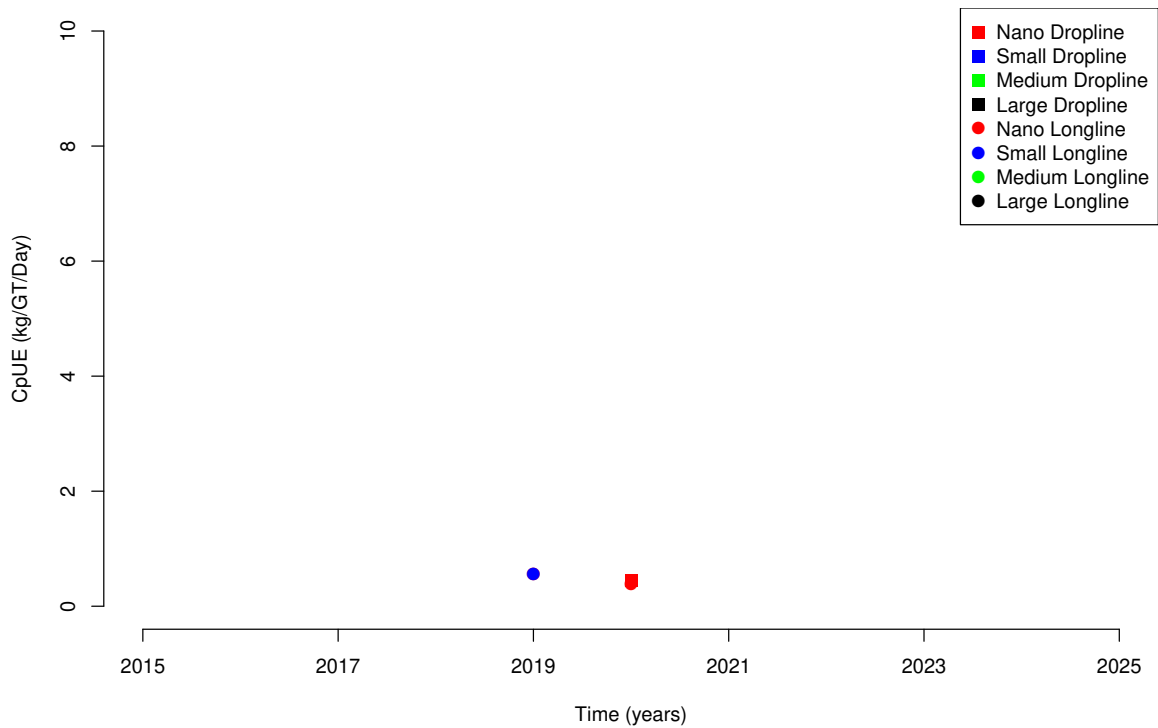


Figure 2.11: Catch per Unit of Effort per calendar year for *Epinephelus latifasciatus* in WPP 571 for Dropline and Longline catches by fleet segment. Solid lines and dashed lines for trends in Dropline CpUE and Longline CpUE respectively.

Table 2.14: Total Number and Gross Tonnage of Snapper Fishing Boats by Main Target WPP, Registration Port, Home District (Kabupaten), Boat Size Category and Type of Fishing Gear. (Nano < 5 GT, Small 5-<10 GT, Medium 10-30 GT, Large >30 GT)

| Row | WPP | Registration Port         | Home District      | Boat Size | Gear     | N  | Total GT |
|-----|-----|---------------------------|--------------------|-----------|----------|----|----------|
| 1   | 571 | Desa Sungai Kuruk III     | Aceh Tamiang       | Nano      | Mixgears | 2  | 6        |
| 2   | 571 | Desa Sungai Kuruk III     | Aceh Tamiang       | Small     | Mixgears | 6  | 34       |
| 3   | 571 | PP. Kuala Cangkoi         | Aceh Utara         | Nano      | Dropline | 1  | 2        |
| 4   | 571 | PP. Kuala Cangkoi         | Aceh Utara         | Nano      | Trap     | 5  | 10       |
| 5   | 571 | PP. Pasiran               | Kota Sabang        | Nano      | Dropline | 3  | 4        |
| 6   | 571 | Pangkalan Susu            | Langkat            | Nano      | Mixgears | 38 | 114      |
| 7   | 571 | Pelabuhan Ujung Kampung   | Langkat            | Medium    | Mixgears | 3  | 39       |
| 8   | 571 | Pelabuhan Ujung Kampung   | Langkat            | Nano      | Mixgears | 5  | 23       |
| 9   | 571 | Pelabuhan Ujung Kampung   | Langkat            | Nano      | Trap     | 1  | 4        |
| 10  | 571 | Pelabuhan Ujung Kampung   | Langkat            | Small     | Mixgears | 2  | 15       |
| 11  | 571 | PPI. Pangkalan Brandan    | Langkat            | Medium    | Mixgears | 1  | 10       |
| 12  | 571 | PPI. Pangkalan Brandan    | Langkat            | Nano      | Mixgears | 33 | 135      |
| 13  | 571 | PPI. Pangkalan Brandan    | Langkat            | Small     | Mixgears | 7  | 42       |
| 14  | 571 | PP. Ujung Blang           | Lhokseumawe        | Nano      | Longline | 7  | 11       |
| 15  | 571 | Belawan                   | Medan              | Small     | Mixgears | 10 | 50       |
| 16  | 571 | Teluk Mengkudu            | Serdang Bedagai    | Small     | Longline | 5  | 48       |
| 17  | 571 | TPI. Sialang Buah         | Serdang Bedagai    | Small     | Longline | 5  | 48       |
| 18  | 572 | Kuala Bubon               | Aceh Barat         | Medium    | Mixgears | 2  | 21       |
| 19  | 572 | Kuala Bubon               | Aceh Barat         | Small     | Mixgears | 2  | 14       |
| 20  | 572 | PP. Meulaboh              | Aceh Barat         | Nano      | Mixgears | 5  | 17       |
| 21  | 572 | PP. Ujoeng Baroh          | Aceh Barat         | Medium    | Mixgears | 1  | 10       |
| 22  | 572 | PP. Ujoeng Baroh          | Aceh Barat         | Nano      | Mixgears | 1  | 3        |
| 23  | 572 | PP. Ujong Baroeh          | Aceh Barat         | Nano      | Mixgears | 3  | 10       |
| 24  | 572 | PP. Ujong Baroeh          | Aceh Barat         | Small     | Dropline | 2  | 13       |
| 25  | 572 | PP. Ujong Baroeh          | Aceh Barat         | Small     | Mixgears | 18 | 107      |
| 26  | 572 | Susoh                     | Aceh Barat Daya    | Medium    | Dropline | 1  | 11       |
| 27  | 572 | Susoh                     | Aceh Barat Daya    | Small     | Dropline | 2  | 12       |
| 28  | 572 | Desa Lampuyang            | Aceh Besar         | Nano      | Dropline | 15 | 22       |
| 29  | 572 | PP. Lhok Bengkuang        | Aceh Selatan       | Nano      | Mixgears | 10 | 36       |
| 30  | 572 | PP. Lhok Bengkuang        | Aceh Selatan       | Small     | Mixgears | 37 | 236      |
| 31  | 572 | PP. Lampulo               | Banda Aceh         | Nano      | Dropline | 1  | 4        |
| 32  | 572 | PP. Lampulo               | Banda Aceh         | Nano      | Longline | 2  | 6        |
| 33  | 572 | PP. Lampulo               | Banda Aceh         | Small     | Dropline | 8  | 49       |
| 34  | 572 | PP. Lampulo               | Banda Aceh         | Small     | Longline | 1  | 6        |
| 35  | 572 | PPS Lampulo               | Banda Aceh         | Small     | Dropline | 9  | 63       |
| 36  | 572 | PP. Pulau Baai            | Bengkulu           | Large     | Trap     | 1  | 31       |
| 37  | 572 | PP. Pulau Baai            | Bengkulu           | Medium    | Dropline | 2  | 34       |
| 38  | 572 | PP. Pulau Baai            | Bengkulu           | Medium    | Gillnet  | 7  | 153      |
| 39  | 572 | PP. Pulau Baai            | Bengkulu           | Medium    | Mixgears | 5  | 61       |
| 40  | 572 | PP. Pulau Baai            | Bengkulu           | Nano      | Dropline | 5  | 21       |
| 41  | 572 | PP. Pulau Baai            | Bengkulu           | Nano      | Mixgears | 2  | 8        |
| 42  | 572 | PP. Pulau Baai            | Bengkulu           | Small     | Dropline | 23 | 130      |
| 43  | 572 | PP. Pulau Baai            | Bengkulu           | Small     | Gillnet  | 1  | 6        |
| 44  | 572 | PP. Pulau Baai            | Bengkulu           | Small     | Mixgears | 2  | 12       |
| 45  | 572 | PP. Muara Angke           | Jakarta            | Large     | Dropline | 1  | 158      |
| 46  | 572 | PP. Sikakap               | Kepulauan Mentawai | Nano      | Dropline | 1  | 3        |
| 47  | 572 | PP. Tuapejat              | Kepulauan Mentawai | Medium    | Dropline | 2  | 24       |
| 48  | 572 | PP. Tuapejat              | Kepulauan Mentawai | Small     | Dropline | 2  | 18       |
| 49  | 572 | PP. Muara Piluk Bakauheni | Lampung            | Nano      | Longline | 14 | 39       |
| 50  | 572 | PP. Muara Piluk Bakauheni | Lampung            | Small     | Longline | 1  | 5        |
| 51  | 572 | Botolakha                 | Nias               | Small     | Dropline | 25 | 197      |
| 52  | 572 | Helera                    | Nias               | Nano      | Mixgears | 13 | 21       |
| 53  | 572 | Helera                    | Nias               | Small     | Mixgears | 2  | 11       |
| 54  | 572 | Teluk Dalam               | Nias               | Nano      | Dropline | 5  | 18       |
| 55  | 572 | Muara Padang              | Padang             | Medium    | Dropline | 1  | 12       |
| 56  | 572 | Muara Padang              | Padang             | Medium    | Longline | 1  | 11       |
| 57  | 572 | Muara Padang              | Padang             | Nano      | Dropline | 2  | 7        |
| 58  | 572 | Muara Padang              | Padang             | Small     | Dropline | 12 | 70       |

Table 2.14: Total Number and Gross Tonnage of Snapper Fishing Boats by Main Target WPP, Registration Port, Home District (Kabupaten), Boat Size Category and Type of Fishing Gear. (Nano < 5 GT, Small 5-<10 GT, Medium 10-30 GT, Large >30 GT)

| Row | WPP | Registration Port         | Home District      | Boat Size | Gear     | N   | Total GT |
|-----|-----|---------------------------|--------------------|-----------|----------|-----|----------|
| 59  | 572 | PP. Bungus                | Padang             | Medium    | Mixgears | 1   | 15       |
| 60  | 572 | PP. Bungus                | Padang             | Small     | Longline | 1   | 8        |
| 61  | 572 | PP. Muaro                 | Padang             | Medium    | Dropline | 2   | 23       |
| 62  | 572 | PP. Muaro                 | Padang             | Medium    | Longline | 1   | 11       |
| 63  | 572 | PP. Muaro                 | Padang             | Medium    | Mixgears | 2   | 24       |
| 64  | 572 | PP. Muaro                 | Padang             | Small     | Dropline | 1   | 5        |
| 65  | 572 | PP. Muaro                 | Padang             | Small     | Longline | 2   | 19       |
| 66  | 572 | PP. Muaro                 | Padang             | Small     | Mixgears | 4   | 29       |
| 67  | 572 | PP. Labuan                | Pandeglang         | Small     | Dropline | 29  | 152      |
| 68  | 572 | PP. Sibolga               | Sibolga            | Medium    | Trap     | 4   | 64       |
| 69  | 572 | PP. Sibolga               | Sibolga            | Nano      | Dropline | 4   | 14       |
| 70  | 572 | PP. Sibolga               | Sibolga            | Nano      | Trap     | 12  | 47       |
| 71  | 572 | PP. Sibolga               | Sibolga            | Small     | Dropline | 3   | 18       |
| 72  | 572 | PP. Sibolga               | Sibolga            | Small     | Trap     | 6   | 35       |
| 73  | 573 | Desa Alor Kecil           | Alor               | Nano      | Dropline | 25  | 17       |
| 74  | 573 | Kedonganan                | Badung             | Nano      | Mixgears | 30  | 56       |
| 75  | 573 | PP. Pancer                | Banyuwangi         | Nano      | Dropline | 300 | 306      |
| 76  | 573 | Atapupu                   | Belu               | Nano      | Dropline | 5   | 6        |
| 77  | 573 | PP. Rompo                 | Bima               | Nano      | Dropline | 50  | 50       |
| 78  | 573 | PP. Sape                  | Bima               | Nano      | Dropline | 103 | 170      |
| 79  | 573 | PP. Sape                  | Bima               | Nano      | Mixgears | 109 | 267      |
| 80  | 573 | Jetis                     | Cilacap            | Nano      | Longline | 30  | 26       |
| 81  | 573 | Pelabuhan Benoa           | Denpasar           | Medium    | Dropline | 12  | 268      |
| 82  | 573 | Pelabuhan Benoa           | Denpasar           | Medium    | Longline | 1   | 27       |
| 83  | 573 | PP. Tenau Kupang          | Denpasar           | Medium    | Dropline | 1   | 22       |
| 84  | 573 | PP. Soroadu               | Dompu              | Nano      | Dropline | 27  | 15       |
| 85  | 573 | PP. Soroadu               | Dompu              | Nano      | Longline | 11  | 6        |
| 86  | 573 | Pengambangan              | Jembrana           | Nano      | Longline | 20  | 40       |
| 87  | 573 | Yeh Kuning                | Jembrana           | Nano      | Longline | 150 | 126      |
| 88  | 573 | Pelabuhan Benoa           | Kupang             | Medium    | Dropline | 1   | 27       |
| 89  | 573 | PP. Mayangan              | Kupang             | Medium    | Longline | 1   | 29       |
| 90  | 573 | PP. Oeba Kupang           | Kupang             | Nano      | Dropline | 5   | 5        |
| 91  | 573 | PP. Tenau Kupang          | Kupang             | Medium    | Dropline | 21  | 365      |
| 92  | 573 | PP. Tenau Kupang          | Kupang             | Medium    | Longline | 2   | 48       |
| 93  | 573 | PP. Tenau Kupang          | Kupang             | Nano      | Dropline | 6   | 22       |
| 94  | 573 | PP. Tenau Kupang          | Kupang             | Small     | Dropline | 22  | 174      |
| 95  | 573 | Tablolong Kupang          | Kupang             | Nano      | Dropline | 11  | 22       |
| 96  | 573 | Desa waijarang            | Lembata            | Nano      | Dropline | 20  | 14       |
| 97  | 573 | Tapolango                 | Lembata            | Nano      | Mixgears | 20  | 14       |
| 98  | 573 | PP. Tanjung Luar          | Lombok Timur       | Nano      | Dropline | 30  | 30       |
| 99  | 573 | PP. Tanjung Luar          | Lombok Timur       | Nano      | Longline | 50  | 70       |
| 100 | 573 | PP. Tanjung Luar          | Lombok Timur       | Small     | Dropline | 1   | 9        |
| 101 | 573 | Pulau Maringkik           | Lombok Timur       | Small     | Dropline | 11  | 93       |
| 102 | 573 | TPI Kampung Ujung         | Manggarai Barat    | Nano      | Dropline | 60  | 74       |
| 103 | 573 | PP Cikidang               | Pangandaran        | Small     | Gillnet  | 8   | 50       |
| 104 | 573 | PP. Cikidang              | Pangandaran        | Nano      | Gillnet  | 3   | 13       |
| 105 | 573 | Batutua Rote              | Rote               | Nano      | Dropline | 8   | 8        |
| 106 | 573 | Oesely Rote               | Rote               | Nano      | Dropline | 1   | 1        |
| 107 | 573 | Papela Darat              | Rote               | Nano      | Dropline | 9   | 9        |
| 108 | 573 | Papela Tanjung            | Rote               | Nano      | Dropline | 9   | 9        |
| 109 | 573 | Rote                      | Rote               | Nano      | Dropline | 4   | 7        |
| 110 | 573 | Sukabumi                  | Sukabumi           | Nano      | Dropline | 50  | 50       |
| 111 | 573 | Wini                      | Timor Tengah Utara | Nano      | Dropline | 7   | 12       |
| 112 | 711 | PP Baturusa Pangkal Batam | Bangka             | Small     | Trap     | 4   | 24       |
| 113 | 711 | PP. Sungailiat            | Bangka             | Small     | Dropline | 1   | 6        |
| 114 | 711 | PP. Sungailiat            | Bangka             | Small     | Gillnet  | 11  | 67       |
| 115 | 711 | PP. Sungailiat            | Bangka             | Small     | Mixgears | 2   | 12       |
| 116 | 711 | PP. Sungailiat            | Bangka             | Small     | Trap     | 1   | 6        |

Table 2.14: Total Number and Gross Tonnage of Snapper Fishing Boats by Main Target WPP, Registration Port, Home District (Kabupaten), Boat Size Category and Type of Fishing Gear. (Nano < 5 GT, Small 5-<10 GT, Medium 10-30 GT, Large >30 GT)

| Row | WPP | Registration Port            | Home District     | Boat Size | Gear     | N   | Total GT |
|-----|-----|------------------------------|-------------------|-----------|----------|-----|----------|
| 117 | 711 | Batam                        | Batam             | Large     | Trap     | 1   | 34       |
| 118 | 711 | Batam                        | Batam             | Medium    | Trap     | 2   | 56       |
| 119 | 711 | Batam                        | Batam             | Small     | Dropline | 2   | 12       |
| 120 | 711 | Batam                        | Batam             | Small     | Trap     | 2   | 13       |
| 121 | 711 | PP. Tanjung Pandan           | Belitung          | Medium    | Mixgears | 2   | 36       |
| 122 | 711 | PP. Tanjung Pandan           | Belitung          | Medium    | Trap     | 3   | 63       |
| 123 | 711 | PP. Tanjung Pandan           | Belitung          | Nano      | Dropline | 77  | 157      |
| 124 | 711 | PP. Tanjung Pandan           | Belitung          | Nano      | Mixgears | 75  | 225      |
| 125 | 711 | PP. Tanjung Pandan           | Belitung          | Nano      | Trap     | 20  | 71       |
| 126 | 711 | PP. Tanjung Pandan           | Belitung          | Small     | Dropline | 5   | 27       |
| 127 | 711 | PP. Tanjung Pandan           | Belitung          | Small     | Gillnet  | 3   | 16       |
| 128 | 711 | PP. Tanjung Pandan           | Belitung          | Small     | Longline | 2   | 11       |
| 129 | 711 | PP. Tanjung Pandan           | Belitung          | Small     | Mixgears | 10  | 65       |
| 130 | 711 | PP. Tanjung Pandan           | Belitung          | Small     | Trap     | 46  | 248      |
| 131 | 711 | PP. Manggar Belitung Timur   | Belitung Timur    | Medium    | Dropline | 2   | 21       |
| 132 | 711 | PP. Manggar Belitung Timur   | Belitung Timur    | Medium    | Mixgears | 1   | 20       |
| 133 | 711 | PP. Manggar Belitung Timur   | Belitung Timur    | Nano      | Dropline | 3   | 11       |
| 134 | 711 | PP. Manggar Belitung Timur   | Belitung Timur    | Nano      | Mixgears | 1   | 4        |
| 135 | 711 | PP. Manggar Belitung Timur   | Belitung Timur    | Small     | Dropline | 4   | 22       |
| 136 | 711 | PP. Manggar Belitung Timur   | Belitung Timur    | Small     | Mixgears | 87  | 481      |
| 137 | 711 | PP. Kijang                   | Bintan            | Large     | Longline | 2   | 69       |
| 138 | 711 | PP. Kijang                   | Bintan            | Medium    | Dropline | 3   | 47       |
| 139 | 711 | PP. Kijang                   | Bintan            | Medium    | Longline | 4   | 78       |
| 140 | 711 | PP. Kijang                   | Bintan            | Medium    | Trap     | 245 | 4709     |
| 141 | 711 | PP. Kijang                   | Bintan            | Nano      | Mixgears | 2   | 8        |
| 142 | 711 | PP. Kijang                   | Bintan            | Nano      | Trap     | 7   | 29       |
| 143 | 711 | PP. Kijang                   | Bintan            | Small     | Dropline | 10  | 66       |
| 144 | 711 | PP. Kijang                   | Bintan            | Small     | Longline | 5   | 36       |
| 145 | 711 | PP. Kijang                   | Bintan            | Small     | Mixgears | 9   | 58       |
| 146 | 711 | PP. Kijang                   | Bintan            | Small     | Trap     | 210 | 1425     |
| 147 | 711 | Moro                         | Karimun           | Small     | Trap     | 1   | 7        |
| 148 | 711 | Tanjung Balai Karimun        | Karimun           | Medium    | Longline | 7   | 163      |
| 149 | 711 | PP. Tarempa                  | Kepulauan Anambas | Nano      | Dropline | 202 | 298      |
| 150 | 711 | PP. Tarempa                  | Kepulauan Anambas | Nano      | Trap     | 19  | 24       |
| 151 | 711 | PP. Tarempa                  | Kepulauan Anambas | Small     | Dropline | 11  | 63       |
| 152 | 711 | PPI Ladan                    | Kepulauan Anambas | Nano      | Dropline | 73  | 182      |
| 153 | 711 | PPI Ladan                    | Kepulauan Anambas | Small     | Dropline | 1   | 5        |
| 154 | 711 | Bunguran                     | Natuna            | Nano      | Dropline | 22  | 79       |
| 155 | 711 | Dermaga Kayu Sededap         | Natuna            | Nano      | Dropline | 1   | 5        |
| 156 | 711 | Lagong                       | Natuna            | Nano      | Dropline | 23  | 69       |
| 157 | 711 | Natuna                       | Natuna            | Large     | Longline | 3   | 94       |
| 158 | 711 | Natuna                       | Natuna            | Medium    | Longline | 1   | 28       |
| 159 | 711 | Pelabuhan Midai              | Natuna            | Medium    | Mixgears | 4   | 48       |
| 160 | 711 | Pelabuhan Midai              | Natuna            | Small     | Mixgears | 1   | 6        |
| 161 | 711 | Pelabuhan Pasir Putih        | Natuna            | Nano      | Dropline | 1   | 2        |
| 162 | 711 | Pelabuhan Pering             | Natuna            | Medium    | Dropline | 2   | 30       |
| 163 | 711 | Pelabuhan Pering             | Natuna            | Nano      | Dropline | 21  | 78       |
| 164 | 711 | Pelabuhan Pering             | Natuna            | Small     | Dropline | 1   | 8        |
| 165 | 711 | Pelabuhan Sabang Barat-Midai | Natuna            | Medium    | Mixgears | 1   | 12       |
| 166 | 711 | Pelabuhan Sabang Barat-Midai | Natuna            | Small     | Mixgears | 2   | 12       |
| 167 | 711 | Pelabuhan Tanjung            | Natuna            | Nano      | Dropline | 30  | 59       |
| 168 | 711 | Pering                       | Natuna            | Nano      | Dropline | 1   | 4        |
| 169 | 711 | PP. Pering                   | Natuna            | Small     | Dropline | 1   | 5        |
| 170 | 711 | PP. Tarempa                  | Natuna            | Medium    | Longline | 1   | 18       |
| 171 | 711 | Pulau Tiga Natuna            | Natuna            | Small     | Dropline | 28  | 170      |
| 172 | 711 | Sepempang                    | Natuna            | Small     | Dropline | 22  | 132      |
| 173 | 711 | Subi-besar                   | Natuna            | Nano      | Dropline | 23  | 69       |
| 174 | 711 | Tanjung Balai Karimun        | Natuna            | Medium    | Longline | 57  | 1579     |

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| Row | WPP | Registration Port    | Home District  | Boat Size | Gear     | N   | Total GT |
|-----|-----|----------------------|----------------|-----------|----------|-----|----------|
| 175 | 711 | Teluk Buton          | Natuna         | Nano      | Dropline | 26  | 78       |
| 176 | 711 | Pangkal Balam        | Pangkal Pinang | Nano      | Dropline | 2   | 7        |
| 177 | 711 | Pangkal Balam        | Pangkal Pinang | Nano      | Mixgears | 3   | 12       |
| 178 | 711 | Pangkal Balam        | Pangkal Pinang | Nano      | Trap     | 1   | 4        |
| 179 | 711 | Pangkal Balam        | Pangkal Pinang | Small     | Gillnet  | 1   | 6        |
| 180 | 711 | Pangkal Balam        | Pangkal Pinang | Small     | Mixgears | 5   | 27       |
| 181 | 711 | Pangkal Balam        | Pangkal Pinang | Small     | Trap     | 12  | 67       |
| 182 | 711 | PP. Bajomulyo        | Pati           | Large     | Longline | 2   | 125      |
| 183 | 711 | PP. Kuala Mempawah   | Pontianak      | Medium    | Trap     | 2   | 20       |
| 184 | 711 | PP. Kuala Mempawah   | Pontianak      | Small     | Trap     | 3   | 19       |
| 185 | 712 | PP. Tanjung Pandan   | Belitung       | Nano      | Trap     | 2   | 7        |
| 186 | 712 | PP. Tanjung Pandan   | Belitung       | Small     | Trap     | 12  | 63       |
| 187 | 712 | PP. Karangsong       | Indramayu      | Medium    | Longline | 11  | 165      |
| 188 | 712 | PP. Karangsong       | Indramayu      | Small     | Longline | 1   | 9        |
| 189 | 712 | PP. Cituis           | Jakarta        | Nano      | Mixgears | 8   | 32       |
| 190 | 712 | Jepara               | Jepara         | Medium    | Mixgears | 4   | 55       |
| 191 | 712 | Jepara               | Jepara         | Small     | Mixgears | 1   | 6        |
| 192 | 712 | PP. Karimun Jawa     | Jepara         | Medium    | Mixgears | 28  | 395      |
| 193 | 712 | PP. Karimun Jawa     | Jepara         | Nano      | Mixgears | 6   | 21       |
| 194 | 712 | PP. Karimun Jawa     | Jepara         | Small     | Mixgears | 68  | 491      |
| 195 | 712 | Pulau Parang         | Jepara         | Medium    | Mixgears | 5   | 99       |
| 196 | 712 | Pulau Parang         | Jepara         | Small     | Trap     | 1   | 7        |
| 197 | 712 | PP. Brondong         | Lamongan       | Medium    | Dropline | 43  | 575      |
| 198 | 712 | PP. Brondong         | Lamongan       | Medium    | Mixgears | 18  | 314      |
| 199 | 712 | PP. Brondong         | Lamongan       | Nano      | Dropline | 8   | 32       |
| 200 | 712 | PP. Brondong         | Lamongan       | Small     | Dropline | 118 | 902      |
| 201 | 712 | PP. Brondong         | Lamongan       | Small     | Mixgears | 2   | 14       |
| 202 | 712 | PP. Paciran          | Lamongan       | Medium    | Dropline | 1   | 16       |
| 203 | 712 | PP. Paciran          | Lamongan       | Medium    | Mixgears | 22  | 343      |
| 204 | 712 | PP. Bajomulyo        | Pati           | Large     | Longline | 42  | 2117     |
| 205 | 712 | PP. Bajomulyo        | Pati           | Medium    | Longline | 36  | 956      |
| 206 | 712 | PP. Bajomulyo        | Pati           | Small     | Longline | 2   | 16       |
| 207 | 712 | PP. Asem Doyong      | Pemalang       | Small     | Dropline | 24  | 132      |
| 208 | 712 | PP. Mayangan         | Probolinggo    | Medium    | Longline | 1   | 29       |
| 209 | 712 | Probolinggo          | Probolinggo    | Large     | Longline | 1   | 85       |
| 210 | 712 | Situbondo            | Situbondo      | Nano      | Dropline | 20  | 60       |
| 211 | 712 | Situbondo            | Situbondo      | Nano      | Longline | 20  | 60       |
| 212 | 712 | Desa Masalima        | Sumenep        | Small     | Dropline | 10  | 68       |
| 213 | 712 | Desa Masalima        | Sumenep        | Small     | Mixgears | 2   | 16       |
| 214 | 712 | Dungkek              | Sumenep        | Medium    | Dropline | 1   | 12       |
| 215 | 712 | Dungkek              | Sumenep        | Small     | Dropline | 3   | 22       |
| 216 | 712 | Gili Iyang           | Sumenep        | Small     | Dropline | 7   | 51       |
| 217 | 712 | Pagerungan Besar     | Sumenep        | Nano      | Longline | 1   | 4        |
| 218 | 712 | Pagerungan Besar     | Sumenep        | Small     | Longline | 4   | 25       |
| 219 | 712 | Sumenep              | Sumenep        | Medium    | Dropline | 2   | 28       |
| 220 | 712 | Sumenep              | Sumenep        | Nano      | Dropline | 1   | 4        |
| 221 | 712 | Sumenep              | Sumenep        | Nano      | Longline | 1   | 3        |
| 222 | 712 | Sumenep              | Sumenep        | Small     | Dropline | 401 | 3398     |
| 223 | 712 | Sumenep              | Sumenep        | Small     | Longline | 49  | 392      |
| 224 | 712 | Pagatan              | Tanah Bumbu    | Small     | Dropline | 2   | 10       |
| 225 | 713 | PP. Filial Klandasan | Balikpapan     | Nano      | Dropline | 2   | 8        |
| 226 | 713 | PP. Filial Klandasan | Balikpapan     | Small     | Dropline | 23  | 132      |
| 227 | 713 | PP. Klandasan        | Balikpapan     | Small     | Dropline | 3   | 21       |
| 228 | 713 | PP. Manggar Baru     | Balikpapan     | Medium    | Dropline | 17  | 303      |
| 229 | 713 | PP. Manggar Baru     | Balikpapan     | Small     | Longline | 8   | 44       |
| 230 | 713 | PP. Tanjung Pandan   | Belitung       | Nano      | Trap     | 1   | 3        |
| 231 | 713 | PP. Tanjung Pandan   | Belitung       | Small     | Dropline | 1   | 5        |
| 232 | 713 | PP. Tanjung Pandan   | Belitung       | Small     | Trap     | 4   | 21       |



Table 2.14: Total Number and Gross Tonnage of Snapper Fishing Boats by Main Target WPP, Registration Port, Home District (Kabupaten), Boat Size Category and Type of Fishing Gear. (Nano < 5 GT, Small 5-<10 GT, Medium 10-30 GT, Large >30 GT)

| Row | WPP | Registration Port          | Home District       | Boat Size | Gear     | N   | Total GT |
|-----|-----|----------------------------|---------------------|-----------|----------|-----|----------|
| 233 | 713 | Lok Tuan                   | Bontang             | Nano      | Dropline | 1   | 1        |
| 234 | 713 | Lok Tuan                   | Bontang             | Nano      | Mixgears | 3   | 12       |
| 235 | 713 | PP. Tanjung Limau          | Bontang             | Nano      | Dropline | 5   | 11       |
| 236 | 713 | PP. Tanjung Limau          | Bontang             | Small     | Dropline | 4   | 24       |
| 237 | 713 | Tanjung Laut               | Bontang             | Nano      | Dropline | 1   | 1        |
| 238 | 713 | Dannuang                   | Bulukumba           | Nano      | Mixgears | 20  | 20       |
| 239 | 713 | Kalumeme                   | Bulukumba           | Nano      | Mixgears | 20  | 20       |
| 240 | 713 | Kota Bulukumba             | Bulukumba           | Nano      | Mixgears | 300 | 300      |
| 241 | 713 | Para-para                  | Bulukumba           | Small     | Dropline | 20  | 120      |
| 242 | 713 | PP. Soro Kempo             | Dompu               | Nano      | Longline | 300 | 300      |
| 243 | 713 | PP. Labean                 | Donggala            | Nano      | Dropline | 27  | 24       |
| 244 | 713 | Anawoi                     | Kolaka              | Medium    | Trap     | 5   | 64       |
| 245 | 713 | Gang Kakap, Muara Jawa     | Kutai Kartanegara   | Nano      | Longline | 20  | 60       |
| 246 | 713 | Kampung Terusan            | Kutai Kartanegara   | Small     | Longline | 10  | 85       |
| 247 | 713 | Kuala Samboja              | Kutai Kartanegara   | Small     | Longline | 3   | 15       |
| 248 | 713 | Pantai Biru Kersik         | Kutai Kartanegara   | Nano      | Dropline | 16  | 48       |
| 249 | 713 | Semangkok                  | Kutai Kartanegara   | Nano      | Dropline | 10  | 31       |
| 250 | 713 | Gang Mulia, Kampung Kajang | Kutai Timur         | Small     | Dropline | 1   | 5        |
| 251 | 713 | Maloy                      | Kutai Timur         | Small     | Dropline | 1   | 5        |
| 252 | 713 | Muara Selangkau            | Kutai Timur         | Nano      | Dropline | 40  | 120      |
| 253 | 713 | Majene                     | Majene              | Nano      | Mixgears | 52  | 156      |
| 254 | 713 | Majene                     | Majene              | Small     | Dropline | 1   | 7        |
| 255 | 713 | Majene                     | Majene              | Small     | Longline | 12  | 84       |
| 256 | 713 | Mamuju                     | Mamuju              | Nano      | Dropline | 31  | 93       |
| 257 | 713 | Mamuju                     | Mamuju              | Small     | Dropline | 4   | 20       |
| 258 | 713 | PP. Labuhan Bajo           | Manggarai Barat     | Nano      | Dropline | 40  | 15       |
| 259 | 713 | PP. Konge                  | Nagekeo             | Nano      | Dropline | 50  | 16       |
| 260 | 713 | Muara Pasir                | Paser               | Nano      | Longline | 10  | 20       |
| 261 | 713 | PP. Bajomulyo              | Pati                | Large     | Longline | 3   | 130      |
| 262 | 713 | Kampung Pejala             | Penajam Paser Utara | Small     | Mixgears | 17  | 85       |
| 263 | 713 | Logpond CV. Alas           | Penajam Paser Utara | Nano      | Dropline | 26  | 78       |
| 264 | 713 | Logpond CV. Alas           | Penajam Paser Utara | Small     | Dropline | 4   | 20       |
| 265 | 713 | Logpond SDR                | Penajam Paser Utara | Nano      | Dropline | 14  | 42       |
| 266 | 713 | Muara Tunan                | Penajam Paser Utara | Nano      | Dropline | 40  | 120      |
| 267 | 713 | Nenang                     | Penajam Paser Utara | Small     | Trap     | 50  | 253      |
| 268 | 713 | PP. Mayangan               | Probolinggo         | Medium    | Longline | 1   | 27       |
| 269 | 713 | PP. Kenyamukan             | Sangatta            | Medium    | Dropline | 3   | 32       |
| 270 | 713 | PP. Kenyamukan             | Sangatta            | Nano      | Dropline | 40  | 40       |
| 271 | 713 | PP. Kenyamukan             | Sangatta            | Small     | Dropline | 11  | 75       |
| 272 | 713 | PP. Sangatta               | Sangatta            | Medium    | Dropline | 1   | 10       |
| 273 | 713 | PP. Sangatta               | Sangatta            | Small     | Dropline | 5   | 31       |
| 274 | 713 | Labuan Sangoro             | Sumbawa             | Nano      | Longline | 20  | 37       |
| 275 | 713 | Labuan Sumbawa             | Sumbawa             | Large     | Dropline | 1   | 34       |
| 276 | 713 | Labuan Terata              | Sumbawa             | Nano      | Dropline | 4   | 7        |
| 277 | 713 | Labuhan Sumbawa            | Sumbawa             | Medium    | Dropline | 1   | 12       |
| 278 | 713 | Labuhan Sumbawa            | Sumbawa             | Small     | Dropline | 7   | 36       |
| 279 | 713 | Sumbawa                    | Sumbawa             | Nano      | Longline | 50  | 50       |
| 280 | 713 | PP. Beba                   | Takalar             | Medium    | Dropline | 26  | 362      |
| 281 | 713 | PP. Beba                   | Takalar             | Medium    | Gillnet  | 14  | 215      |
| 282 | 713 | PP. Beba                   | Takalar             | Medium    | Longline | 82  | 1003     |
| 283 | 713 | PP. Beba                   | Takalar             | Nano      | Longline | 1   | 3        |
| 284 | 713 | PP. Paotere                | Takalar             | Medium    | Dropline | 1   | 12       |
| 285 | 713 | PP. Paotere                | Takalar             | Small     | Dropline | 1   | 8        |
| 286 | 713 | PP. Paotere                | Takalar             | Small     | Longline | 3   | 24       |
| 287 | 714 | Kabola                     | Alor                | Nano      | Dropline | 15  | 10       |
| 288 | 714 | Kokar                      | Alor                | Nano      | Dropline | 100 | 88       |
| 289 | 714 | Banggai Kepulauan          | Banggai Kepulauan   | Nano      | Dropline | 10  | 10       |
| 290 | 714 | Banggai Laut               | Banggai Laut        | Nano      | Dropline | 50  | 50       |

Table 2.14: Total Number and Gross Tonnage of Snapper Fishing Boats by Main Target WPP, Registration Port, Home District (Kabupaten), Boat Size Category and Type of Fishing Gear. (Nano < 5 GT, Small 5-<10 GT, Medium 10-30 GT, Large >30 GT)

| Row | WPP | Registration Port         | Home District         | Boat Size | Gear     | N  | Total GT |
|-----|-----|---------------------------|-----------------------|-----------|----------|----|----------|
| 291 | 714 | Bontosi                   | Banggai Laut          | Nano      | Dropline | 2  | 5        |
| 292 | 714 | Kasuari                   | Banggai Laut          | Nano      | Longline | 18 | 21       |
| 293 | 714 | Matanga                   | Banggai Laut          | Nano      | Longline | 5  | 4        |
| 294 | 714 | Sonit                     | Banggai Laut          | Nano      | Longline | 3  | 9        |
| 295 | 714 | Tinakin                   | Banggai Laut          | Nano      | Dropline | 1  | 1        |
| 296 | 714 | PP. Tanjung Pandan        | Belitung              | Small     | Dropline | 1  | 6        |
| 297 | 714 | PPI Soropia               | Konawe                | Medium    | Trap     | 1  | 12       |
| 298 | 714 | PPI Soropia               | Konawe                | Nano      | Trap     | 2  | 1        |
| 299 | 714 | Labengki                  | Konawe Utara          | Nano      | Dropline | 4  | 5        |
| 300 | 714 | Labengki                  | Konawe Utara          | Nano      | Longline | 1  | 1        |
| 301 | 714 | Labengki                  | Konawe Utara          | Nano      | Mixgears | 5  | 5        |
| 302 | 714 | Batu Lubang               | Kota Ambon            | Nano      | Dropline | 30 | 53       |
| 303 | 714 | Asilulu                   | Maluku Tengah         | Nano      | Dropline | 30 | 56       |
| 304 | 714 | PP. Tulehu                | Maluku Tengah         | Large     | Dropline | 1  | 34       |
| 305 | 714 | Kampung Barbar            | Maluku Tenggara Barat | Nano      | Dropline | 6  | 12       |
| 306 | 714 | Pasar Baru Omele Saumlaki | Maluku Tenggara Barat | Nano      | Dropline | 6  | 13       |
| 307 | 714 | Pasar Baru Omele Saumlaki | Maluku Tenggara Barat | Nano      | Longline | 1  | 3        |
| 308 | 714 | Pasar Lama Saumlaki       | Maluku Tenggara Barat | Nano      | Dropline | 1  | 2        |
| 309 | 714 | Saumlaki                  | Maluku Tenggara Barat | Nano      | Dropline | 3  | 8        |
| 310 | 714 | PP. Kema                  | Minahasa Utara        | Large     | Dropline | 1  | 30       |
| 311 | 714 | Desa Bahonsuai            | Morowali              | Nano      | Dropline | 2  | 2        |
| 312 | 714 | Desa Umbele               | Morowali              | Nano      | Dropline | 2  | 2        |
| 313 | 714 | Desa Umbele               | Morowali              | Nano      | Longline | 1  | 1        |
| 314 | 714 | Limbo                     | Pulau Taliabu         | Nano      | Mixgears | 30 | 18       |
| 315 | 714 | Dusun Anauni              | Seram Bagian Barat    | Nano      | Dropline | 15 | 15       |
| 316 | 714 | Dusun Anauni              | Seram Bagian Barat    | Nano      | Longline | 35 | 44       |
| 317 | 714 | Dusun Huaroa              | Seram Bagian Barat    | Nano      | Dropline | 50 | 74       |
| 318 | 714 | Dusun Huhua               | Seram Bagian Barat    | Nano      | Mixgears | 20 | 27       |
| 319 | 714 | Dusun Naeselan            | Seram Bagian Barat    | Nano      | Mixgears | 20 | 33       |
| 320 | 714 | Dusun Pattinea            | Seram Bagian Barat    | Nano      | Mixgears | 50 | 67       |
| 321 | 714 | Dusun Pohon Batu          | Seram Bagian Barat    | Nano      | Dropline | 30 | 43       |
| 322 | 714 | Dusun Waisela             | Seram Bagian Barat    | Nano      | Dropline | 5  | 7        |
| 323 | 714 | Dusun Waisela             | Seram Bagian Barat    | Nano      | Longline | 10 | 14       |
| 324 | 714 | Dusun Wayohong            | Seram Bagian Barat    | Nano      | Dropline | 10 | 12       |
| 325 | 714 | Langgur Tual              | Tual                  | Medium    | Longline | 1  | 15       |
| 326 | 714 | Langgur Tual              | Tual                  | Small     | Longline | 2  | 13       |
| 327 | 714 | Mangon Tual               | Tual                  | Small     | Dropline | 1  | 7        |
| 328 | 714 | PP. Tual                  | Tual                  | Large     | Dropline | 1  | 36       |
| 329 | 714 | PP. Tual                  | Tual                  | Medium    | Dropline | 2  | 47       |
| 330 | 714 | PP. Tual                  | Tual                  | Medium    | Longline | 3  | 62       |
| 331 | 714 | PP. Tual                  | Tual                  | Nano      | Dropline | 1  | 2        |
| 332 | 714 | PP. Tual                  | Tual                  | Nano      | Longline | 1  | 4        |
| 333 | 714 | PP. Tual                  | Tual                  | Small     | Dropline | 2  | 13       |
| 334 | 714 | PP. Tual                  | Tual                  | Small     | Longline | 3  | 18       |
| 335 | 714 | Watdek                    | Tual                  | Small     | Mixgears | 5  | 32       |
| 336 | 714 | Binongko                  | Wakatobi              | Medium    | Dropline | 1  | 13       |
| 337 | 714 | Binongko                  | Wakatobi              | Nano      | Dropline | 28 | 16       |
| 338 | 714 | Dermaga Desa Wali         | Wakatobi              | Small     | Dropline | 1  | 5        |
| 339 | 714 | Desa Lagongga             | Wakatobi              | Nano      | Dropline | 7  | 26       |
| 340 | 714 | Desa Lagongga             | Wakatobi              | Small     | Dropline | 1  | 6        |
| 341 | 714 | Desa Wali                 | Wakatobi              | Nano      | Dropline | 2  | 8        |
| 342 | 714 | Pelabuhan Lagelewa        | Wakatobi              | Nano      | Dropline | 1  | 3        |
| 343 | 715 | Pagimana                  | Banggai               | Nano      | Dropline | 3  | 4        |
| 344 | 715 | Pagimana                  | Banggai               | Nano      | Mixgears | 60 | 48       |
| 345 | 715 | Pangkalaseang             | Banggai               | Nano      | Dropline | 10 | 10       |
| 346 | 715 | Kampung Sekar             | Fakfak                | Nano      | Dropline | 7  | 7        |
| 347 | 715 | Kampung Sosar, Kokas      | Fakfak                | Nano      | Dropline | 7  | 7        |
| 348 | 715 | Kampung Ugar              | Fakfak                | Nano      | Dropline | 17 | 11       |

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| Row | WPP | Registration Port           | Home District           | Boat Size | Gear     | N   | Total GT |
|-----|-----|-----------------------------|-------------------------|-----------|----------|-----|----------|
| 349 | 715 | Pasar Sorpeha               | Fakfak                  | Nano      | Dropline | 7   | 17       |
| 350 | 715 | PP. Dulan Pokpok            | Fakfak                  | Nano      | Dropline | 215 | 206      |
| 351 | 715 | PP. Fakfak                  | Fakfak                  | Medium    | Longline | 3   | 46       |
| 352 | 715 | PP. Fakfak                  | Fakfak                  | Small     | Longline | 2   | 19       |
| 353 | 715 | Bacan                       | Halmahera Selatan       | Nano      | Dropline | 39  | 18       |
| 354 | 715 | Bacan                       | Halmahera Selatan       | Nano      | Mixgears | 1   | 0        |
| 355 | 715 | Bacan Barat                 | Halmahera Selatan       | Nano      | Dropline | 6   | 2        |
| 356 | 715 | Bacan Tengah                | Halmahera Selatan       | Nano      | Dropline | 35  | 11       |
| 357 | 715 | Bacan Timur                 | Halmahera Selatan       | Nano      | Dropline | 4   | 1        |
| 358 | 715 | Bacan Utara                 | Halmahera Selatan       | Nano      | Dropline | 5   | 2        |
| 359 | 715 | Desa Lalei                  | Halmahera Selatan       | Nano      | Dropline | 29  | 17       |
| 360 | 715 | Gane Barat                  | Halmahera Selatan       | Nano      | Dropline | 15  | 5        |
| 361 | 715 | Gane Timur Selatan          | Halmahera Selatan       | Nano      | Dropline | 40  | 13       |
| 362 | 715 | Kep. Batang Lomang          | Halmahera Selatan       | Nano      | Dropline | 12  | 4        |
| 363 | 715 | Kepulauan Joronga           | Halmahera Selatan       | Nano      | Dropline | 7   | 2        |
| 364 | 715 | Mandioli Selatan            | Halmahera Selatan       | Nano      | Dropline | 13  | 4        |
| 365 | 715 | Mandioli Utara              | Halmahera Selatan       | Nano      | Dropline | 17  | 5        |
| 366 | 715 | Puau Obilatu                | Halmahera Selatan       | Nano      | Dropline | 10  | 3        |
| 367 | 715 | Pulau Obi                   | Halmahera Selatan       | Nano      | Dropline | 137 | 44       |
| 368 | 715 | Buli                        | Halmahera Timur         | Nano      | Dropline | 7   | 7        |
| 369 | 715 | Halmahera Timur             | Halmahera Timur         | Nano      | Dropline | 48  | 78       |
| 370 | 715 | Kaimana                     | Kaimana                 | Nano      | Dropline | 53  | 53       |
| 371 | 715 | PU. Kaimana                 | Kaimana                 | Large     | Longline | 2   | 61       |
| 372 | 715 | PU. Kaimana                 | Kaimana                 | Medium    | Longline | 6   | 101      |
| 373 | 715 | PP. Kema                    | Minahasa Utara          | Large     | Dropline | 8   | 339      |
| 374 | 715 | PP. Kema                    | Minahasa Utara          | Medium    | Dropline | 12  | 349      |
| 375 | 715 | Desa Pantai Pos, Bula       | Seram Bagian Timur      | Nano      | Dropline | 30  | 50       |
| 376 | 715 | Desa Sesar, Bula            | Seram Bagian Timur      | Nano      | Dropline | 10  | 20       |
| 377 | 715 | Desa Waru                   | Seram Bagian Timur      | Nano      | Dropline | 50  | 90       |
| 378 | 715 | Pulau Parang                | Seram Bagian Timur      | Nano      | Dropline | 50  | 92       |
| 379 | 715 | Soffi                       | Soffi                   | Nano      | Dropline | 10  | 10       |
| 380 | 715 | Jembatan Puri Sorong        | Sorong                  | Medium    | Dropline | 5   | 94       |
| 381 | 715 | Jembatan Puri Sorong        | Sorong                  | Medium    | Mixgears | 2   | 26       |
| 382 | 715 | PP. Sorong                  | Sorong                  | Medium    | Dropline | 8   | 145      |
| 383 | 715 | PP. Sorong                  | Sorong                  | Medium    | Longline | 1   | 17       |
| 384 | 715 | PP. Sorong                  | Sorong                  | Medium    | Trap     | 9   | 136      |
| 385 | 715 | PP. Sorong                  | Sorong                  | Nano      | Dropline | 7   | 22       |
| 386 | 715 | PP. Sorong                  | Sorong                  | Nano      | Mixgears | 2   | 6        |
| 387 | 715 | PP. Sorong                  | Sorong                  | Small     | Dropline | 4   | 26       |
| 388 | 715 | PP. Sorong                  | Sorong                  | Small     | Trap     | 2   | 18       |
| 389 | 715 | Bajugan                     | Tolitoli                | Nano      | Dropline | 10  | 6        |
| 390 | 716 | Biduk-biduk                 | Berau                   | Medium    | Dropline | 1   | 22       |
| 391 | 716 | Biduk-biduk                 | Berau                   | Nano      | Dropline | 23  | 69       |
| 392 | 716 | Desa Tanjung Batu           | Berau                   | Nano      | Dropline | 67  | 201      |
| 393 | 716 | Desa Tanjung Batu           | Berau                   | Nano      | Trap     | 1   | 3        |
| 394 | 716 | Giring-giring               | Berau                   | Nano      | Dropline | 22  | 66       |
| 395 | 716 | Labuan Cermin               | Berau                   | Nano      | Dropline | 1   | 3        |
| 396 | 716 | Logpond, Batu Putih         | Berau                   | Nano      | Dropline | 10  | 16       |
| 397 | 716 | P. Derawan                  | Berau                   | Nano      | Trap     | 4   | 7        |
| 398 | 716 | Pantai Harapan              | Berau                   | Nano      | Dropline | 20  | 60       |
| 399 | 716 | Pulau Balikukup, Batu Putih | Berau                   | Nano      | Longline | 5   | 20       |
| 400 | 716 | Tanjung Batu                | Berau                   | Nano      | Trap     | 6   | 18       |
| 401 | 716 | Tanjung Batu                | Berau                   | Small     | Trap     | 1   | 8        |
| 402 | 716 | Tanjung Perepat             | Berau                   | Nano      | Dropline | 5   | 13       |
| 403 | 716 | Teluk Sulaiman              | Berau                   | Nano      | Dropline | 29  | 87       |
| 404 | 716 | Desa Sampiro                | Bolaang Mongondow Utara | Nano      | Mixgears | 11  | 4        |
| 405 | 716 | Desa Bulontio               | Gorontalo Utara         | Nano      | Dropline | 11  | 5        |
| 406 | 716 | Desa Buluwatu               | Gorontalo Utara         | Nano      | Dropline | 21  | 16       |

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| Row | WPP | Registration Port             | Home District         | Boat Size | Gear     | N    | Total GT |
|-----|-----|-------------------------------|-----------------------|-----------|----------|------|----------|
| 407 | 716 | Desa Huntokalo                | Gorontalo Utara       | Nano      | Dropline | 10   | 3        |
| 408 | 716 | Desa Tihengo                  | Gorontalo Utara       | Nano      | Dropline | 26   | 7        |
| 409 | 716 | Desa Dalako Bembanehe         | Kepulauan Sangihe     | Nano      | Dropline | 4    | 2        |
| 410 | 716 | Desa Lipang                   | Kepulauan Sangihe     | Nano      | Dropline | 5    | 2        |
| 411 | 716 | Desa Paruruang                | Kepulauan Sangihe     | Nano      | Dropline | 16   | 8        |
| 412 | 716 | Desa Parururang               | Kepulauan Sangihe     | Nano      | Dropline | 5    | 2        |
| 413 | 716 | Kampung Lipang                | Kepulauan Sangihe     | Nano      | Dropline | 5    | 1        |
| 414 | 716 | Sangihe                       | Kepulauan Sangihe     | Nano      | Dropline | 2    | 0        |
| 415 | 716 | Tariang Baru                  | Kepulauan Sangihe     | Nano      | Longline | 4    | 3        |
| 416 | 716 | Buhias                        | Kepulauan Sitaro      | Nano      | Dropline | 153  | 124      |
| 417 | 716 | Mahongsawang Tagulandang      | Kepulauan Sitaro      | Nano      | Dropline | 8    | 4        |
| 418 | 716 | Mongsawang                    | Kepulauan Sitaro      | Nano      | Dropline | 16   | 6        |
| 419 | 716 | Pulau Biaro                   | Kepulauan Sitaro      | Nano      | Dropline | 29   | 7        |
| 420 | 716 | Desa Damau                    | Talaud                | Nano      | Dropline | 8    | 3        |
| 421 | 716 | Desa Makatara                 | Talaud                | Nano      | Dropline | 20   | 24       |
| 422 | 716 | Desa Makatara, Dusun Bawunia  | Talaud                | Nano      | Dropline | 1    | 1        |
| 423 | 716 | Desa Makatara, Dusun Bawunian | Talaud                | Nano      | Dropline | 4    | 3        |
| 424 | 716 | Belakang BRI, Selumit Pantai  | Tarakan               | Nano      | Longline | 46   | 138      |
| 425 | 716 | Belakang BRI, Selumit Pantai  | Tarakan               | Small     | Longline | 4    | 20       |
| 426 | 716 | Mamburungan Dalam             | Tarakan               | Nano      | Mixgears | 48   | 144      |
| 427 | 717 | Biak                          | Biak                  | Nano      | Dropline | 1796 | 1793     |
| 428 | 717 | Desa Nikakamp                 | Biak                  | Nano      | Dropline | 4    | 7        |
| 429 | 717 | Desa Tanjung Barari           | Biak                  | Nano      | Dropline | 5    | 4        |
| 430 | 717 | Fanindi Pantai                | Manokwari             | Nano      | Dropline | 4    | 10       |
| 431 | 717 | Kampung Fanindi               | Manokwari             | Nano      | Dropline | 20   | 21       |
| 432 | 717 | Manokwari                     | Manokwari             | Nano      | Dropline | 6    | 16       |
| 433 | 717 | PP. Sanoba                    | Nabire                | Nano      | Dropline | 12   | 30       |
| 434 | 717 | Wasior                        | Teluk Wondama         | Nano      | Dropline | 19   | 23       |
| 435 | 718 | PP. Muara Angke               | Jakarta               | Large     | Dropline | 2    | 97       |
| 436 | 718 | PP. Muara Angke               | Jakarta               | Medium    | Dropline | 1    | 30       |
| 437 | 718 | PP. Nizam Zachman             | Jakarta               | Large     | Longline | 4    | 205      |
| 438 | 718 | Namatota                      | Kaimana               | Large     | Longline | 6    | 379      |
| 439 | 718 | PP. Kaimana                   | Kaimana               | Large     | Longline | 1    | 45       |
| 440 | 718 | Dusun Wamar Desa Durjela      | Kepulauan Aru         | Medium    | Longline | 4    | 73       |
| 441 | 718 | PP. Bajomulyo                 | Kepulauan Aru         | Large     | Gillnet  | 1    | 82       |
| 442 | 718 | PP. Benjina                   | Kepulauan Aru         | Large     | Longline | 2    | 92       |
| 443 | 718 | PP. Dobo                      | Kepulauan Aru         | Large     | Gillnet  | 8    | 527      |
| 444 | 718 | PP. Dobo                      | Kepulauan Aru         | Large     | Longline | 10   | 596      |
| 445 | 718 | PP. Dobo                      | Kepulauan Aru         | Medium    | Dropline | 93   | 1658     |
| 446 | 718 | PP. Dobo                      | Kepulauan Aru         | Medium    | Gillnet  | 5    | 121      |
| 447 | 718 | PP. Dobo                      | Kepulauan Aru         | Medium    | Longline | 10   | 185      |
| 448 | 718 | PP. Dobo                      | Kepulauan Aru         | Nano      | Dropline | 11   | 30       |
| 449 | 718 | PP. Dobo                      | Kepulauan Aru         | Nano      | Longline | 8    | 23       |
| 450 | 718 | PP. Dobo                      | Kepulauan Aru         | Small     | Dropline | 7    | 56       |
| 451 | 718 | PP. Dobo                      | Kepulauan Aru         | Small     | Longline | 1    | 7        |
| 452 | 718 | PP. Kaimana                   | Kepulauan Aru         | Large     | Longline | 1    | 51       |
| 453 | 718 | PP. Klidang Lor               | Kepulauan Aru         | Large     | Gillnet  | 1    | 73       |
| 454 | 718 | PP. Mayangan                  | Kepulauan Aru         | Large     | Longline | 19   | 1405     |
| 455 | 718 | PP. Merauke                   | Kepulauan Aru         | Large     | Longline | 4    | 397      |
| 456 | 718 | PP. Nizam Zachman             | Kepulauan Aru         | Large     | Gillnet  | 1    | 92       |
| 457 | 718 | PP. Pekalongan                | Kepulauan Aru         | Large     | Gillnet  | 1    | 115      |
| 458 | 718 | PU. Dobo                      | Kepulauan Aru         | Large     | Gillnet  | 3    | 285      |
| 459 | 718 | PU. Dobo                      | Kepulauan Aru         | Large     | Longline | 36   | 2670     |
| 460 | 718 | Saumlaki                      | Maluku Tenggara Barat | Nano      | Dropline | 37   | 109      |
| 461 | 718 | Saumlaki                      | Maluku Tenggara Barat | Small     | Dropline | 1    | 5        |
| 462 | 718 | Saumlaki                      | Maluku Tenggara Barat | Small     | Longline | 5    | 37       |
| 463 | 718 | PP. Bajomulyo                 | Merauke               | Large     | Gillnet  | 1    | 91       |
| 464 | 718 | PP. Merauke                   | Merauke               | Large     | Dropline | 1    | 106      |

Table 2.14: Total Number and Gross Tonnage of Snapper Fishing Boats by Main Target WPP, Registration Port, Home District (Kabupaten), Boat Size Category and Type of Fishing Gear. (Nano < 5 GT, Small 5-<10 GT, Medium 10-30 GT, Large >30 GT)

| Row   | WPP | Registration Port | Home District | Boat Size | Gear     | N     | Total GT |
|-------|-----|-------------------|---------------|-----------|----------|-------|----------|
| 465   | 718 | PP. Merauke       | Merauke       | Large     | Gillnet  | 48    | 3873     |
| 466   | 718 | PP. Merauke       | Merauke       | Large     | Longline | 2     | 213      |
| 467   | 718 | PP. Merauke       | Merauke       | Medium    | Gillnet  | 5     | 138      |
| 468   | 718 | PP. Nizam Zachman | Merauke       | Large     | Dropline | 5     | 455      |
| 469   | 718 | PP. Nizam Zachman | Merauke       | Large     | Gillnet  | 13    | 841      |
| 470   | 718 | PP. Nizam Zachman | Merauke       | Large     | Longline | 1     | 60       |
| 471   | 718 | PP. Poumako       | Merauke       | Medium    | Gillnet  | 3     | 88       |
| 472   | 718 | PP. Tegal         | Merauke       | Large     | Gillnet  | 1     | 148      |
| 473   | 718 | PP. Bajomulyo     | Mimika        | Large     | Longline | 1     | 82       |
| 474   | 718 | PP. Dobo          | Mimika        | Large     | Gillnet  | 1     | 75       |
| 475   | 718 | PP. Mayangan      | Mimika        | Large     | Gillnet  | 1     | 129      |
| 476   | 718 | PP. Merauke       | Mimika        | Large     | Gillnet  | 2     | 123      |
| 477   | 718 | PP. Merauke       | Mimika        | Medium    | Gillnet  | 2     | 49       |
| 478   | 718 | PP. Muara Angke   | Mimika        | Large     | Gillnet  | 1     | 92       |
| 479   | 718 | PP. Nizam Zachman | Mimika        | Large     | Gillnet  | 1     | 88       |
| 480   | 718 | PP. Paumako       | Mimika        | Large     | Gillnet  | 2     | 60       |
| 481   | 718 | PP. Paumako       | Mimika        | Medium    | Gillnet  | 2     | 58       |
| 482   | 718 | PP. Pekalongan    | Mimika        | Large     | Gillnet  | 1     | 112      |
| 483   | 718 | PP. Pomako        | Mimika        | Medium    | Gillnet  | 1     | 16       |
| 484   | 718 | PP. Poumako       | Mimika        | Large     | Gillnet  | 3     | 90       |
| 485   | 718 | PP. Poumako       | Mimika        | Medium    | Gillnet  | 15    | 387      |
| 486   | 718 | PP. Poumako       | Mimika        | Small     | Gillnet  | 1     | 8        |
| 487   | 718 | PP. Bajomulyo     | Pati          | Large     | Longline | 2     | 217      |
| 488   | 718 | Bagansiapiapi     | Probolinggo   | Large     | Longline | 1     | 40       |
| 489   | 718 | PP. Dobo          | Probolinggo   | Large     | Longline | 2     | 142      |
| 490   | 718 | PP. Mayangan      | Probolinggo   | Large     | Gillnet  | 3     | 124      |
| 491   | 718 | PP. Mayangan      | Probolinggo   | Large     | Longline | 33    | 2095     |
| 492   | 718 | PP. Mayangan      | Probolinggo   | Medium    | Longline | 7     | 199      |
| 493   | 718 | Probolinggo       | Probolinggo   | Large     | Longline | 19    | 1408     |
| 494   | 718 | PP. Lappa         | Sinjai        | Large     | Dropline | 1     | 35       |
| 495   | 718 | PP. Lappa         | Sinjai        | Medium    | Dropline | 10    | 233      |
| 496   | 718 | Timika            | Timika        | Medium    | Longline | 3     | 88       |
| 497   | 718 | PP. Bajomulyo     | Tual          | Large     | Longline | 1     | 87       |
| 498   | 718 | PP. Tual          | Tual          | Medium    | Dropline | 1     | 28       |
| 499   | 718 | PP. Tual          | Tual          | Nano      | Longline | 1     | 4        |
| 500   | 718 | PP. Tual          | Tual          | Small     | Dropline | 1     | 6        |
| TOTAL |     |                   |               |           |          | 10329 | 61081    |

## 2.5 I-Fish Community

I-Fish Community only stores data that are relevant to fisheries management, whereas data on processed volume and sales, from the Smart Weighing and Measuring System, remain on servers at processing companies. Access to the I-Fish Community database is controlled by user name and password. I-Fish Community has different layers of privacy, which is contingent on the user's role in the supply chain. For instance, boat owners may view exact location of their boats, but not of the boats of other owners.

I-Fish Community has an automatic length-frequency distribution reporting system for length-based assessment of the fishery by species. The database generates length frequency distribution graphs for each species, together with life history parameters including length at maturity ( $L_{mat}$ ), optimum harvest size ( $L_{opt}$ ), asymptotic length ( $L_{inf}$ ), and maximum total length ( $L_{max}$ ). Procedures for estimation of these length based life history characteristics are explained in the "Guide to Length Based Stock Assessment" (Mous et al., 2019). The data base also includes size limits used in the trade. These "trade limit" lengths are derived from general buying behavior (minimal weight) of processing companies. The weights are converted into lengths by using species-specific length-weight relationships.

Each length frequency distribution is accompanied by an automated length-based assessment on current status of the fishery by species. Any I-Fish Community user can access these graphs and the conclusions from the assessments. The report produces an assessment for the 50 most abundant species in the fishery, based on complete catches from the most recent complete calendar year (to ensure full year data sets). The graphs show the position of the catch length frequency distributions relative to various life history parameter values and trading limits for each species. Relative abundance of specific size groups is plotted for all years for which data are available, to indicate trends in status by species.

Immature fish, small mature fish, large mature fish, and a subset of large mature fish, namely "mega-spawners", which are fish larger than 1.1 times the optimum harvest size (Froese 2004), make up the specific size groups used in our length based assessment. For all fish of each species in the catch, the percentage in each category is calculated for further use in the length based assessment. These percentages are calculated and presented as the first step in the length based assessment as follows:  $W\%$  is immature (smaller than the length at maturity),  $X\%$  is small matures (at or above size at maturity but smaller than the optimum harvest size), and  $Y\%$  is large mature fish (at or above optimum harvest size). The percentage of mega-spawners is  $Z\%$ .

The automated assessment comprises of six elements from the catch length frequencies. These elements all work with length based indicators of various kinds to draw conclusions from species specific length frequencies in the catch.

### *1. Minimum size as traded compared to length and maturity.*

We use a comparison between the trade limit (minimum size accepted by the trade) and the size at maturity as an indicator for incentives from the trade for either unsustainable targeting of juveniles or for more sustainable targeting of mature fish that have spawned at least once. We consider a trade limit at 10% below or above the length at maturity to be significantly different from the length at maturity and we consider trade limits to provide incentives for targeting of specific sizes of fish through price differentiation.

IF “TradeLimit” is lower than  $0.9 * L\text{-mat}$  THEN: “The trade limit is significantly lower than the length at first maturity. This means that the trade encourages capture of immature fish, which impairs sustainability. Risk level is high.”

ELSE, IF “TradeLimit” is greater than or equal to  $0.9 * L\text{-mat}$  AND “TradeLimit” is lower than or equal to  $1.1 * L\text{-mat}$  THEN: “The trade limit is about the same as the length at first maturity. This means that the trade puts a premium on fish that have spawned at least once, which improves sustainability of the fishery. Risk level is medium.”

ELSE, IF “TradeLimit” is greater than  $1.1 * L\text{-mat}$  THEN: “The trade limit is significantly higher than length at first maturity. This means that the trade puts a premium on fish that have spawned at least once. The trade does not cause any concern of recruitment overfishing for this species. Risk level is low.”

## *2. Proportion of immature fish in the catch.*

With 0% immature fish in the catch as an ideal target (Froese, 2004), a target of 10% or less is considered a reasonable indicator for sustainable (or safe) harvesting (Fujita et al., 2012; Vasilakopoulos et al., 2011). Zhang et al. (2009) consider 20% immature fish in the catch as an indicator for a fishery at risk, in their approach to an ecosystem based fisheries assessment. Results from meta-analysis over multiple fisheries showed stock status over a range of stocks to fall below precautionary limits at 30% or more immature fish in the catch (Vasilakopoulos et al., 2011). The fishery is considered highly at risk when more than 50% of the fish in the catch are immature (Froese et al, 2016).

IF “% immature” is lower than or equal to 10% THEN: “At least 90% of the fish in the catch are mature specimens that have spawned at least once before they were caught. The fishery does not depend on immature size classes for this species and is considered safe for this indicator. This fishery will not be causing overfishing through over harvesting of juveniles for this species. Risk level is low.”

ELSE, IF “% immature” is greater than 10% AND “% immature” is lower than or equal to 20% THEN: “Between 10% and 20% of the fish in the catch are juveniles that have not yet reproduced. There is no immediate concern in terms of overfishing through over harvesting of juveniles, but the fishery needs to be monitored closely for any further increase in this indicator and incentives need to be geared towards targeting larger fish. Risk level is medium.”

ELSE, IF “% immature” is greater than 20% AND “% immature” is lower than or equal to 30% THEN: “Between 20% and 30% of the fish in the catch are specimens that have not yet reproduced. This is reason for concern in terms of potential overfishing through overharvesting of juveniles, if fishing pressure is high and percentages immature fish would further rise. Targeting larger fish and avoiding small fish in the catch will promote a sustainable fishery. Risk level is medium.”

ELSE, IF “% immature” is greater than 30% AND “% immature” is lower than or equal to 50% THEN: “Between 30% and 50% of the fish in the catch are immature and have not had a chance to reproduce before capture. The fishery is in immediate danger of overfishing through overharvesting of juveniles, if fishing pressure is high. Catching small and immature fish needs to be actively avoided and a limit on overall fishing pressure is warranted. Risk level is high.”

ELSE, IF “% immature” is greater than 50% THEN: “The majority of the fish in the catch have not had a chance to reproduce before capture. This fishery is most likely overfished already if fishing mortality is high for all size classes in the population. An immediate shift away from targeting juvenile fish and a reduction in overall fishing pressure is essential to prevent collapse of the stock. Risk level is high.”

### *3. Current exploitation level.*

We use the current exploitation level expressed as the percentage of fish in the catch below the optimum harvest size as an indicator for fisheries status. We consider a proportion of 65% of the fish (i.e. the vast majority in numbers) in the catch below the optimum harvest size as an indicator for growth overfishing. We also consider a majority in the catch around or above the optimum harvest size as an indicator for minimizing the impact of fishing (Froese et al., 2016). This indicator will be achieved when less than 50% of the fish in the catch are below the optimum harvest size.

IF “% immature + % small mature” is greater than or equal to 65% THEN: “The vast majority of the fish in the catch have not yet achieved their growth potential. The harvest of small fish promotes growth overfishing and the size distribution for this species indicates that over exploitation through growth overfishing may already be happening. Risk level is high.”

ELSE, IF “% immature + % small mature” is lower than or equal to 50% THEN: “The majority of the catch consists of size classes around or above the optimum harvest size. This means that the impact of the fishery is minimized for this species. Potentially higher yields of this species could be achieved by catching them at somewhat smaller size, although capture of smaller specimen may take place already in other fisheries. Risk level is low.”

ELSE, IF “% immature + % small mature” is greater than 50% AND “% immature + % small mature” is lower than 65% THEN: “The bulk of the catch includes age groups that have just matured and are about to achieve their full growth potential. This indicates that the fishery is probably at least being fully exploited. Risk level is medium.”

### *4. Proportion of mega spawners in the catch.*

Mega spawners are fish larger than 1.1 times the optimum harvest size. We consider a proportion of 30% or more mega spawners in the catch to be a sign of a healthy population (Froese, 2004), whereas lower proportions are increasingly leading to concerns, with proportions below 20% indicating great risk to the fishery.

IF “% mega spawners” is greater than 30% THEN: “More than 30% of the catch consists of mega spawners which indicates that this fish population is in good health unless large amounts of much smaller fish from the same population are caught by other fisheries. Risk level is low.”

ELSE, IF “% mega spawners” is greater than 20% AND “% mega spawners” is lower than or equal to 30% THEN: “The percentage of mega spawners is between 20 and 30%. There is no immediate reason for concern, though fishing pressure may be significantly reducing the percentage of mega-spawners, which may negatively affect the reproductive output of this population. Risk level is medium.”



ELSE, IF “% mega spawners” is lower than or equal to 20%, THEN: “Less than 20% of the catch comprises of mega spawners. This indicates that the population may be severely affected by the fishery, and that there is a substantial risk of recruitment overfishing through over harvesting of the mega spawners, unless large numbers of mega spawners would be surviving at other habitats. There is no reason to assume that this is the case and therefore a reduction of fishing effort may be necessary in this fishery. Risk level is high.

##### *5. Spawning Potential Ratio.*

As an indicator for Spawning Potential Ratio (SPR, Quinn and Deriso, 1999), we used the estimated spawning stock biomass divided by the spawning stock biomass of that population if it would have been pristine (see, for example, Meester et al 2001). We calculated SPR on a per-recruit basis from life-history parameters Z, F, K (von Bertalanffy), and  $L_{inf}$ . We estimated the instantaneous total mortality (Z) from the equilibrium Beverton-Holt estimator from length data using Ehrhardt and Ault (1992) bias-correction, implemented through the function `bheq2` of the R Fishmethods package.

We estimated the natural rate of mortality (M) using Froese and Pauly (2000) empirical formula with asymptotic length as estimated by species and an ambient water temperature at fishing depth estimated at about 20 degrees Celcius. With an asymptotic length for a snapper of about 80cm this results in an M of about 0.4, which aligns well with the mean of reported values from the literature (Martinez-Andrade, 2003). The fishing mortality F follows as the difference between total and natural mortality. We estimated K from  $L_{opt}$  and M and  $L_{inf}$ , using the equation presented in Froese and Binohlan 2000:  $K = M * L_{opt} / 3 * (L_{inf} - L_{opt})$ .

In a perfect world, fishery biologists would know what the appropriate SPR should be for every harvested stock based on the biology of that stock. Generally, however, not enough is known about managed stocks to be so precise. However, studies show that some stocks (depending on the species of fish) can maintain themselves if the spawning stock biomass per recruit can be kept at 20 to 35% (or more) of what it was in the un-fished stock. Lower values of SPR may lead to severe stock declines (Wallace and Fletcher, 2001). Froese et al. (2016) considered a total population biomass B of half the pristine population biomass  $B_0$  to be the lower limit reference point for stock size, minimizing the impact of fishing. Using SPR and B/ $B_0$  estimates from our own data set, this Froese et al. (2016) lower limit reference point correlates with an SPR of about 40%, not far from but slightly more conservative than the Wallace and Fletcher (2001) reference point. We chose an SPR of 40% as our reference point for low risk and after similar comparisons we consider and SPR between 25% and 40% to represent a medium risk situation.

IF “SPR” is lower than 25% THEN: “SPR is less than 25%. The fishery probably over-exploits the stock, and there is a substantial risk that the fishery will cause severe decline of the stock if fishing effort is not reduced. Risk level is high.”

ELSE, IF “SPR” is greater than or equal to 25% AND “SPR” is lower than 40% THEN: “SPR is between 25% and 40%. The stock is heavily exploited, and there is some risk that the fishery will cause further decline of the stock. Risk level is medium.”

ELSE, IF “SPR” is greater than or equal to 40% THEN: “SPR is more than 40%. The stock is probably not over exploited, and the risk that the fishery will cause further stock decline is small. Risk level is low.”

### 3 Fishing grounds and traceability

Fish landings made at ports in any specific WPP are not necessarily originating from fishing grounds within that same WPP. This is especially true for snappers, groupers and emperors landed and processed in Java, on the coast of WPP 712 and in South Sulawesi, on the coast of WPP 713. The issue of landings originating from multiple WPP is illustrated clearly by the fish that are processed in major processing centres like Probolinggo in East Java, on the coast of WPP 712. These fish commonly originate from a number of different fleets that can operate throughout the waters of Western, Central and Eastern Indonesian, including on distant fishing grounds in the Natuna Sea (WPP 711), the Timor Sea (WPP 573), and the Arafura Sea (WPP 718). Most of the demersal fish caught in WPP 571 however, is landed in North Sumatra and sent to processing centres in the Riau Islands, in Jakarta or exported directly to Malaysia and Singapore.

The current report with length based stock assessments for groupers, snappers, emperors and grunts in WPP 571 is based on catches that were made on WPP 571 fishing grounds only, regardless of vessel origin or landing place. SPOT Trace tracking devices on cooperating vessels indicate where catches are actually made, as dates on CODRS images can be related to locations of fishing vessels on the fishing grounds. Even without linking SPOT locations to CODRS data it is possible to distinguish between steaming and fishing activity, when SPOT data are plotted on the maps of the fishing grounds (Figures 3.1 to 3.3). Catches are allocated in our analysis to a specific WPP when SPOT data indicate that the vessel was mostly fishing in that particular WPP during the trip that the catches were photographed.

Fishing vessels from many home ports along the coast of the southern Andaman Sea and the Malacca Strait (Figures 3.4 to 3.5) operate in WPP 571 as well as in Thai and Malaysian waters. The Spot Trace data from the southern Andaman Sea and Malacca Strait snapper and grouper fisheries illustrate that effective management by WPP is only possible in close coordination with fisheries management in the neighbouring WPP, in neighbouring provinces and even in neighbouring countries.

Coordination of management across WPP boundaries is especially important when fishing grounds are continuous across those boundaries, with fish stocks spread over multiple WPP, and when fishing fleets freely move across WPP boundaries to target these stocks. In the case of the snapper fisheries in WPP 571, many vessels are fishing right around the international borders, regularly fishing in foreign waters.

Potential IUU issues related to fish landed at ports in WPP 571 include the illegal operation by various fleets outside Indonesian waters in the Malacca Strait and in the southern Andaman Sea, in Thai and Malaysian waters. Additional issues include the under marking of medium scale vessels to below 30GT, the licensing of the various fleets for various WPP and the operation of fleets inside Marine Protected Areas.

All this needs to be discussed with fishing boat captains, fish processors and traders, to prevent issues of supply line “pollution” with IUU fish. Maps with projections of SPOT trace data that illustrate the fishing grounds can be helpful tools in support of those discussions.

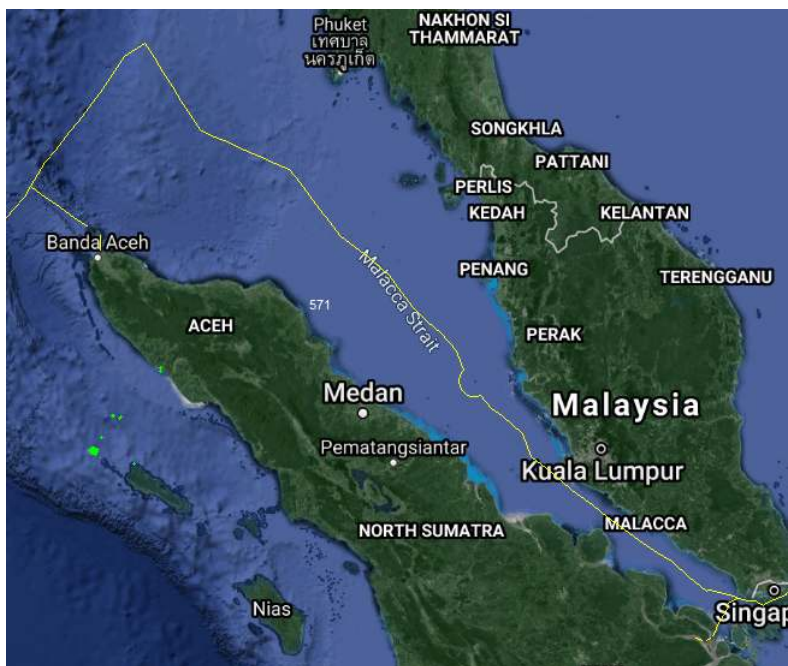


Figure 3.1: Fishing positions of dropliners participating in the CODRS program over the years 2014 - 2019 in WPP 571, as reported by Spot Trace. Reported positions during steaming, anchoring, or docking are excluded from this map.

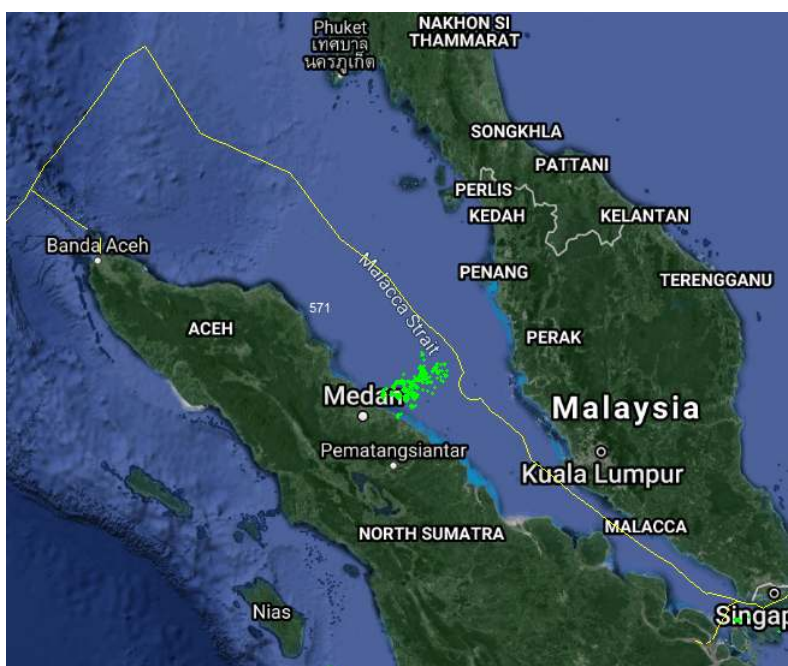


Figure 3.2: Fishing positions of longliners participating in the CODRS program over the years 2014 - 2019 in WPP 571, as reported by Spot Trace. Reported positions during steaming, anchoring, or docking are excluded from this map.

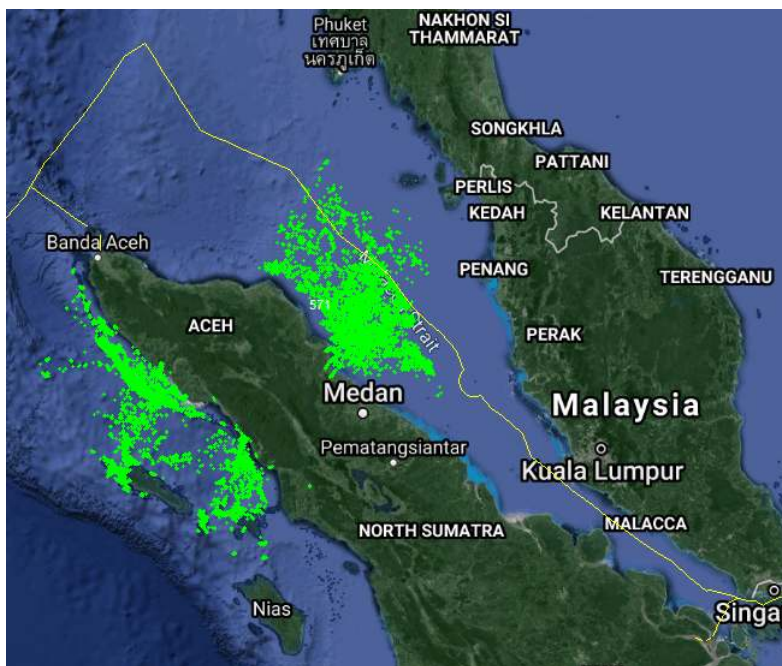


Figure 3.3: Fishing positions of vessels applying more than one gear, participating in the CODRS program over the years 2014 - 2019 in WPP 571, as reported by Spot Trace. Gears used by the vessels in this group are a combination of droplines, longlines, traps, and gillnets. Reported positions during steaming, anchoring, or docking are excluded from this map.

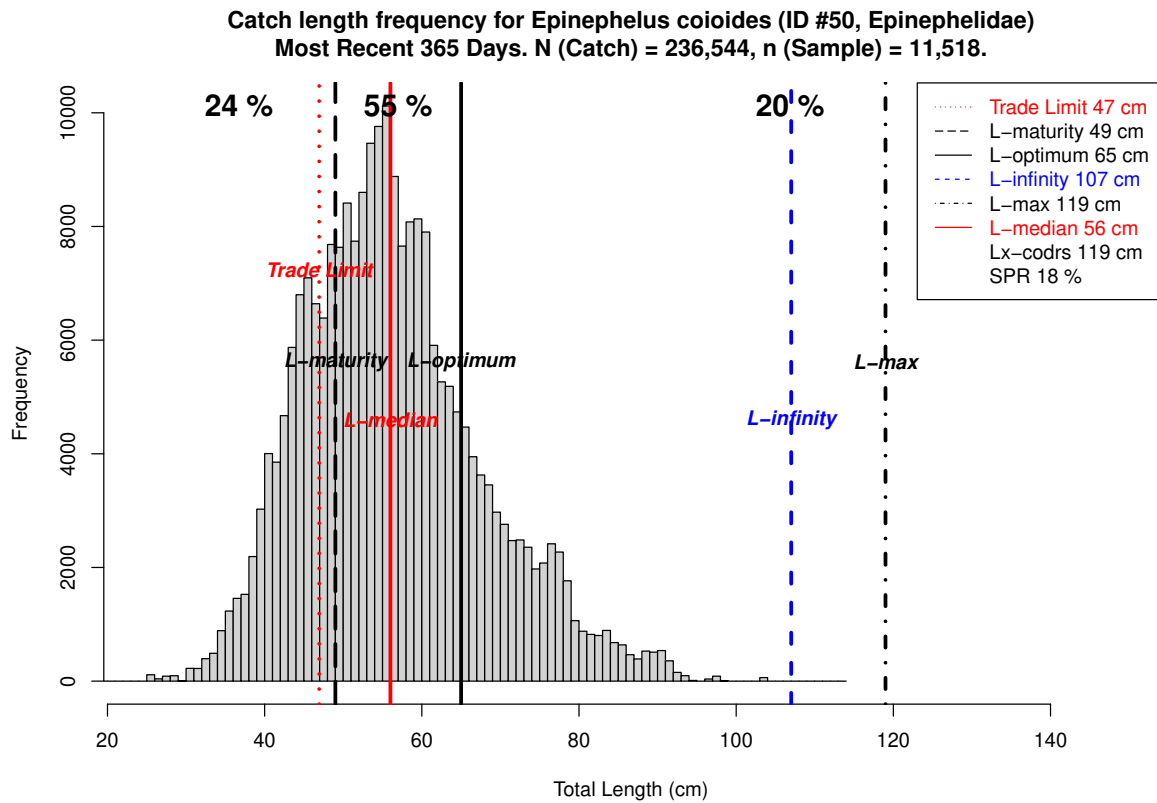


Figure 3.4: A typical snapper fishing boat from Langkat, Sumatera Utara, operating in the Malacca Strait (WPP 571) and on nearby fishing grounds.

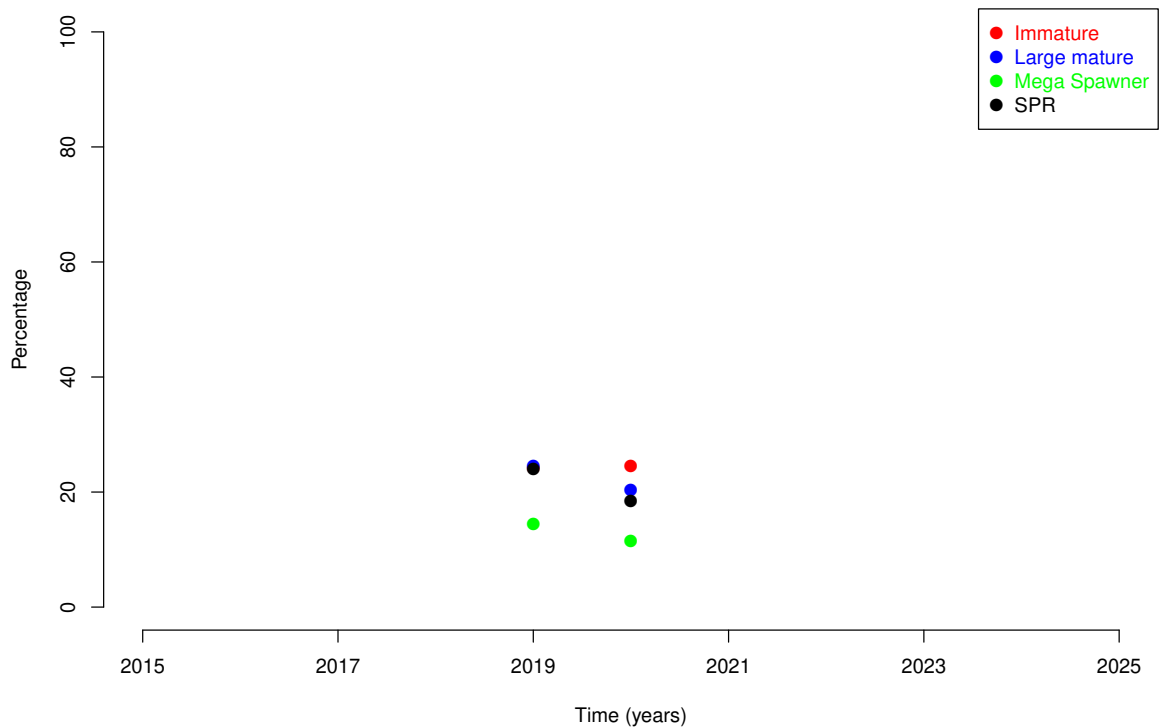


Figure 3.5: A typical snapper fishing boat from Aceh Tamiang, Aceh, operating in the Malacca Strait (WPP 571) and on nearby fishing grounds.

#### 4 Length-based assessments of Top 20 most abundant species in CODRS samples including all years in WPP 571



**Trends in relative abundance by size group for *Epinephelus coioides* (ID #50, Epinephelidae)**



The percentages of *Epinephelus coioides* (ID #50, Epinephelidae) in most recent 365 days.  
N (Catch) = 236,544, n (Sample) = 11,518  
Immature (< 49cm): 24%  
Small mature (>= 49cm, < 65cm): 55%  
Large mature (>= 65cm): 20%  
Mega spawner (>= 71.5cm): 11% (subset of large mature fish)  
Spawning Potential Ratio: 18 %

The trade limit is about the same as the length at first maturity. This means that the trade puts a premium on fish that have spawned at least once, which improves sustainability of the fishery. Risk level is medium.

Between 20% and 30% of the fish in the catch are specimens that have not yet reproduced. This is reason for concern in terms of potential overfishing through overharvesting of juveniles, if fishing pressure is high and percentages immature fish would further rise. Targeting larger fish and avoiding small fish in the catch will promote a sustainable fishery. Risk level is medium.

The vast majority of the fish in the catch have not yet achieved their growth potential. The harvest of small fish promotes growth overfishing and the size distribution for this species indicates that over exploitation through growth overfishing may already be happening. Risk level is high.

Less than 20% of the catch comprises of mega spawners. This indicates that the population may be severely affected by the fishery, and that there is a substantial risk of recruitment overfishing through over harvesting of the mega spawners, unless large numbers of mega spawners would be surviving at other habitats. There is no reason to assume that this is the case and therefore a reduction of fishing effort may be necessary in this fishery. Risk level is high.

SPR is less than 25%. The fishery probably over-exploits the stock, and there is a substantial risk that the fishery will cause severe decline of the stock if fishing effort is not reduced. Risk level is high.

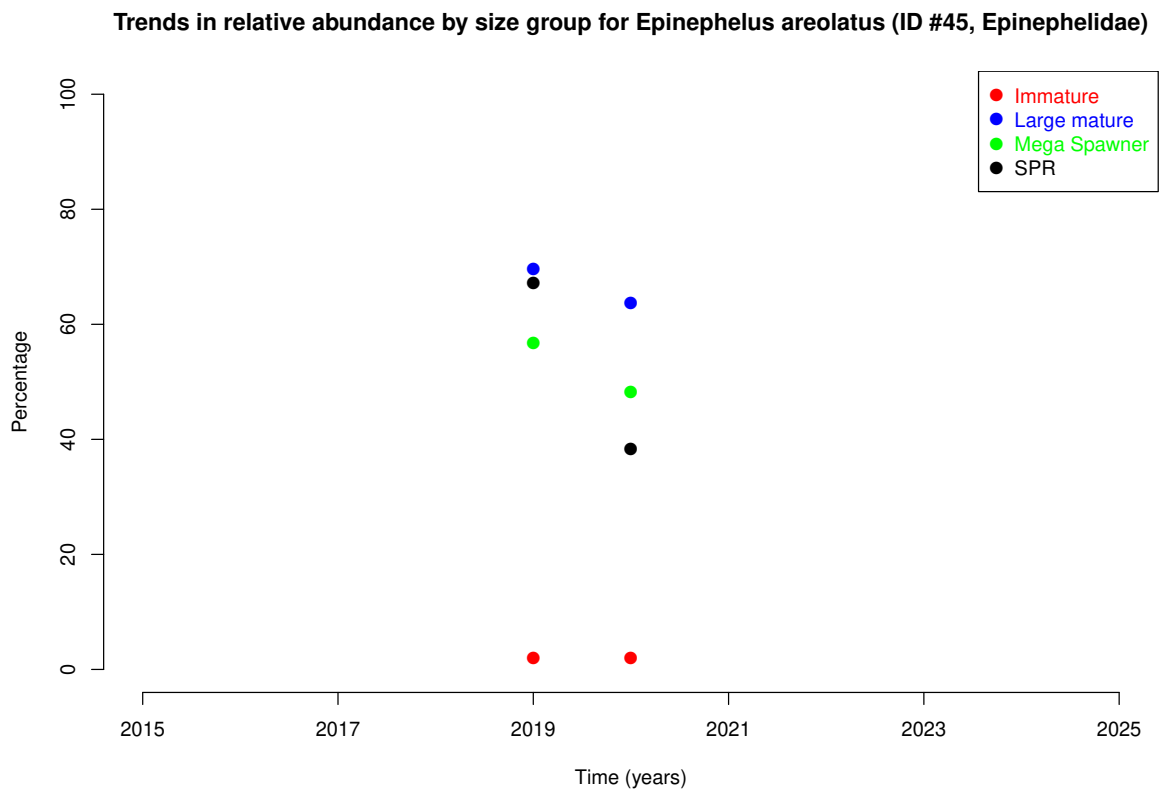
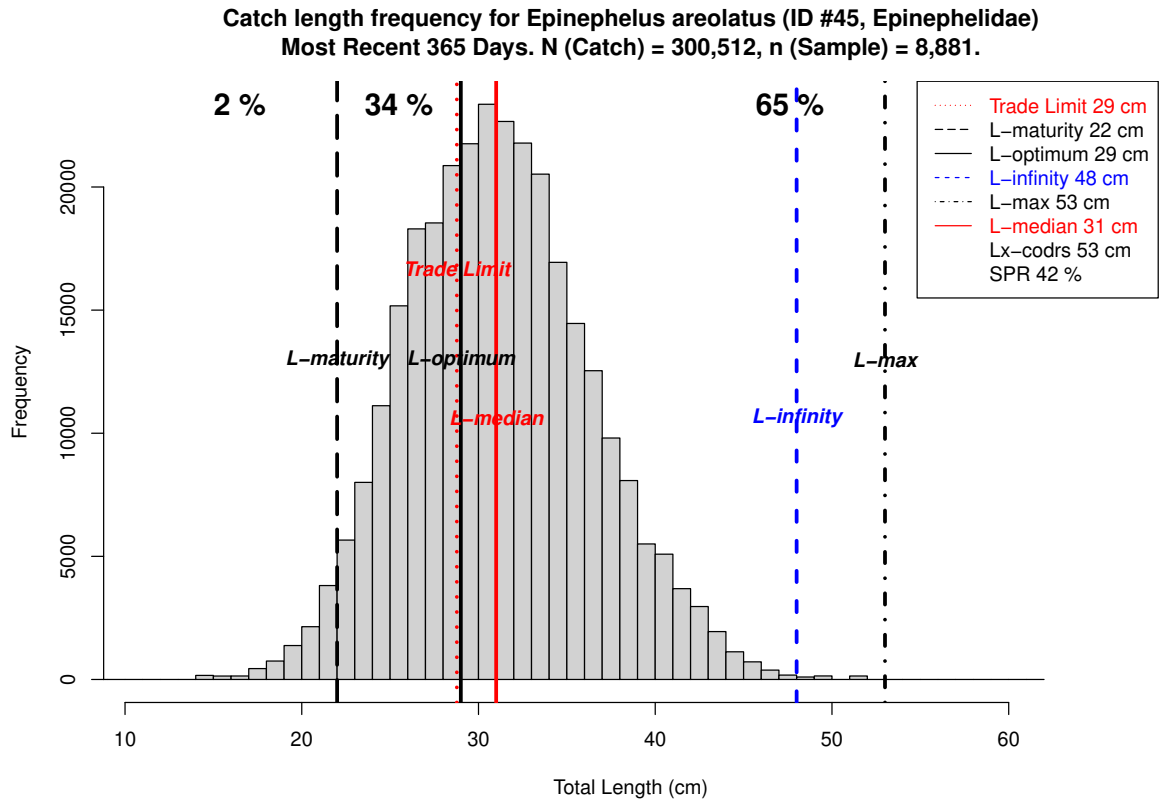
Trends in relative abundance by size group for *Epinephelus coioides* (ID #50, Epinephelidae), as calculated from linear regressions. The P value indicates the chance that this calculated trend is merely a result of stochastic variance.

% Immature trend not available.

% Large Mature trend not available.

% Mega Spawner trend not available.

% SPR trend not available.





The percentages of *Epinephelus areolatus* (ID #45, Epinephelidae) in most recent 365 days.  
N (Catch) = 300,512, n (Sample) = 8,881  
Immature (< 22cm): 2%  
Small mature (>= 22cm, < 29cm): 34%  
Large mature (>= 29cm): 65%  
Mega spawner (>= 31.9cm): 50% (subset of large mature fish)  
Spawning Potential Ratio: 42 %

The trade limit is significantly higher than length at first maturity. This means that the trade puts a premium on fish that have spawned at least once. The trade does not cause any concern of recruitment overfishing for this species. Risk level is low.

At least 90% of the fish in the catch are mature specimens that have spawned at least once before they were caught. The fishery does not depend on immature size classes for this species and is considered safe for this indicator. This fishery will not be causing overfishing through over harvesting of juveniles for this species. Risk level is low.

The majority of the catch consists of size classes around or above the optimum harvest size. This means that the impact of the fishery is minimized for this species. Potentially higher yields of this species could be achieved by catching them at somewhat smaller size, although capture of smaller specimen may take place already in other fisheries. Risk level is low.

More than 30% of the catch consists of mega spawners which indicates that this fish population is in good health unless large amounts of much smaller fish from the same population are caught by other fisheries. Risk level is low.

SPR is more than 40%. The stock is probably not over exploited, and the risk that the fishery will cause further stock decline is small. Risk level is low.

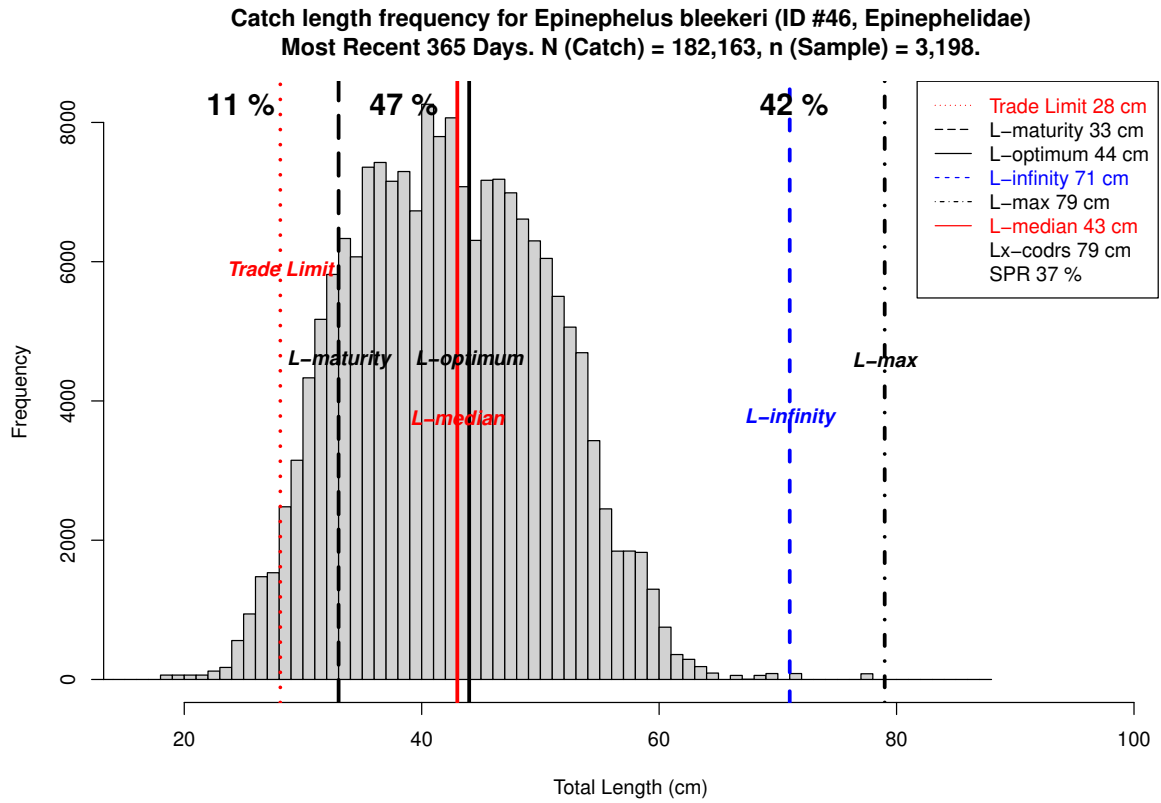
Trends in relative abundance by size group for *Epinephelus areolatus* (ID #45, Epinephelidae), as calculated from linear regressions. The P value indicates the chance that this calculated trend is merely a result of stochastic variance.

% Immature trend not available.

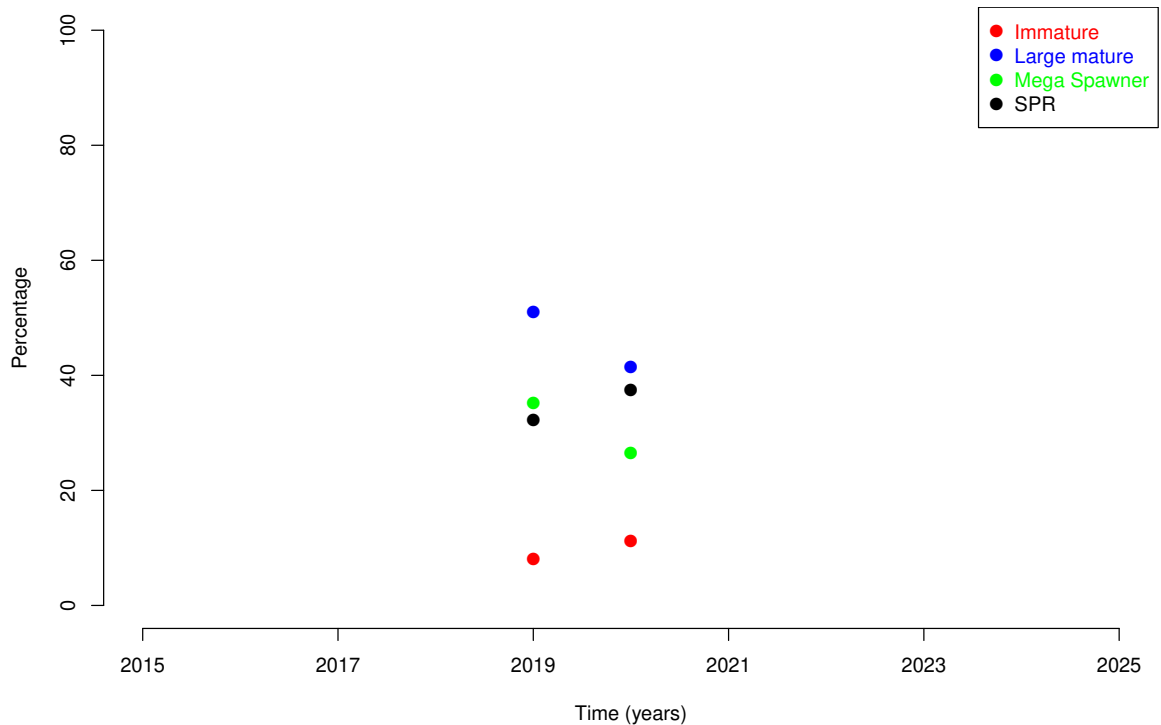
% Large Mature trend not available.

% Mega Spawner trend not available.

% SPR trend not available.



**Trends in relative abundance by size group for *Epinephelus bleekeri* (ID #46, Epinephelidae)**



The percentages of *Epinephelus bleekeri* (ID #46, Epinephelidae) in most recent 365 days.  
N (Catch) =182,163, n (Sample) = 3,198  
Immature (< 33cm): 11%  
Small mature (>= 33cm, < 44cm): 47%  
Large mature (>= 44cm): 42%  
Mega spawner (>= 48.4cm): 27% (subset of large mature fish)  
Spawning Potential Ratio: 37 %

The trade limit is significantly lower than the length at first maturity. This means that the trade encourages capture of immature fish, which impairs sustainability. Risk level is high.

Between 10% and 20% of the fish in the catch are juveniles that have not yet reproduced. There is no immediate concern in terms of overfishing through over harvesting of juveniles, but the fishery needs to be monitored closely for any further increase in this indicator and incentives need to be geared towards targeting larger fish. Risk level is medium.

The bulk of the catch includes age groups that have just matured and are about to achieve their full growth potential. This indicates that the fishery is probably at least being fully exploited. Risk level is medium.

The percentage of mega spawners is between 20 and 30%. There is no immediate reason for concern, though fishing pressure may be significantly reducing the percentage of mega-spawners, which may negatively affect the reproductive output of this population. Risk level is medium.

SPR is between 25% and 40%. The stock is heavily exploited, and there is some risk that the fishery will cause further decline of the stock. Risk level is medium.

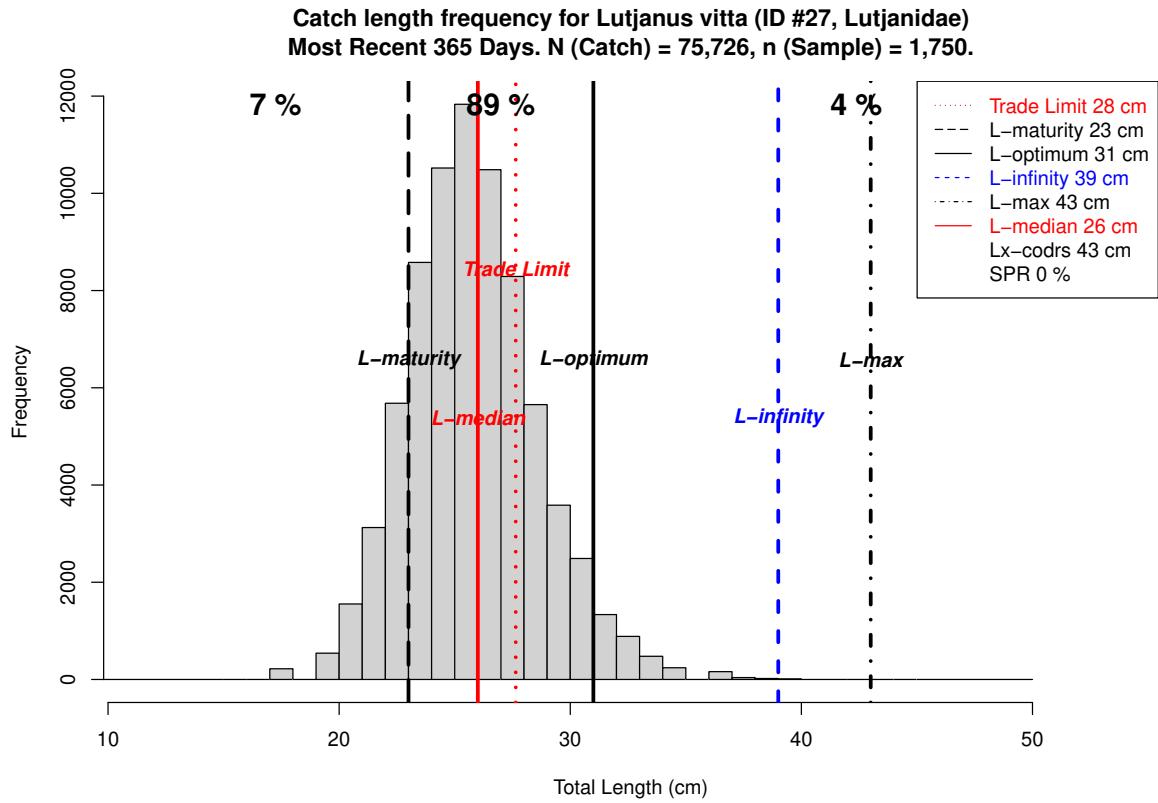
Trends in relative abundance by size group for *Epinephelus bleekeri* (ID #46, Epinephelidae), as calculated from linear regressions. The P value indicates the chance that this calculated trend is merely a result of stochastic variance.

% Immature trend not available.

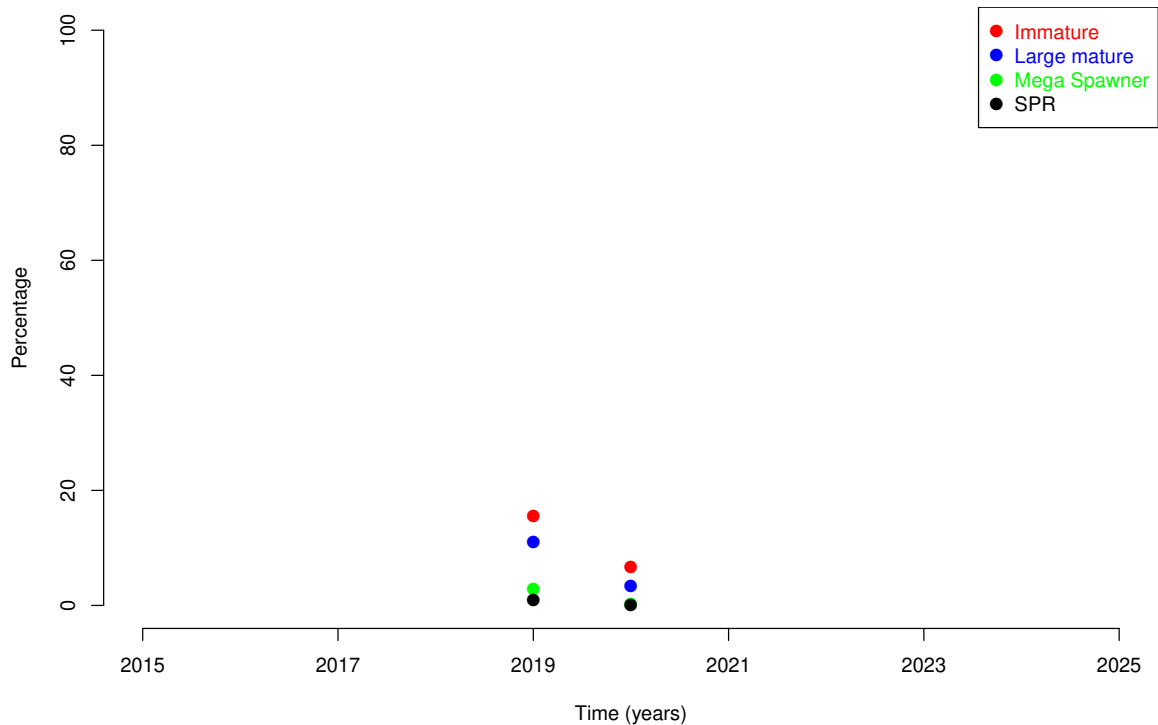
% Large Mature trend not available.

% Mega Spawner trend not available.

% SPR trend not available.



**Trends in relative abundance by size group for *Lutjanus vitta* (ID #27, Lutjanidae)**



The percentages of *Lutjanus vitta* (ID #27, Lutjanidae) in most recent 365 days.  
N (Catch) = 75,726, n (Sample) = 1,750  
Immature (< 23cm): 7%  
Small mature (>= 23cm, < 31cm): 89%  
Large mature (>= 31cm): 4%  
Mega spawner (>= 34.1cm): 1% (subset of large mature fish)  
Spawning Potential Ratio: 0 %

The trade limit is significantly higher than length at first maturity. This means that the trade puts a premium on fish that have spawned at least once. The trade does not cause any concern of recruitment overfishing for this species. Risk level is low.

At least 90% of the fish in the catch are mature specimens that have spawned at least once before they were caught. The fishery does not depend on immature size classes for this species and is considered safe for this indicator. This fishery will not be causing overfishing through over harvesting of juveniles for this species. Risk level is low.

The vast majority of the fish in the catch have not yet achieved their growth potential. The harvest of small fish promotes growth overfishing and the size distribution for this species indicates that over exploitation through growth overfishing may already be happening. Risk level is high.

Less than 20% of the catch comprises of mega spawners. This indicates that the population may be severely affected by the fishery, and that there is a substantial risk of recruitment overfishing through over harvesting of the mega spawners, unless large numbers of mega spawners would be surviving at other habitats. There is no reason to assume that this is the case and therefore a reduction of fishing effort may be necessary in this fishery. Risk level is high.

SPR is less than 25%. The fishery probably over-exploits the stock, and there is a substantial risk that the fishery will cause severe decline of the stock if fishing effort is not reduced. Risk level is high.

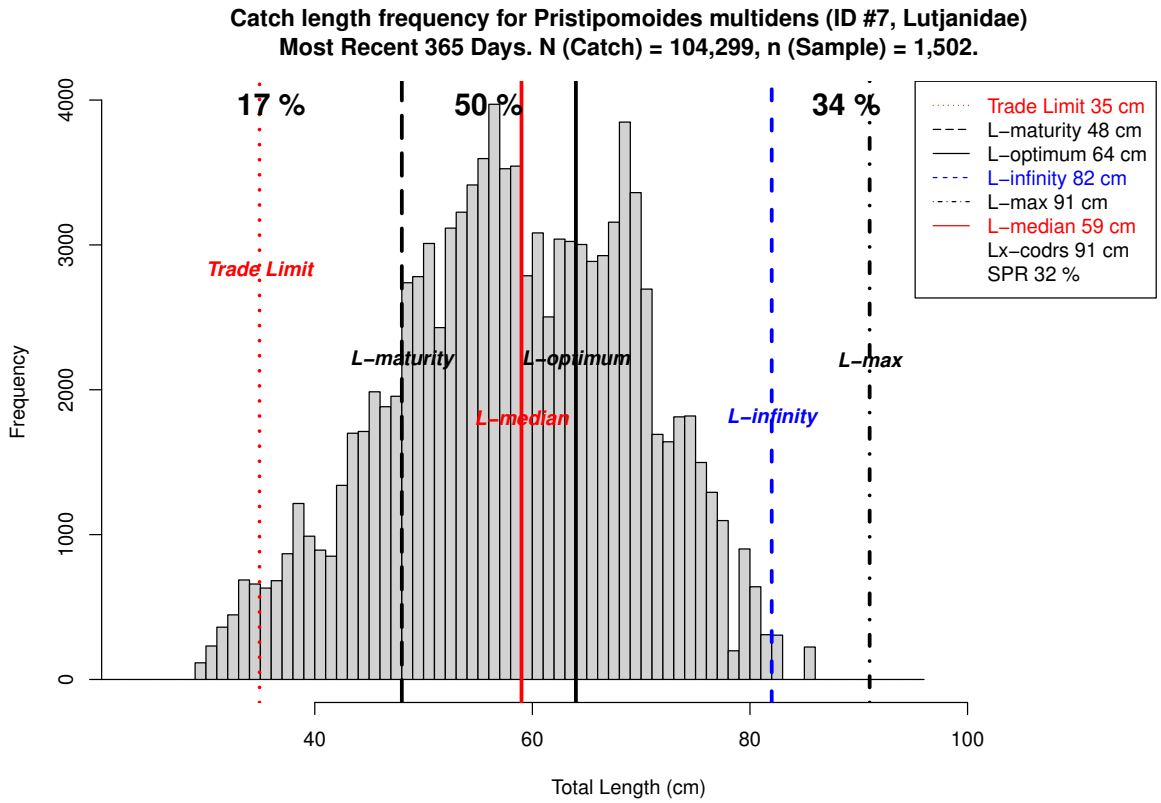
Trends in relative abundance by size group for *Lutjanus vitta* (ID #27, Lutjanidae), as calculated from linear regressions. The P value indicates the chance that this calculated trend is merely a result of stochastic variance.

% Immature trend not available.

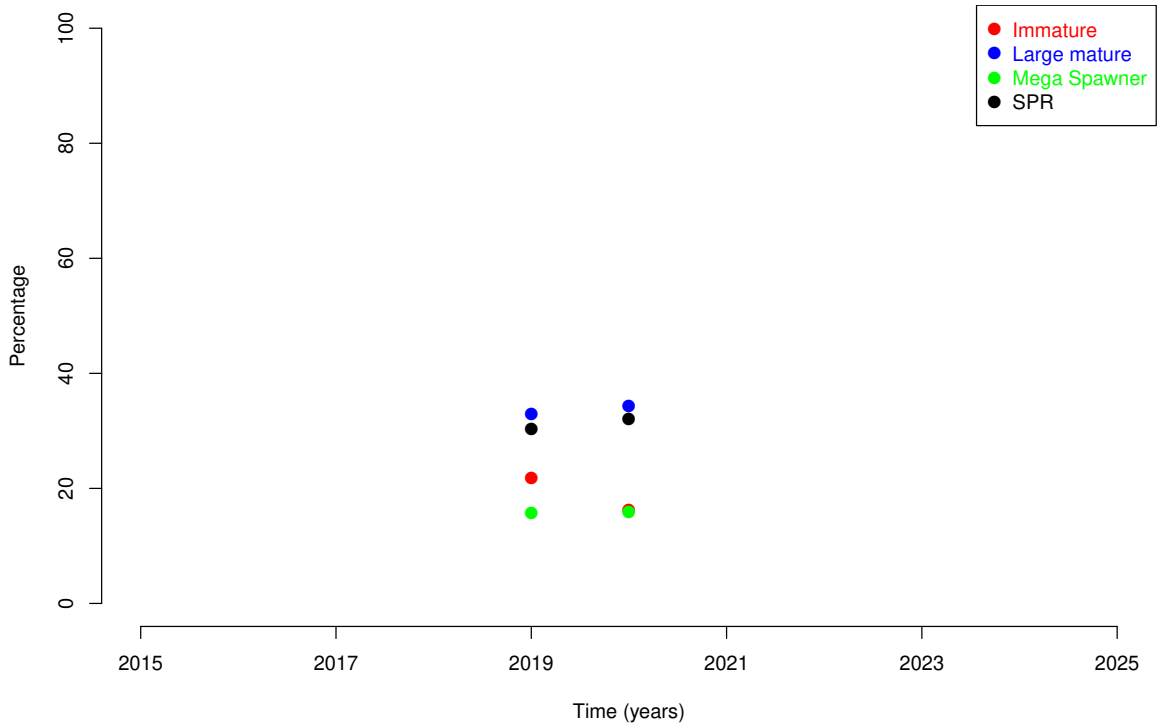
% Large Mature trend not available.

% Mega Spawner trend not available.

% SPR trend not available.



**Trends in relative abundance by size group for *Pristipomoides multidens* (ID #7, Lutjanidae)**



The percentages of *Pristipomoides multidens* (ID #7, Lutjanidae) in most recent 365 days.  
N (Catch) =104,299, n (Sample) = 1,502  
Immature (< 48cm): 17%  
Small mature (>= 48cm, < 64cm): 50%  
Large mature (>= 64cm): 34%  
Mega spawner (>= 70.4cm): 15% (subset of large mature fish)  
Spawning Potential Ratio: 32 %

The trade limit is significantly lower than the length at first maturity. This means that the trade encourages capture of immature fish, which impairs sustainability. Risk level is high.

Between 10% and 20% of the fish in the catch are juveniles that have not yet reproduced. There is no immediate concern in terms of overfishing through over harvesting of juveniles, but the fishery needs to be monitored closely for any further increase in this indicator and incentives need to be geared towards targeting larger fish. Risk level is medium.

The vast majority of the fish in the catch have not yet achieved their growth potential. The harvest of small fish promotes growth overfishing and the size distribution for this species indicates that over exploitation through growth overfishing may already be happening. Risk level is high.

Less than 20% of the catch comprises of mega spawners. This indicates that the population may be severely affected by the fishery, and that there is a substantial risk of recruitment overfishing through over harvesting of the mega spawners, unless large numbers of mega spawners would be surviving at other habitats. There is no reason to assume that this is the case and therefore a reduction of fishing effort may be necessary in this fishery. Risk level is high.

SPR is between 25% and 40%. The stock is heavily exploited, and there is some risk that the fishery will cause further decline of the stock. Risk level is medium.

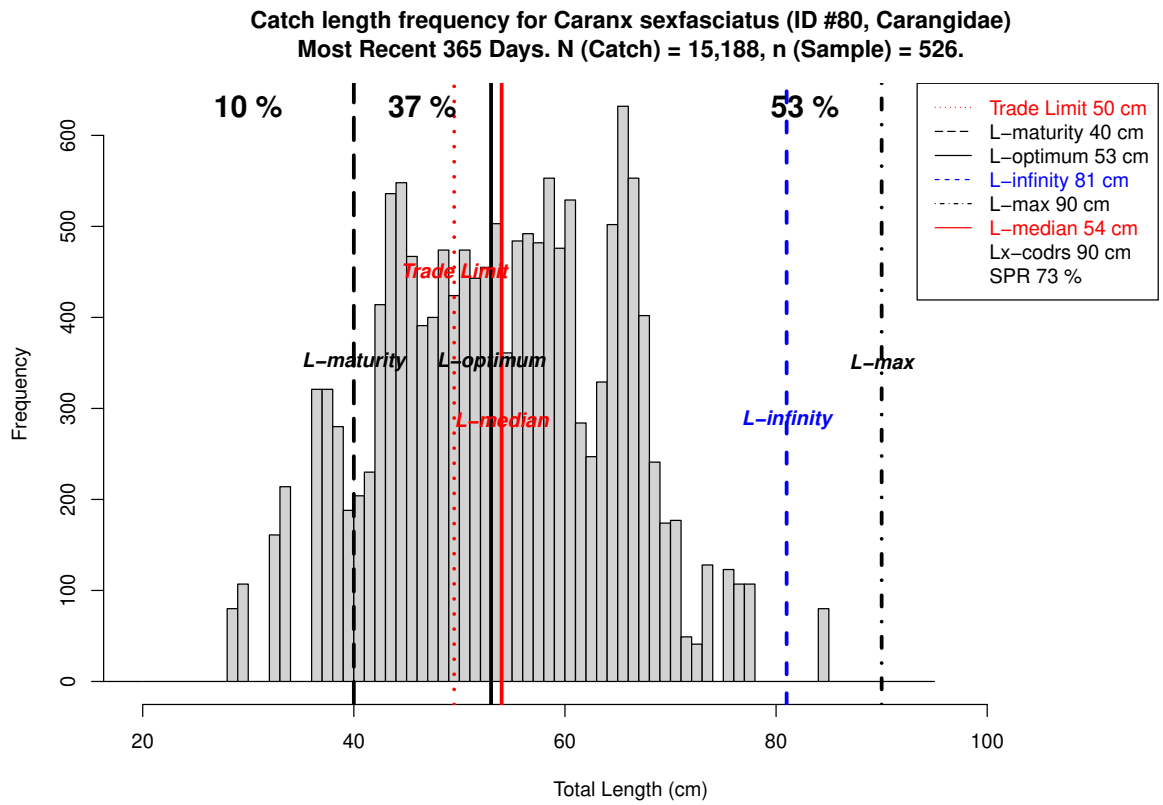
Trends in relative abundance by size group for *Pristipomoides multidens* (ID #7, Lutjanidae), as calculated from linear regressions. The P value indicates the chance that this calculated trend is merely a result of stochastic variance.

% Immature trend not available.

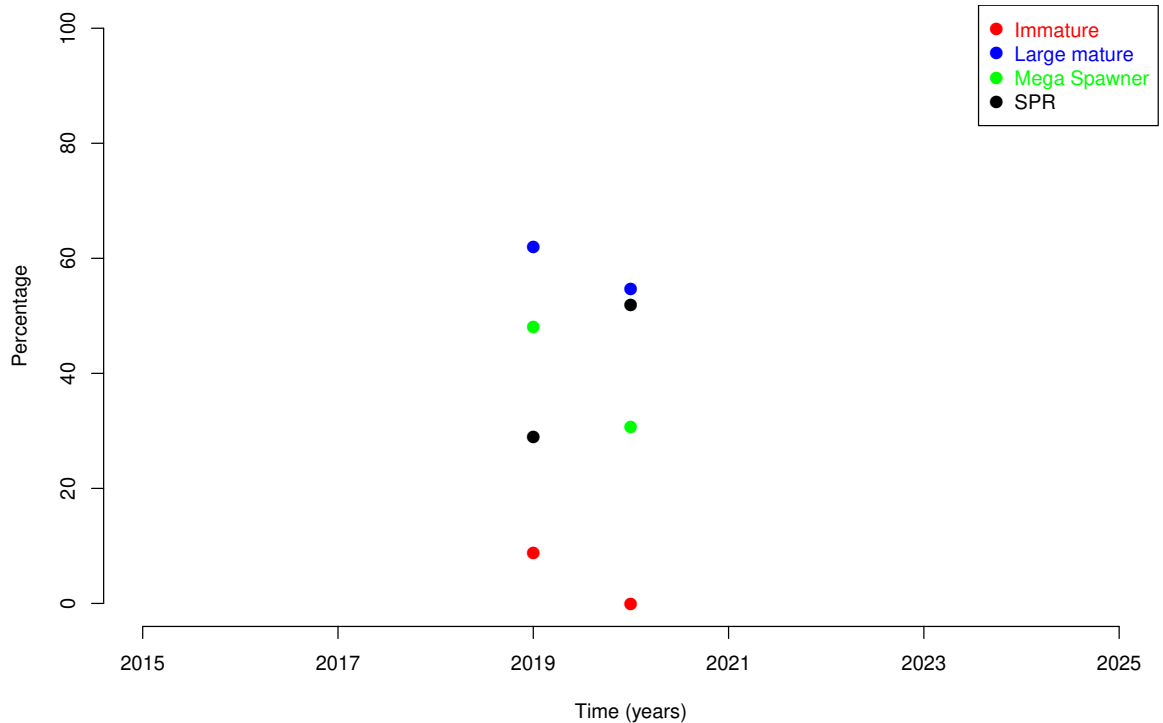
% Large Mature trend not available.

% Mega Spawner trend not available.

% SPR trend not available.



**Trends in relative abundance by size group for *Caranx sexfasciatus* (ID #80, Carangidae)**





The percentages of *Caranx sexfasciatus* (ID #80, Carangidae) in most recent 365 days.

N (Catch) =15,188, n (Sample) = 526

Immature (< 40cm): 10%

Small mature ( $\geq 40\text{cm}$ , < 53cm): 37%

Large mature ( $\geq 53\text{cm}$ ): 53%

Mega spawner ( $\geq 58.3\text{cm}$ ): 38% (subset of large mature fish)

Spawning Potential Ratio: 73 %

The trade limit is significantly higher than length at first maturity. This means that the trade puts a premium on fish that have spawned at least once. The trade does not cause any concern of recruitment overfishing for this species. Risk level is low.

At least 90% of the fish in the catch are mature specimens that have spawned at least once before they were caught. The fishery does not depend on immature size classes for this species and is considered safe for this indicator. This fishery will not be causing overfishing through over harvesting of juveniles for this species. Risk level is low.

The majority of the catch consists of size classes around or above the optimum harvest size. This means that the impact of the fishery is minimized for this species. Potentially higher yields of this species could be achieved by catching them at somewhat smaller size, although capture of smaller specimen may take place already in other fisheries. Risk level is low.

More than 30% of the catch consists of mega spawners which indicates that this fish population is in good health unless large amounts of much smaller fish from the same population are caught by other fisheries. Risk level is low.

SPR is more than 40%. The stock is probably not over exploited, and the risk that the fishery will cause further stock decline is small. Risk level is low.

Trends in relative abundance by size group for *Caranx sexfasciatus* (ID #80, Carangidae), as calculated from linear regressions. The P value indicates the chance that this calculated trend is merely a result of stochastic variance.

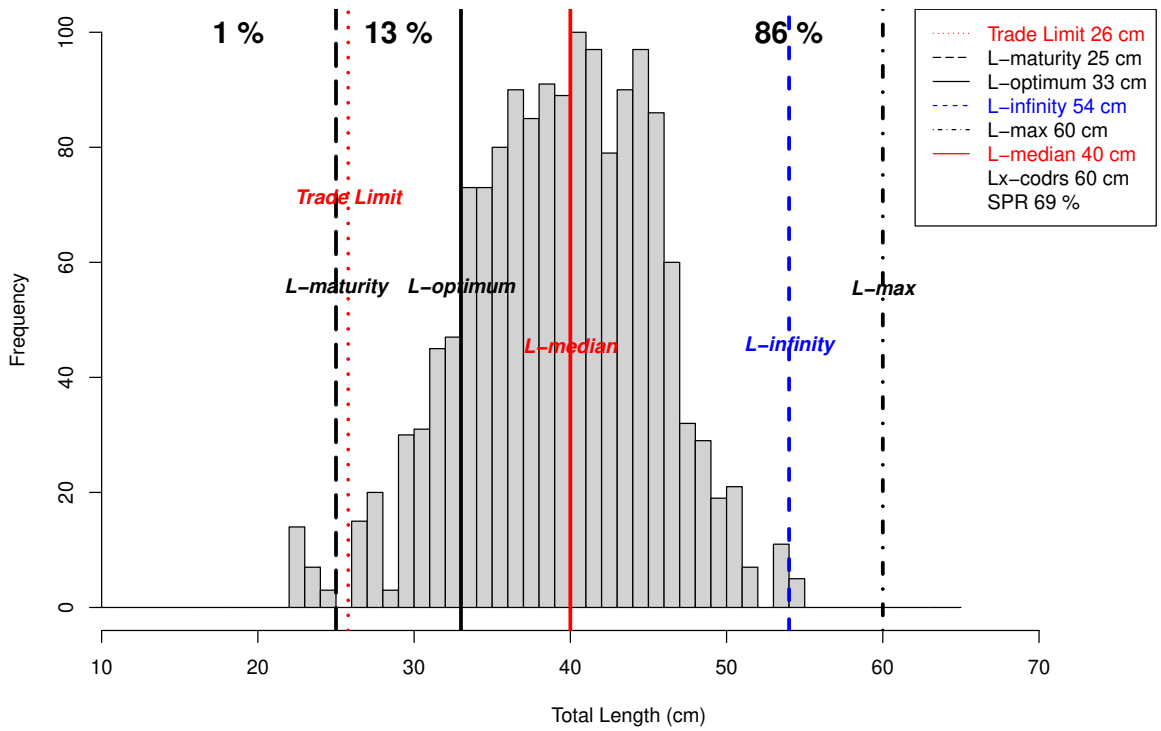
% Immature trend not available.

% Large Mature trend not available.

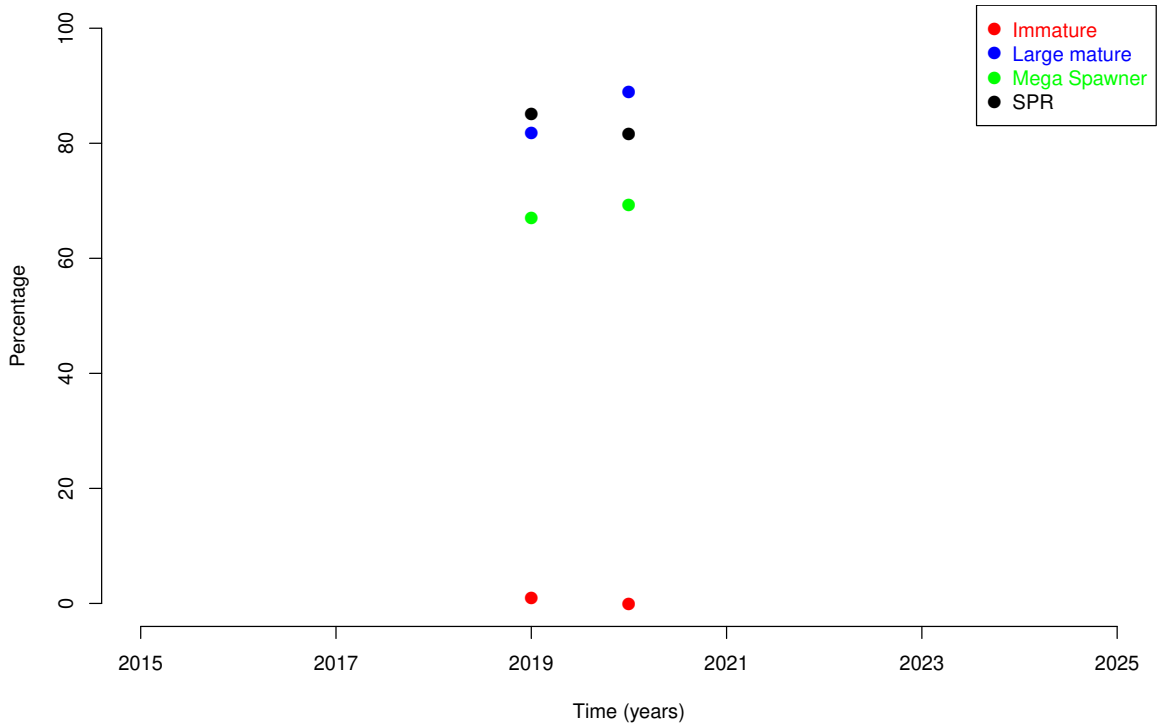
% Mega Spawner trend not available.

% SPR trend not available.

Catch length frequency for *Cephalopholis sonnerati* (ID #39, Epinephelidae)  
 Most Recent 365 Days. N (Catch) = 1,529, n (Sample) = 415.



Trends in relative abundance by size group for *Cephalopholis sonnerati* (ID #39, Epinephelidae)



The percentages of *Cephalopholis sonnerati* (ID #39, Epinephelidae) in most recent 365 days.  
N (Catch) =1,529, n (Sample) = 415  
Immature (< 25cm): 1%  
Small mature (>= 25cm, < 33cm): 13%  
Large mature (>= 33cm): 86%  
Mega spawner (>= 36.3cm): 71% (subset of large mature fish)  
Spawning Potential Ratio: 69 %

The trade limit is about the same as the length at first maturity. This means that the trade puts a premium on fish that have spawned at least once, which improves sustainability of the fishery. Risk level is medium.

At least 90% of the fish in the catch are mature specimens that have spawned at least once before they were caught. The fishery does not depend on immature size classes for this species and is considered safe for this indicator. This fishery will not be causing overfishing through over harvesting of juveniles for this species. Risk level is low.

The majority of the catch consists of size classes around or above the optimum harvest size. This means that the impact of the fishery is minimized for this species. Potentially higher yields of this species could be achieved by catching them at somewhat smaller size, although capture of smaller specimen may take place already in other fisheries. Risk level is low.

More than 30% of the catch consists of mega spawners which indicates that this fish population is in good health unless large amounts of much smaller fish from the same population are caught by other fisheries. Risk level is low.

SPR is more than 40%. The stock is probably not over exploited, and the risk that the fishery will cause further stock decline is small. Risk level is low.

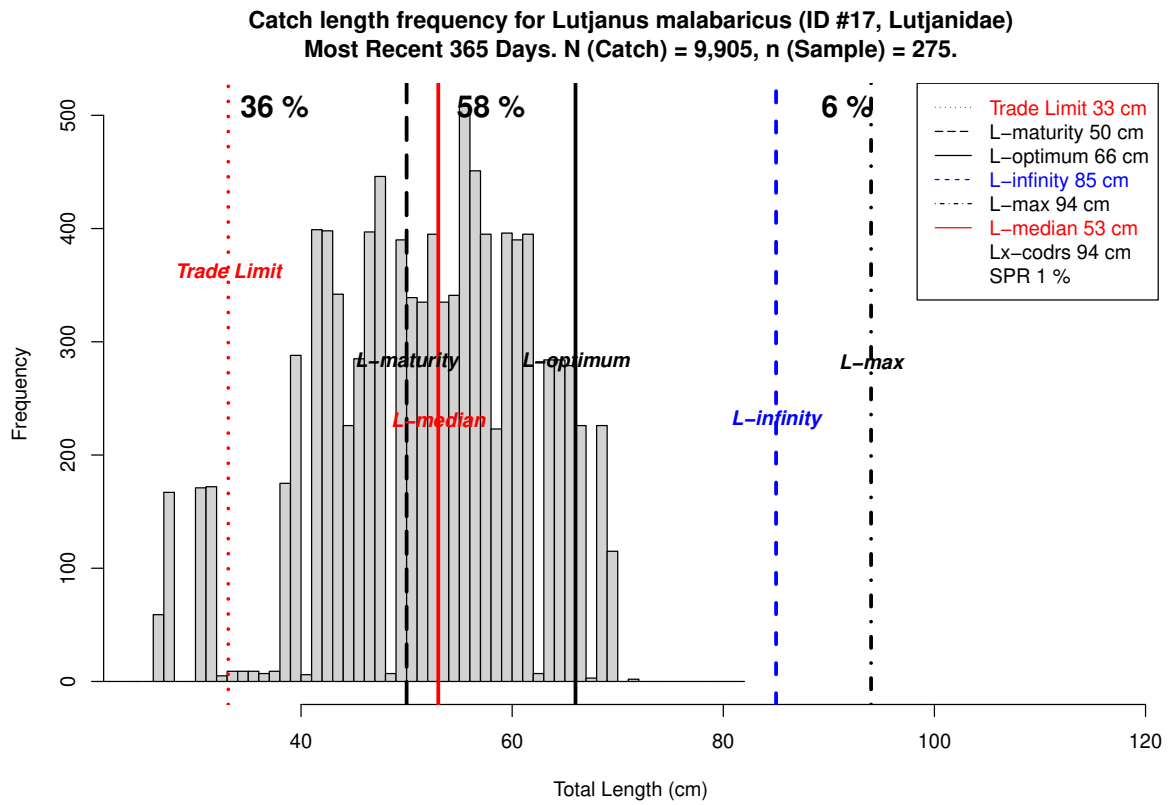
Trends in relative abundance by size group for *Cephalopholis sonnerati* (ID #39, Epinephelidae), as calculated from linear regressions. The P value indicates the chance that this calculated trend is merely a result of stochastic variance.

% Immature trend not available.

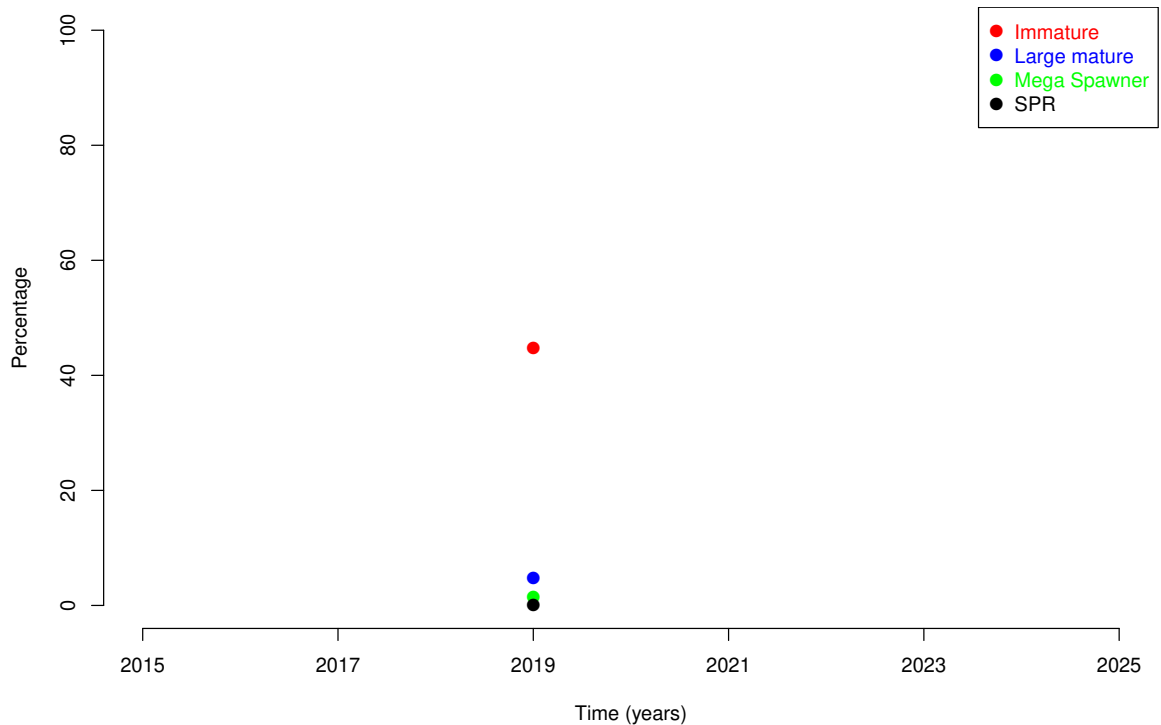
% Large Mature trend not available.

% Mega Spawner trend not available.

% SPR trend not available.



**Trends in relative abundance by size group for *Lutjanus malabaricus* (ID #17, Lutjanidae)**



The percentages of *Lutjanus malabaricus* (ID #17, Lutjanidae) in most recent 365 days.  
N (Catch) =9,905, n (Sample) = 275  
Immature (< 50cm): 36%  
Small mature (>= 50cm, < 66cm): 58%  
Large mature (>= 66cm): 6%  
Mega spawner (>= 72.6cm): 0% (subset of large mature fish)  
Spawning Potential Ratio: 1 %

The trade limit is significantly lower than the length at first maturity. This means that the trade encourages capture of immature fish, which impairs sustainability. Risk level is high.

Between 30% and 50% of the fish in the catch are immature and have not had a chance to reproduce before capture. The fishery is in immediate danger of overfishing through overharvesting of juveniles, if fishing pressure is high. Catching small and immature fish needs to be actively avoided and a limit on overall fishing pressure is warranted. Risk level is high.

The vast majority of the fish in the catch have not yet achieved their growth potential. The harvest of small fish promotes growth overfishing and the size distribution for this species indicates that over exploitation through growth overfishing may already be happening. Risk level is high.

Less than 20% of the catch comprises of mega spawners. This indicates that the population may be severely affected by the fishery, and that there is a substantial risk of recruitment overfishing through over harvesting of the mega spawners, unless large numbers of mega spawners would be surviving at other habitats. There is no reason to assume that this is the case and therefore a reduction of fishing effort may be necessary in this fishery. Risk level is high.

SPR is less than 25%. The fishery probably over-exploits the stock, and there is a substantial risk that the fishery will cause severe decline of the stock if fishing effort is not reduced. Risk level is high.

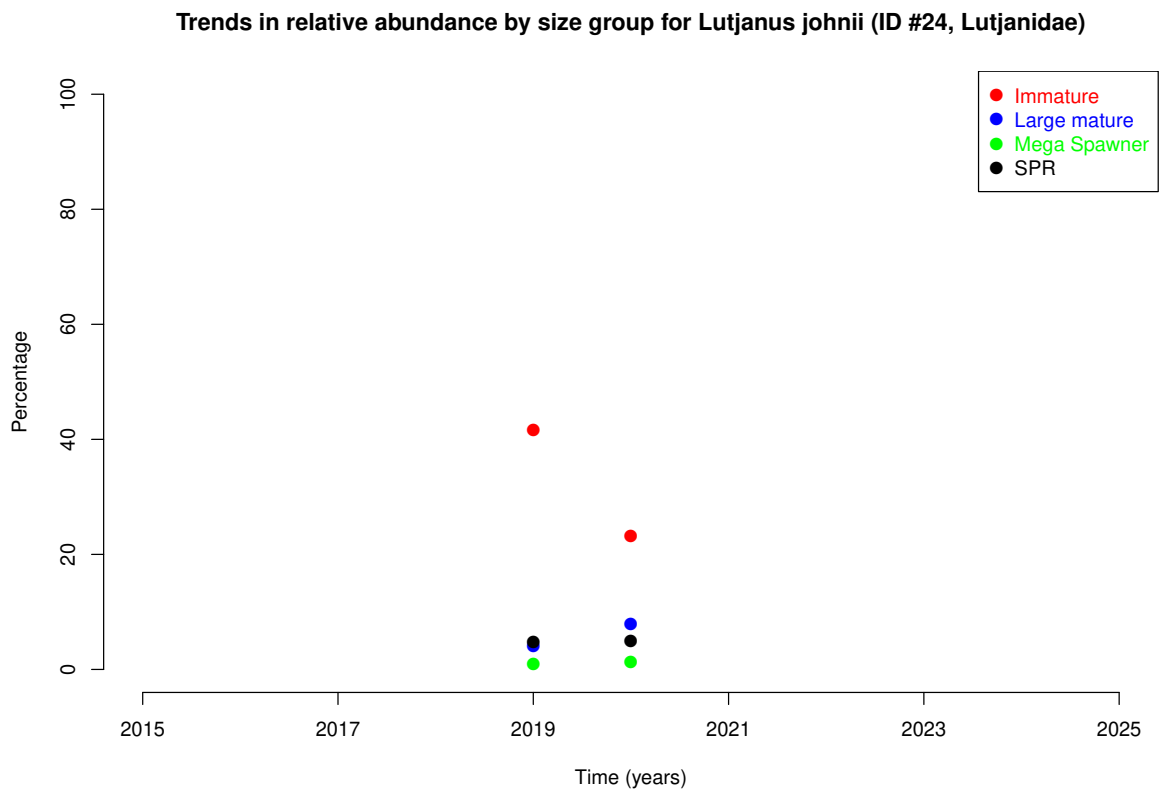
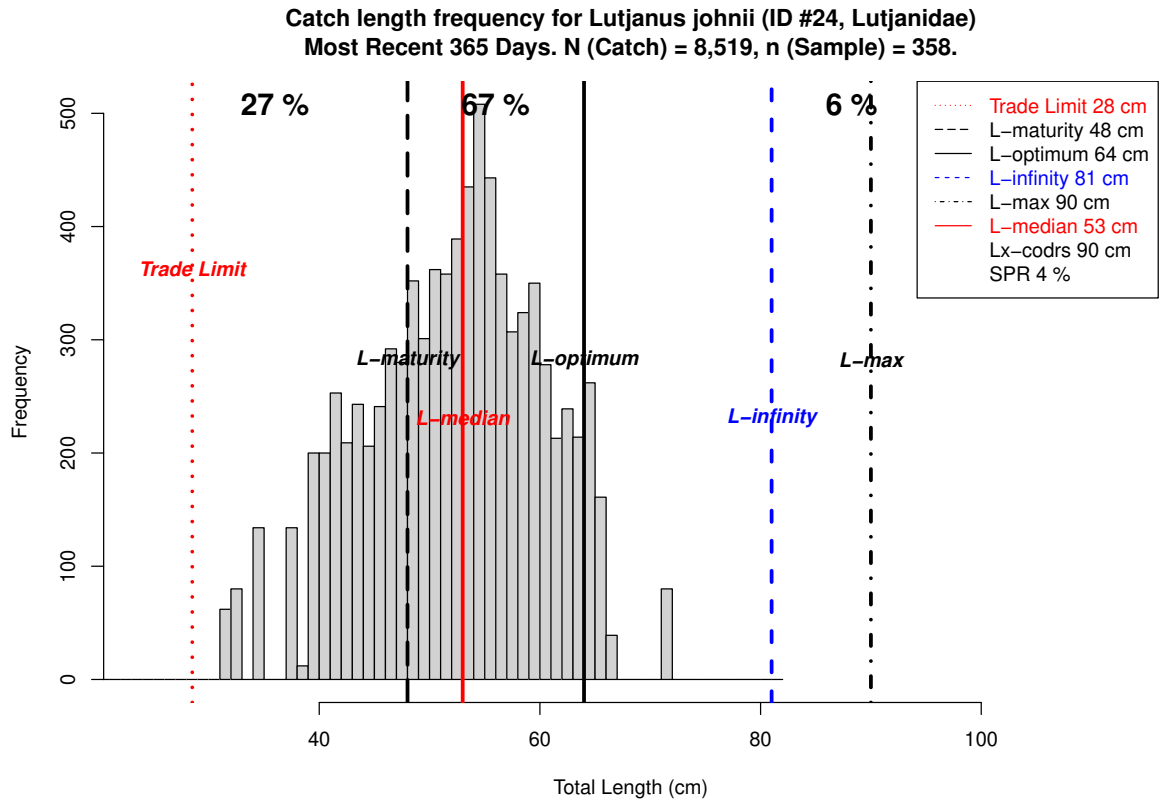
Trends in relative abundance by size group for *Lutjanus malabaricus* (ID #17, Lutjanidae), as calculated from linear regressions. The P value indicates the chance that this calculated trend is merely a result of stochastic variance.

% Immature trend not available.

% Large Mature trend not available.

% Mega Spawner trend not available.

% SPR trend not available.



The percentages of *Lutjanus johnii* (ID #24, Lutjanidae) in most recent 365 days.  
N (Catch) = 8,519, n (Sample) = 358  
Immature (< 48cm): 27%  
Small mature (>= 48cm, < 64cm): 67%  
Large mature (>= 64cm): 6%  
Mega spawner (>= 70.4cm): 1% (subset of large mature fish)  
Spawning Potential Ratio: 4 %

The trade limit is significantly lower than the length at first maturity. This means that the trade encourages capture of immature fish, which impairs sustainability. Risk level is high.

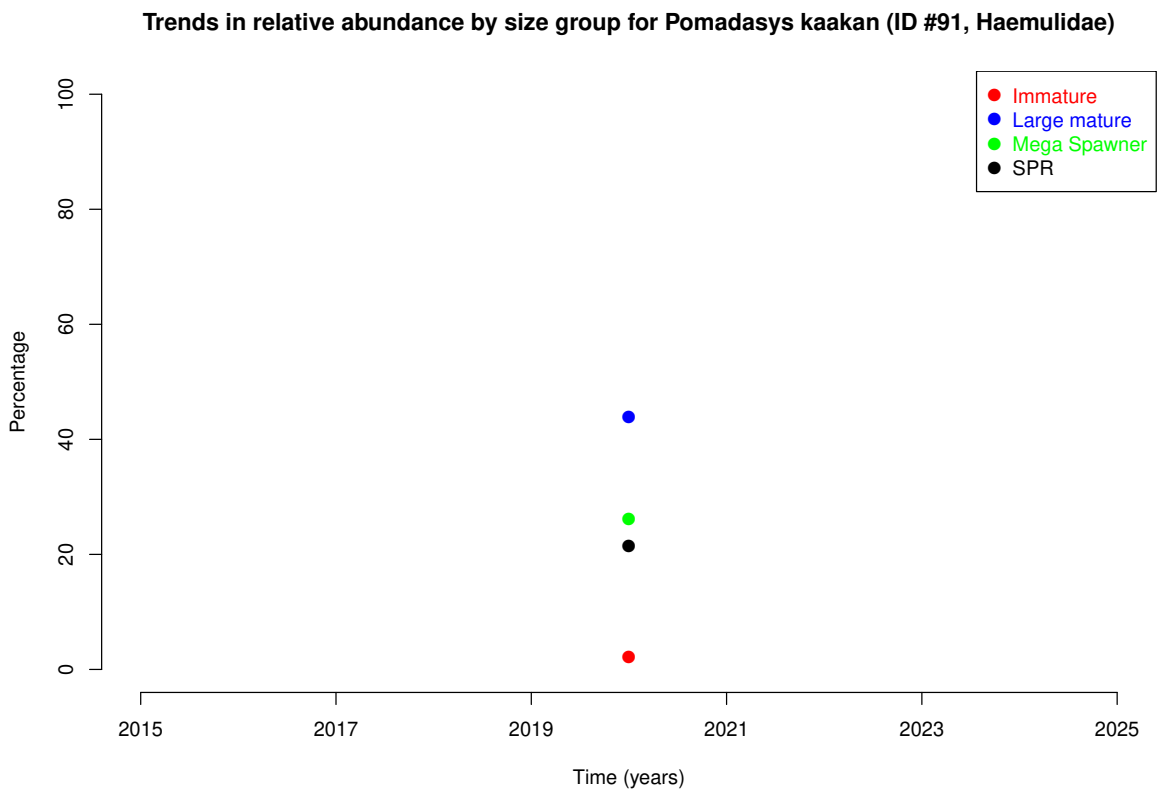
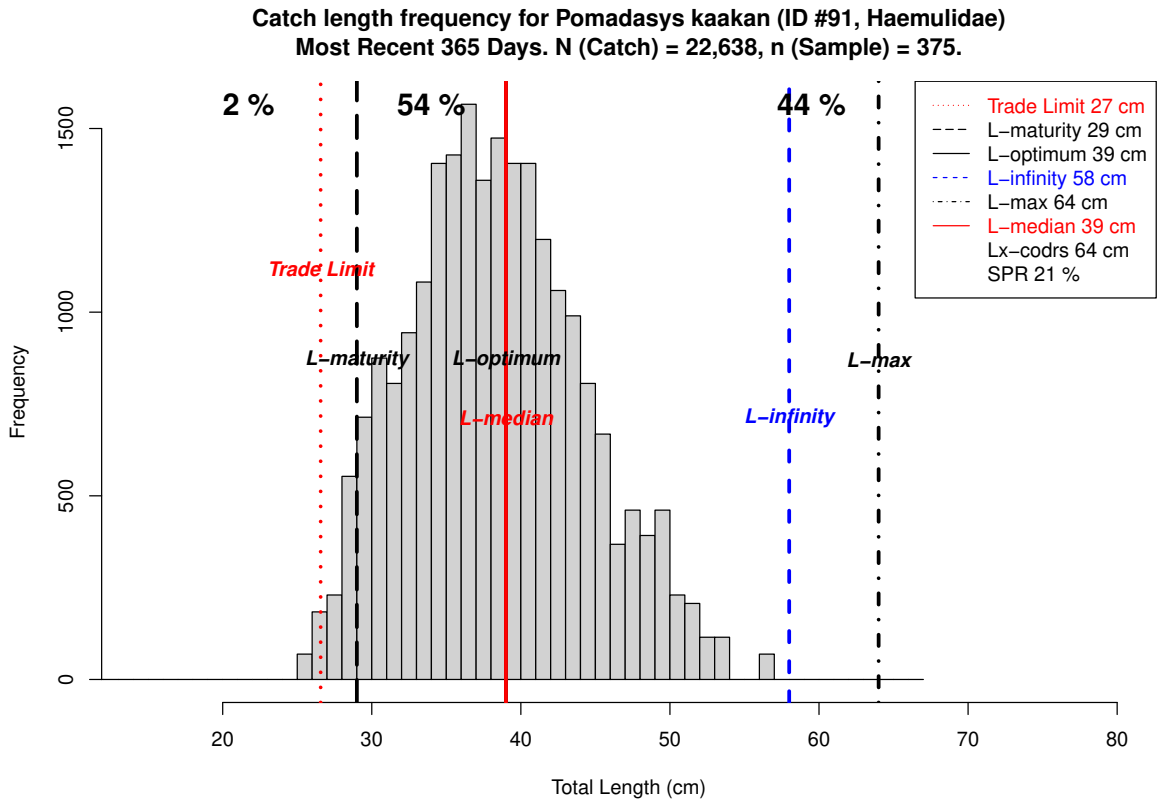
Between 20% and 30% of the fish in the catch are specimens that have not yet reproduced. This is reason for concern in terms of potential overfishing through overharvesting of juveniles, if fishing pressure is high and percentages immature fish would further rise. Targeting larger fish and avoiding small fish in the catch will promote a sustainable fishery. Risk level is medium.

The vast majority of the fish in the catch have not yet achieved their growth potential. The harvest of small fish promotes growth overfishing and the size distribution for this species indicates that over exploitation through growth overfishing may already be happening. Risk level is high.

Less than 20% of the catch comprises of mega spawners. This indicates that the population may be severely affected by the fishery, and that there is a substantial risk of recruitment overfishing through over harvesting of the mega spawners, unless large numbers of mega spawners would be surviving at other habitats. There is no reason to assume that this is the case and therefore a reduction of fishing effort may be necessary in this fishery. Risk level is high.

SPR is less than 25%. The fishery probably over-exploits the stock, and there is a substantial risk that the fishery will cause severe decline of the stock if fishing effort is not reduced. Risk level is high.

Trends in relative abundance by size group for *Lutjanus johnii* (ID #24, Lutjanidae), as calculated from linear regressions. The P value indicates the chance that this calculated trend is merely a result of stochastic variance.  
% Immature trend not available.  
% Large Mature trend not available.  
% Mega Spawner trend not available.  
% SPR trend not available.





The percentages of *Pomadasys kaakan* (ID #91, Haemulidae) in most recent 365 days.  
N (Catch) =22,638, n (Sample) = 375  
Immature (< 29cm): 2%  
Small mature (>= 29cm, < 39cm): 54%  
Large mature (>= 39cm): 44%  
Mega spawner (>= 42.9cm): 26% (subset of large mature fish)  
Spawning Potential Ratio: 21 %

The trade limit is about the same as the length at first maturity. This means that the trade puts a premium on fish that have spawned at least once, which improves sustainability of the fishery. Risk level is medium.

At least 90% of the fish in the catch are mature specimens that have spawned at least once before they were caught. The fishery does not depend on immature size classes for this species and is considered safe for this indicator. This fishery will not be causing overfishing through over harvesting of juveniles for this species. Risk level is low.

The bulk of the catch includes age groups that have just matured and are about to achieve their full growth potential. This indicates that the fishery is probably at least being fully exploited. Risk level is medium.

The percentage of mega spawners is between 20 and 30%. There is no immediate reason for concern, though fishing pressure may be significantly reducing the percentage of mega-spawners, which may negatively affect the reproductive output of this population. Risk level is medium.

SPR is less than 25%. The fishery probably over-exploits the stock, and there is a substantial risk that the fishery will cause severe decline of the stock if fishing effort is not reduced. Risk level is high.

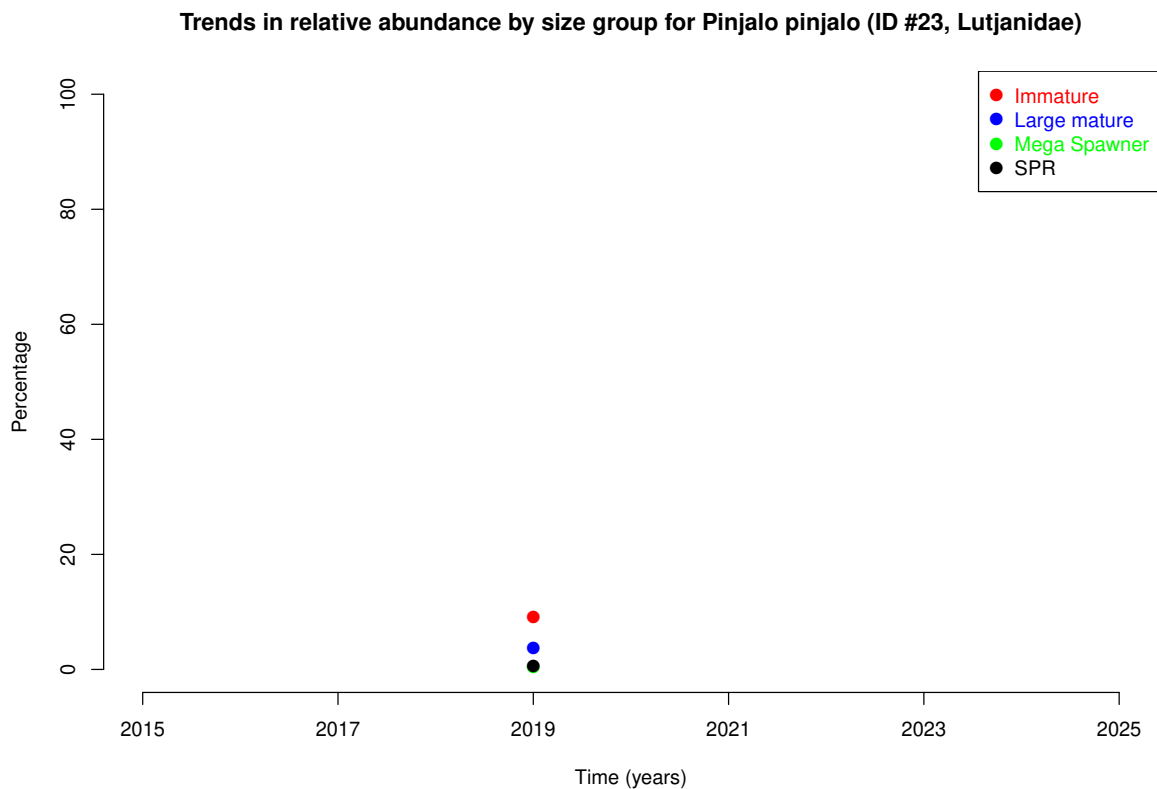
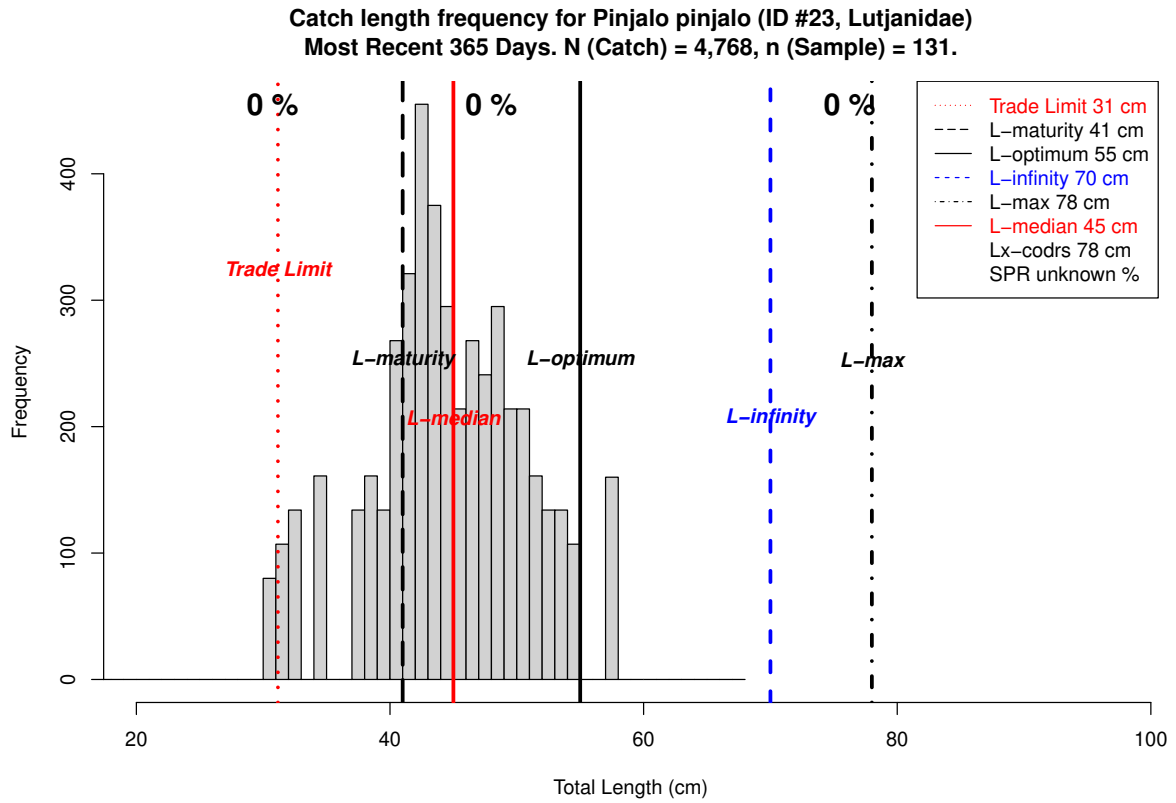
Trends in relative abundance by size group for *Pomadasys kaakan* (ID #91, Haemulidae), as calculated from linear regressions. The P value indicates the chance that this calculated trend is merely a result of stochastic variance.

% Immature trend not available.

% Large Mature trend not available.

% Mega Spawner trend not available.

% SPR trend not available.



The percentages of Pinjalo pinjalo (ID #23, Lutjanidae) in most recent 365 days.  
N (Catch) = 4,768, n (Sample) = 131  
Immature (< 41cm): 0%  
Small mature (>= 41cm, < 55cm): 0%  
Large mature (>= 55cm): 0%  
Mega spawner (>= 60.5cm): 0% (subset of large mature fish)

The trade limit is about the same as the length at first maturity. This means that the trade puts a premium on fish that have spawned at least once, which improves sustainability of the fishery. Risk level is medium.

At least 90% of the fish in the catch are mature specimens that have spawned at least once before they were caught. The fishery does not depend on immature size classes for this species and is considered safe for this indicator. This fishery will not be causing overfishing through over harvesting of juveniles for this species. Risk level is low.

The bulk of the catch includes age groups that have just matured and are about to achieve their full growth potential. This indicates that the fishery is probably at least being fully exploited. Risk level is medium.

The percentage of mega spawners is between 20 and 30%. There is no immediate reason for concern, though fishing pressure may be significantly reducing the percentage of mega-spawners, which may negatively affect the reproductive output of this population. Risk level is medium.

SPR is less than 25%. The fishery probably over-exploits the stock, and there is a substantial risk that the fishery will cause severe decline of the stock if fishing effort is not reduced. Risk level is high.

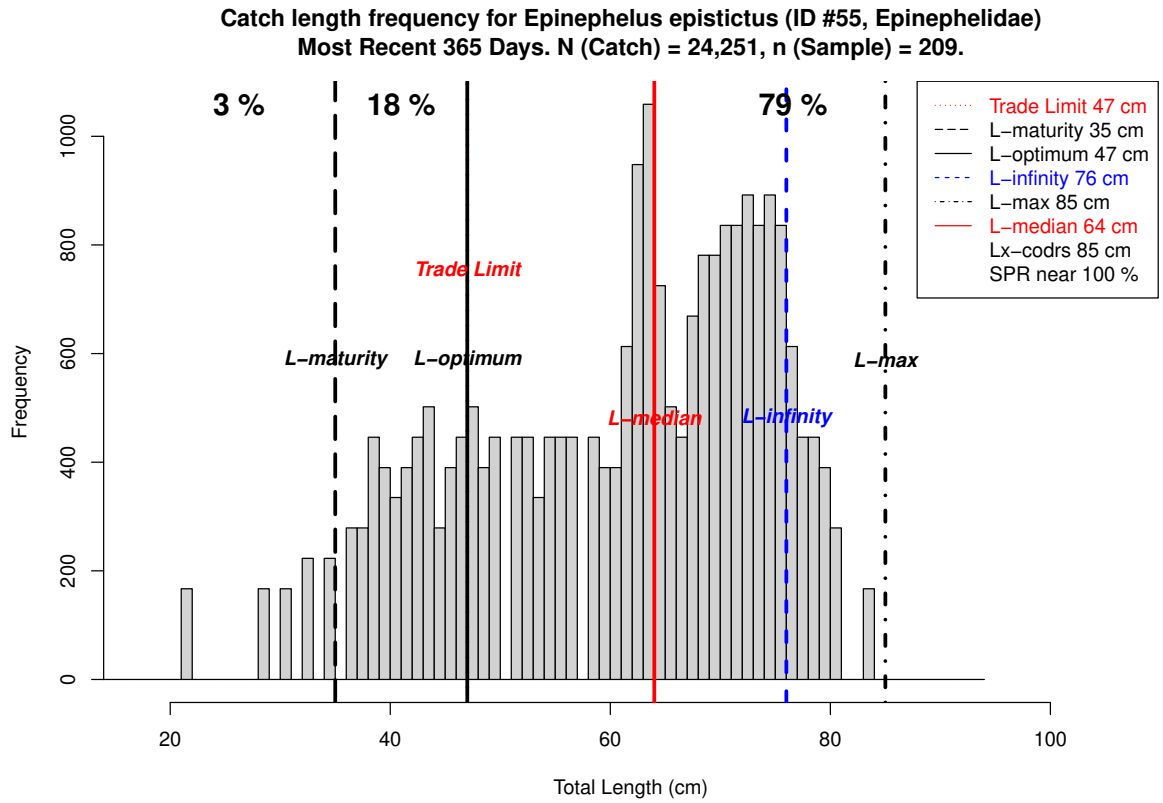
Trends in relative abundance by size group for Pinjalo pinjalo (ID #23, Lutjanidae), as calculated from linear regressions. The P value indicates the chance that this calculated trend is merely a result of stochastic variance.

% Immature trend not available.

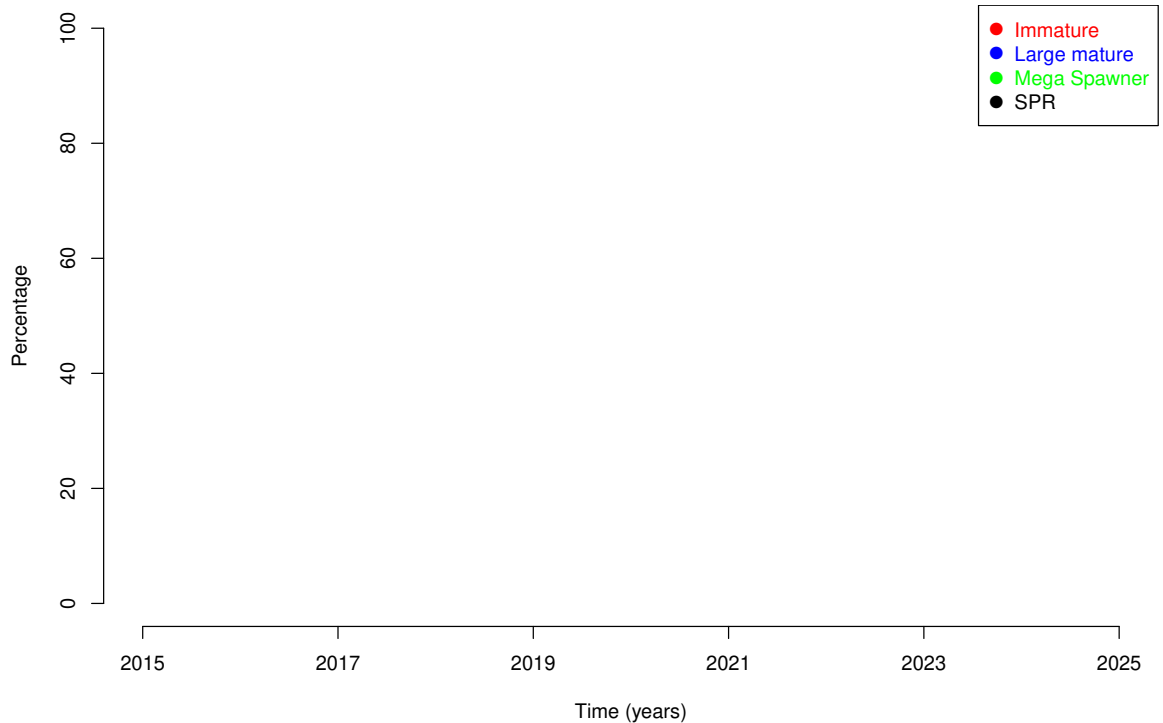
% Large Mature trend not available.

% Mega Spawner trend not available.

% SPR trend not available.



**Trends in relative abundance by size group for *Epinephelus epistictus* (ID #55, Epinephelidae)**



The percentages of *Epinephelus epistictus* (ID #55, Epinephelidae) in most recent 365 days.  
N (Catch) =24,251, n (Sample) = 209  
Immature (< 35cm): 3%  
Small mature (>= 35cm, < 47cm): 18%  
Large mature (>= 47cm): 79%  
Mega spawner (>= 51.7cm): 73% (subset of large mature fish)  
Spawning Potential Ratio: near 100 %

The trade limit is significantly higher than length at first maturity. This means that the trade puts a premium on fish that have spawned at least once. The trade does not cause any concern of recruitment overfishing for this species. Risk level is low.

At least 90% of the fish in the catch are mature specimens that have spawned at least once before they were caught. The fishery does not depend on immature size classes for this species and is considered safe for this indicator. This fishery will not be causing overfishing through over harvesting of juveniles for this species. Risk level is low.

The majority of the catch consists of size classes around or above the optimum harvest size. This means that the impact of the fishery is minimized for this species. Potentially higher yields of this species could be achieved by catching them at somewhat smaller size, although capture of smaller specimen may take place already in other fisheries. Risk level is low.

More than 30% of the catch consists of mega spawners which indicates that this fish population is in good health unless large amounts of much smaller fish from the same population are caught by other fisheries. Risk level is low.

SPR is more than 40%. The stock is probably not over exploited, and the risk that the fishery will cause further stock decline is small. Risk level is low.

Trends in relative abundance by size group for *Epinephelus epistictus* (ID #55, Epinephelidae), as calculated from linear regressions. The P value indicates the chance that this calculated trend is merely a result of stochastic variance.

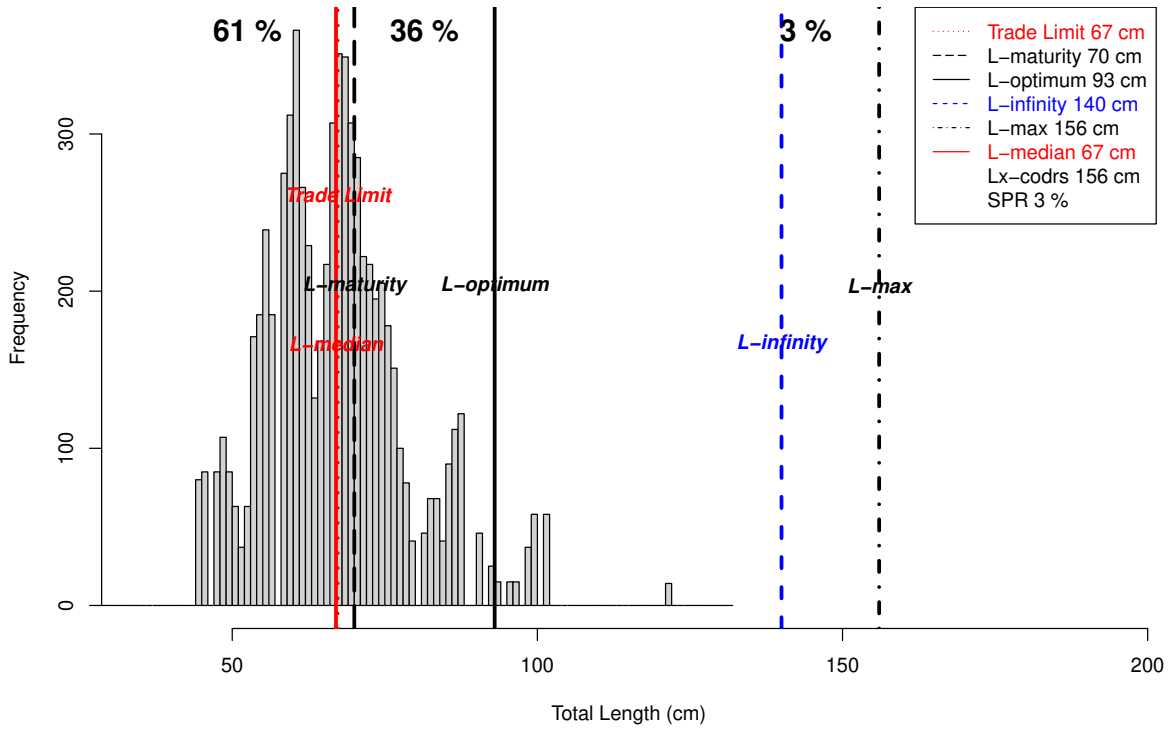
% Immature trend not available.

% Large Mature trend not available.

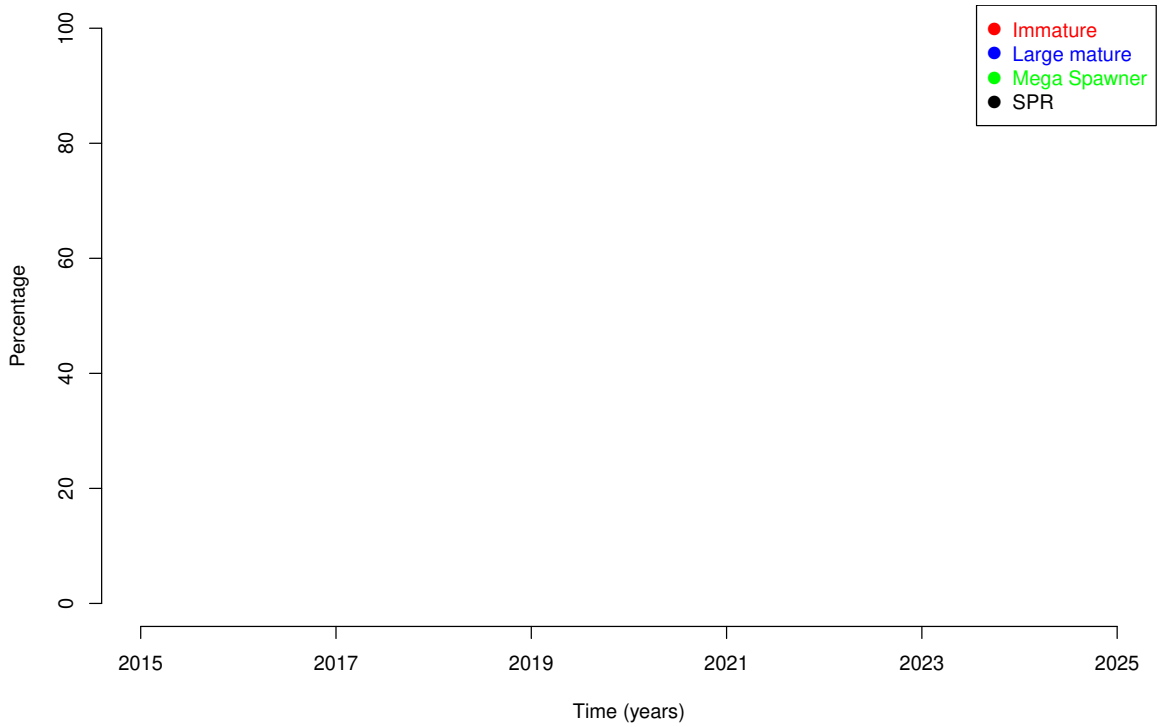
% Mega Spawner trend not available.

% SPR trend not available.

**Catch length frequency for *Rachycentron canadum* (ID #98, Rachycentridae)  
 Most Recent 365 Days. N (Catch) = 7,167, n (Sample) = 242.**



**Trends in relative abundance by size group for *Rachycentron canadum* (ID #98, Rachycentridae)**



The percentages of *Rachycentron canadum* (ID #98, Rachycentridae) in most recent 365 days.  
N (Catch) = 7,167, n (Sample) = 242  
Immature (< 70cm): 61%  
Small mature (>= 70cm, < 93cm): 36%  
Large mature (>= 93cm): 3%  
Mega spawner (>= 102.3cm): 0% (subset of large mature fish)  
Spawning Potential Ratio: 3 %

The trade limit is about the same as the length at first maturity. This means that the trade puts a premium on fish that have spawned at least once, which improves sustainability of the fishery. Risk level is medium.

The majority of the fish in the catch have not had a chance to reproduce before capture. This fishery is most likely overfished already if fishing mortality is high for all size classes in the population. An immediate shift away from targeting juvenile fish and a reduction in overall fishing pressure is essential to prevent collapse of the stock. Risk level is high.

The vast majority of the fish in the catch have not yet achieved their growth potential. The harvest of small fish promotes growth overfishing and the size distribution for this species indicates that over exploitation through growth overfishing may already be happening. Risk level is high.

Less than 20% of the catch comprises of mega spawners. This indicates that the population may be severely affected by the fishery, and that there is a substantial risk of recruitment overfishing through over harvesting of the mega spawners, unless large numbers of mega spawners would be surviving at other habitats. There is no reason to assume that this is the case and therefore a reduction of fishing effort may be necessary in this fishery. Risk level is high.

SPR is less than 25%. The fishery probably over-exploits the stock, and there is a substantial risk that the fishery will cause severe decline of the stock if fishing effort is not reduced. Risk level is high.

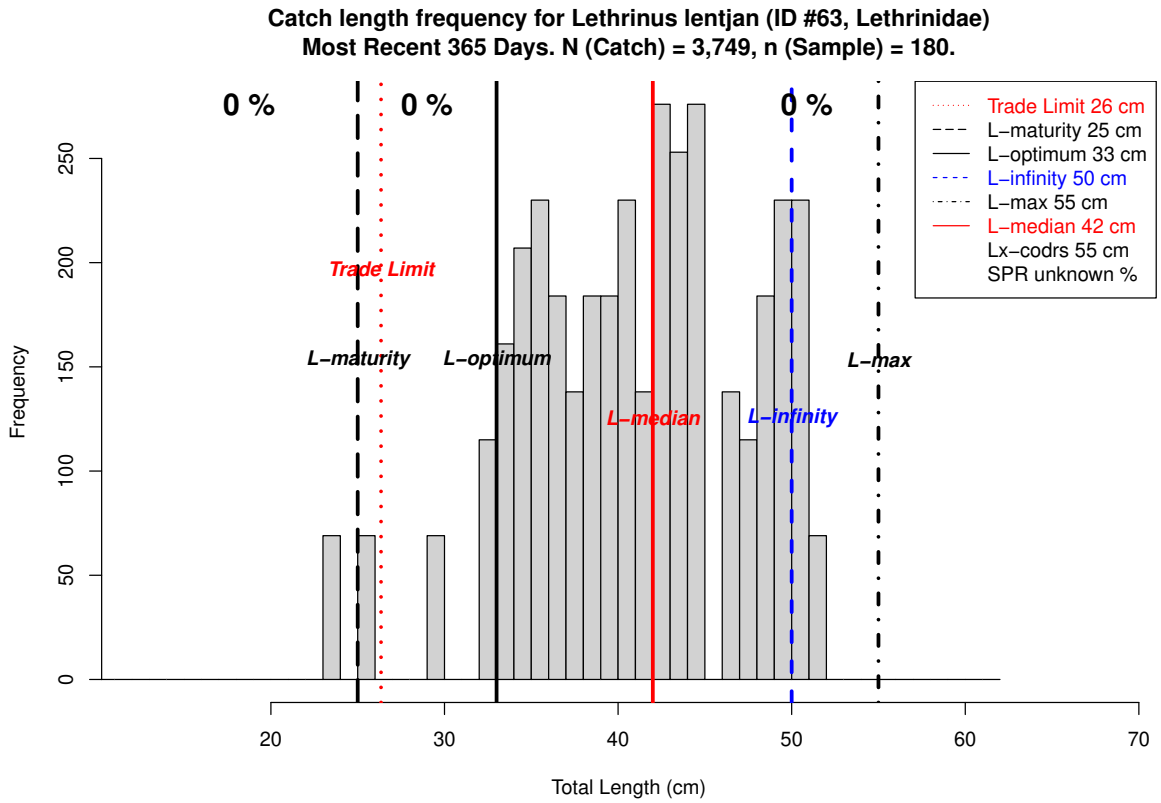
Trends in relative abundance by size group for *Rachycentron canadum* (ID #98, Rachycentridae), as calculated from linear regressions. The P value indicates the chance that this calculated trend is merely a result of stochastic variance.

% Immature trend not available.

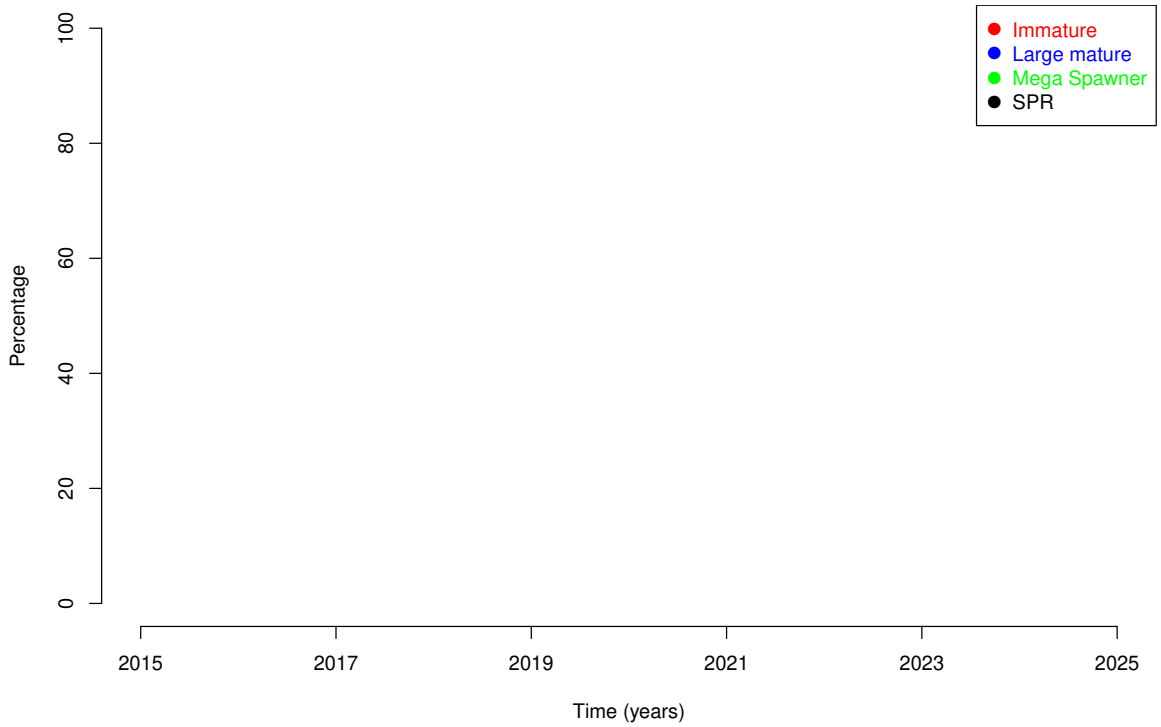
% Large Mature trend not available.

% Mega Spawner trend not available.

% SPR trend not available.



**Trends in relative abundance by size group for *Lethrinus lentjan* (ID #63, Lethrinidae)**





The percentages of *Lethrinus lentjan* (ID #63, Lethrinidae) in most recent 365 days.  
N (Catch) =3,749, n (Sample) = 180  
Immature (< 25cm): 0%  
Small mature (>= 25cm, < 33cm): 0%  
Large mature (>= 33cm): 0%  
Mega spawner (>= 36.3cm): 0% (subset of large mature fish)

The trade limit is about the same as the length at first maturity. This means that the trade puts a premium on fish that have spawned at least once, which improves sustainability of the fishery. Risk level is medium.

The majority of the fish in the catch have not had a chance to reproduce before capture. This fishery is most likely overfished already if fishing mortality is high for all size classes in the population. An immediate shift away from targeting juvenile fish and a reduction in overall fishing pressure is essential to prevent collapse of the stock. Risk level is high.

The vast majority of the fish in the catch have not yet achieved their growth potential. The harvest of small fish promotes growth overfishing and the size distribution for this species indicates that over exploitation through growth overfishing may already be happening. Risk level is high.

Less than 20% of the catch comprises of mega spawners. This indicates that the population may be severely affected by the fishery, and that there is a substantial risk of recruitment overfishing through over harvesting of the mega spawners, unless large numbers of mega spawners would be surviving at other habitats. There is no reason to assume that this is the case and therefore a reduction of fishing effort may be necessary in this fishery. Risk level is high.

SPR is less than 25%. The fishery probably over-exploits the stock, and there is a substantial risk that the fishery will cause severe decline of the stock if fishing effort is not reduced. Risk level is high.

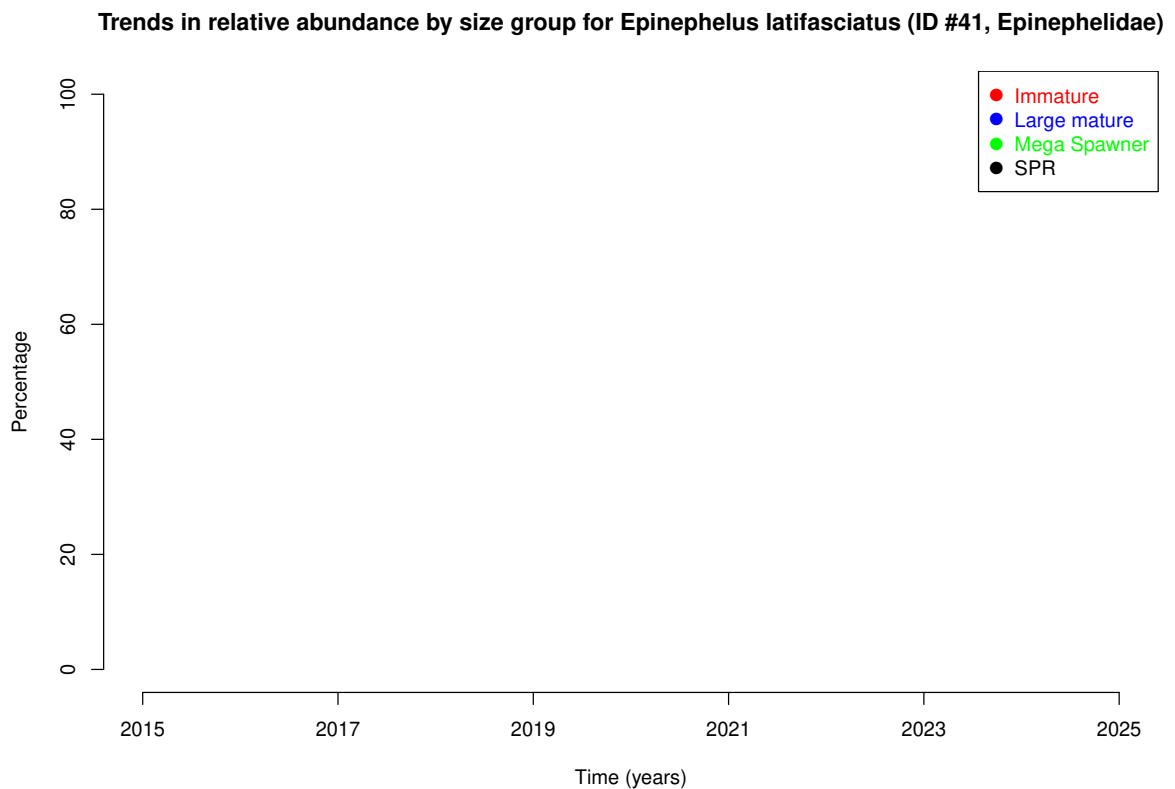
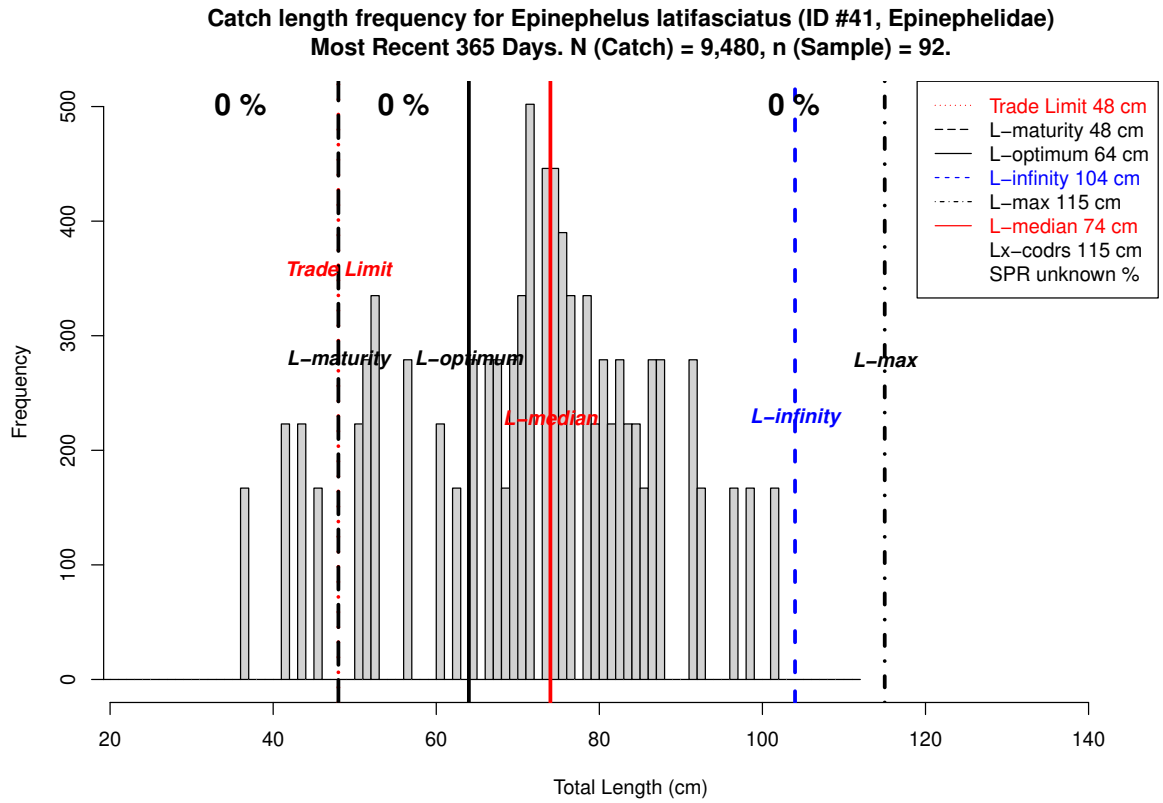
Trends in relative abundance by size group for *Lethrinus lentjan* (ID #63, Lethrinidae), as calculated from linear regressions. The P value indicates the chance that this calculated trend is merely a result of stochastic variance.

% Immature trend not available.

% Large Mature trend not available.

% Mega Spawner trend not available.

% SPR trend not available.



The percentages of *Epinephelus latifasciatus* (ID #41, Epinephelidae) in most recent 365 days.

N (Catch) =9,480, n (Sample) = 92

Immature (< 48cm): 0%

Small mature (>= 48cm, < 64cm): 0%

Large mature (>= 64cm): 0%

Mega spawner (>= 70.4cm): 0% (subset of large mature fish)

The trade limit is about the same as the length at first maturity. This means that the trade puts a premium on fish that have spawned at least once, which improves sustainability of the fishery. Risk level is medium.

The majority of the fish in the catch have not had a chance to reproduce before capture. This fishery is most likely overfished already if fishing mortality is high for all size classes in the population. An immediate shift away from targeting juvenile fish and a reduction in overall fishing pressure is essential to prevent collapse of the stock. Risk level is high.

The vast majority of the fish in the catch have not yet achieved their growth potential. The harvest of small fish promotes growth overfishing and the size distribution for this species indicates that over exploitation through growth overfishing may already be happening. Risk level is high.

Less than 20% of the catch comprises of mega spawners. This indicates that the population may be severely affected by the fishery, and that there is a substantial risk of recruitment overfishing through over harvesting of the mega spawners, unless large numbers of mega spawners would be surviving at other habitats. There is no reason to assume that this is the case and therefore a reduction of fishing effort may be necessary in this fishery. Risk level is high.

SPR is less than 25%. The fishery probably over-exploits the stock, and there is a substantial risk that the fishery will cause severe decline of the stock if fishing effort is not reduced. Risk level is high.

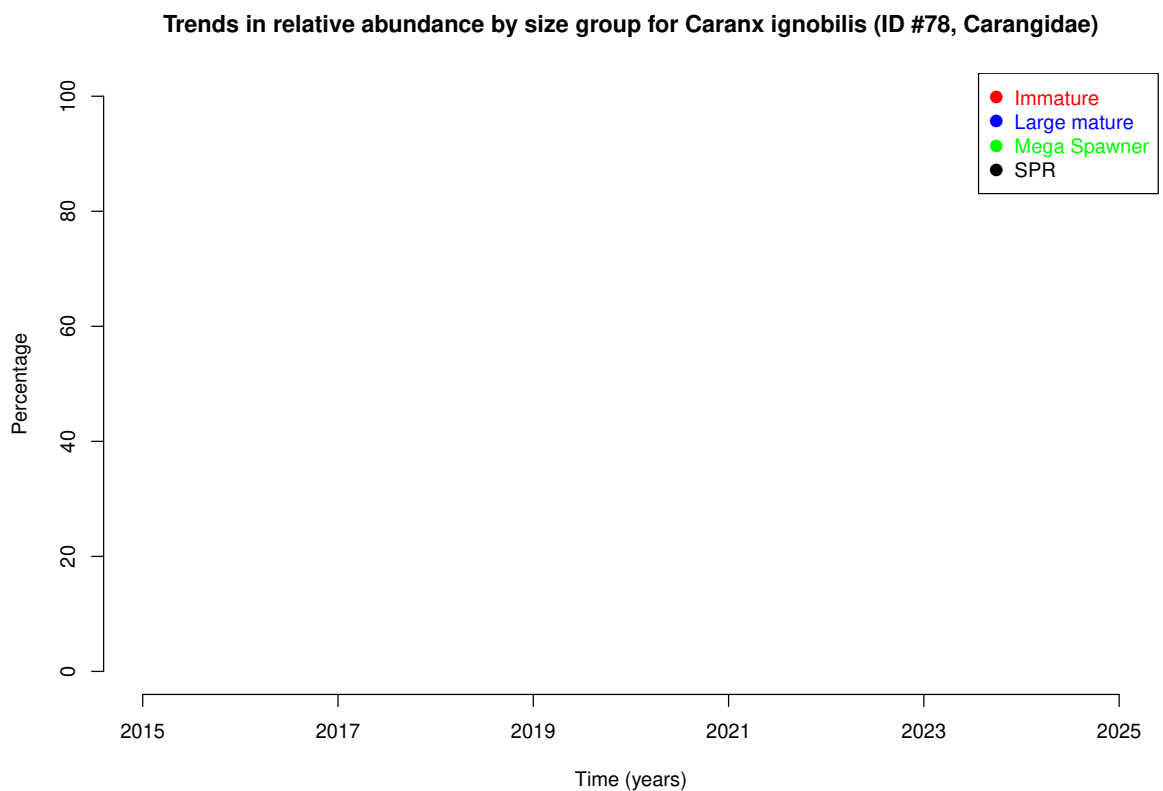
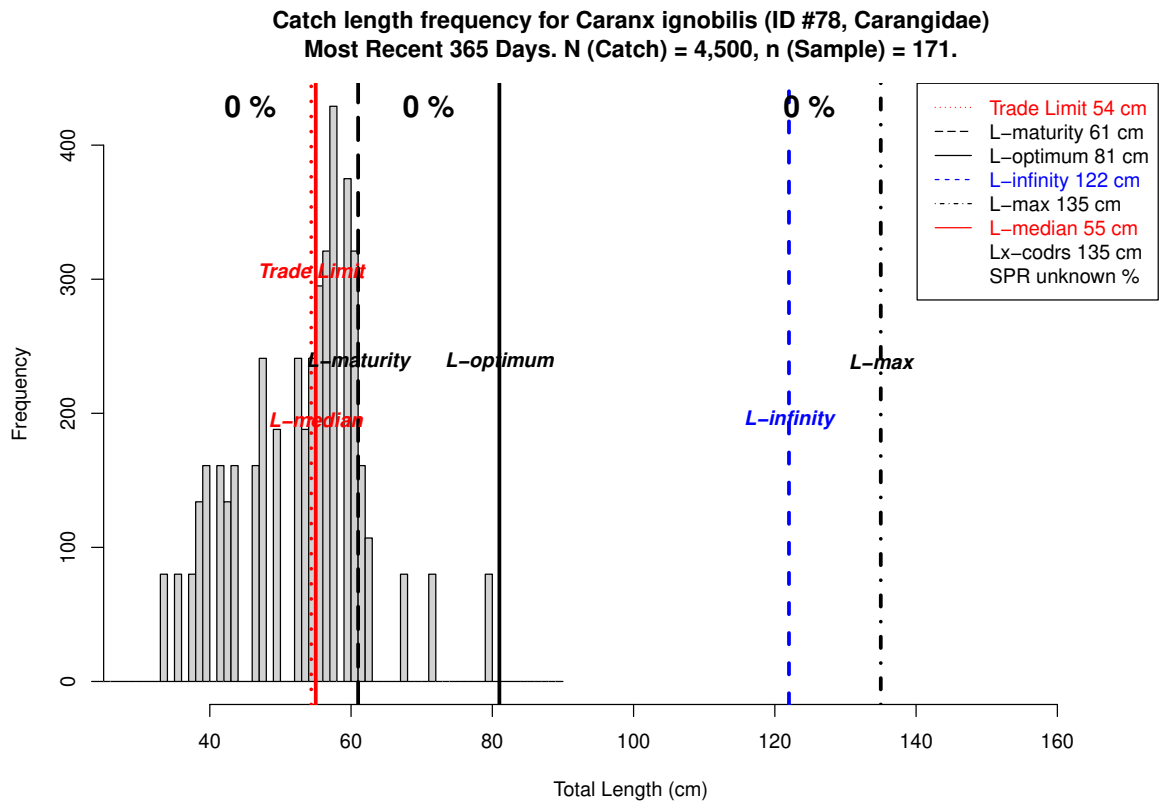
Trends in relative abundance by size group for *Epinephelus latifasciatus* (ID #41, Epinephelidae), as calculated from linear regressions. The P value indicates the chance that this calculated trend is merely a result of stochastic variance.

% Immature trend not available.

% Large Mature trend not available.

% Mega Spawner trend not available.

% SPR trend not available.



The percentages of *Caranx ignobilis* (ID #78, Carangidae) in most recent 365 days.  
N (Catch) = 4,500, n (Sample) = 171  
Immature (< 61cm): 0%  
Small mature (>= 61cm, < 81cm): 0%  
Large mature (>= 81cm): 0%  
Mega spawner (>= 89.1cm): 0% (subset of large mature fish)

The trade limit is about the same as the length at first maturity. This means that the trade puts a premium on fish that have spawned at least once, which improves sustainability of the fishery. Risk level is medium.

The majority of the fish in the catch have not had a chance to reproduce before capture. This fishery is most likely overfished already if fishing mortality is high for all size classes in the population. An immediate shift away from targeting juvenile fish and a reduction in overall fishing pressure is essential to prevent collapse of the stock. Risk level is high.

The vast majority of the fish in the catch have not yet achieved their growth potential. The harvest of small fish promotes growth overfishing and the size distribution for this species indicates that over exploitation through growth overfishing may already be happening. Risk level is high.

Less than 20% of the catch comprises of mega spawners. This indicates that the population may be severely affected by the fishery, and that there is a substantial risk of recruitment overfishing through over harvesting of the mega spawners, unless large numbers of mega spawners would be surviving at other habitats. There is no reason to assume that this is the case and therefore a reduction of fishing effort may be necessary in this fishery. Risk level is high.

SPR is less than 25%. The fishery probably over-exploits the stock, and there is a substantial risk that the fishery will cause severe decline of the stock if fishing effort is not reduced. Risk level is high.

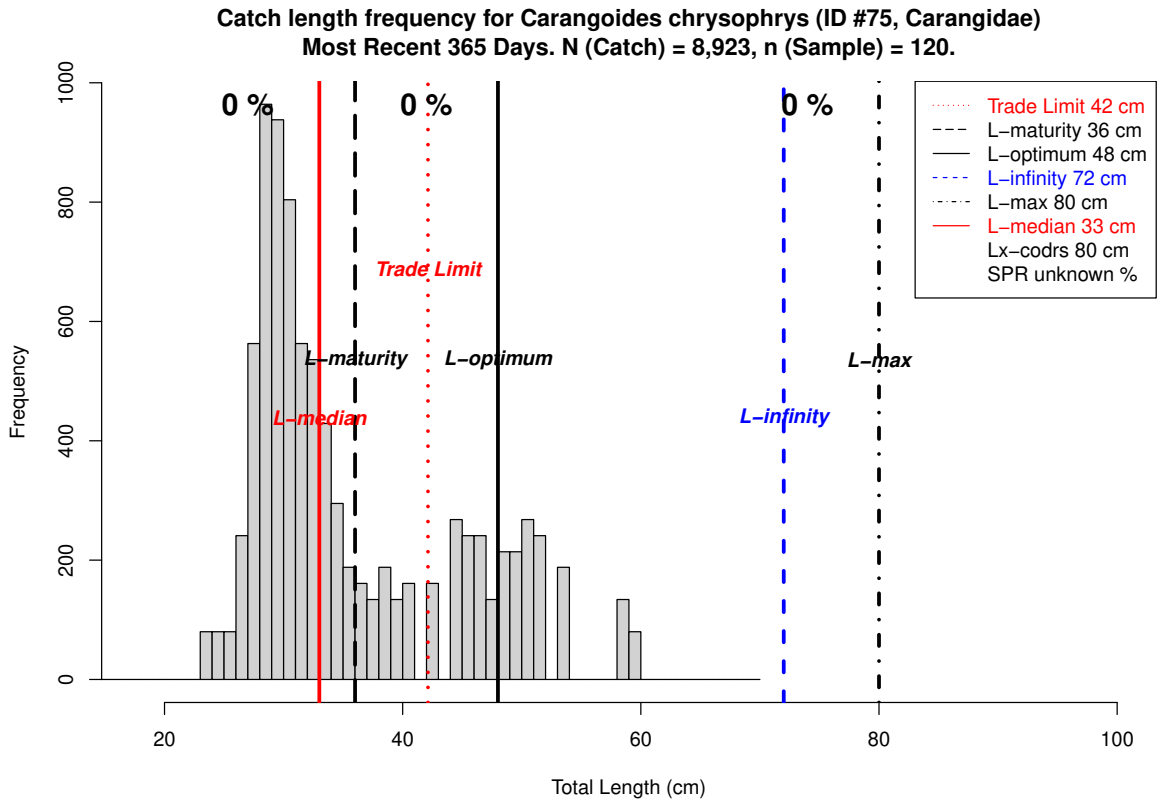
Trends in relative abundance by size group for *Caranx ignobilis* (ID #78, Carangidae), as calculated from linear regressions. The P value indicates the chance that this calculated trend is merely a result of stochastic variance.

% Immature trend not available.

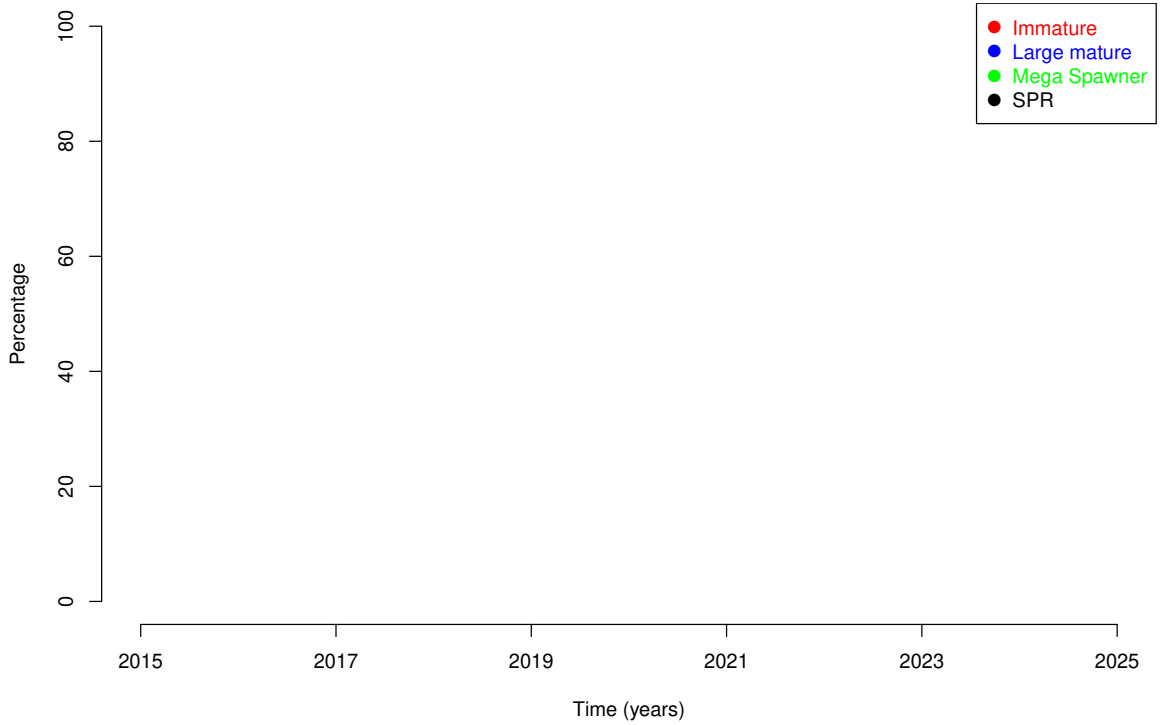
% Large Mature trend not available.

% Mega Spawner trend not available.

% SPR trend not available.



**Trends in relative abundance by size group for *Carangoides chrysophrys* (ID #75, Carangidae)**



The percentages of *Carangoides chrysophrys* (ID #75, Carangidae) in most recent 365 days.  
N (Catch) = 8,923, n (Sample) = 120  
Immature (< 36cm): 0%  
Small mature (>= 36cm, < 48cm): 0%  
Large mature (>= 48cm): 0%  
Mega spawner (>= 52.8cm): 0% (subset of large mature fish)

The trade limit is about the same as the length at first maturity. This means that the trade puts a premium on fish that have spawned at least once, which improves sustainability of the fishery. Risk level is medium.

The majority of the fish in the catch have not had a chance to reproduce before capture. This fishery is most likely overfished already if fishing mortality is high for all size classes in the population. An immediate shift away from targeting juvenile fish and a reduction in overall fishing pressure is essential to prevent collapse of the stock. Risk level is high.

The vast majority of the fish in the catch have not yet achieved their growth potential. The harvest of small fish promotes growth overfishing and the size distribution for this species indicates that over exploitation through growth overfishing may already be happening. Risk level is high.

Less than 20% of the catch comprises of mega spawners. This indicates that the population may be severely affected by the fishery, and that there is a substantial risk of recruitment overfishing through over harvesting of the mega spawners, unless large numbers of mega spawners would be surviving at other habitats. There is no reason to assume that this is the case and therefore a reduction of fishing effort may be necessary in this fishery. Risk level is high.

SPR is less than 25%. The fishery probably over-exploits the stock, and there is a substantial risk that the fishery will cause severe decline of the stock if fishing effort is not reduced. Risk level is high.

Trends in relative abundance by size group for *Carangoides chrysophrys* (ID #75, Carangidae), as calculated from linear regressions. The P value indicates the chance that this calculated trend is merely a result of stochastic variance.

% Immature trend not available.

% Large Mature trend not available.

% Mega Spawner trend not available.

% SPR trend not available.

Table 4.1: Values of indicators over the most recent 365 days in length-based assessments for the top 50 most abundant species by total CODRS samples in WPP 571.

| Rank | #ID | Species                          | Trade Limit<br>Prop. Lmat | Immature<br>% | Exploitation<br>% | Mega Spawn<br>% | SPR<br>% |
|------|-----|----------------------------------|---------------------------|---------------|-------------------|-----------------|----------|
| 1    | 50  | <i>Epinephelus coioides</i>      | 0.96                      | 24            | 80                | 11              | 18       |
| 2    | 45  | <i>Epinephelus areolatus</i>     | 1.31                      | 2             | 35                | 50              | 42       |
| 3    | 46  | <i>Epinephelus bleekeri</i>      | 0.85                      | 11            | 58                | 27              | 37       |
| 4    | 27  | <i>Lutjanus vitta</i>            | 1.20                      | 7             | 96                | 1               | 0        |
| 5    | 7   | <i>Pristipomoides multidens</i>  | 0.73                      | 17            | 66                | 15              | 32       |
| 6    | 80  | <i>Caranx sexfasciatus</i>       | 1.24                      | 10            | 47                | 38              | 73       |
| 7    | 39  | <i>Cephalopholis sonnerati</i>   | 1.03                      | 1             | 14                | 71              | 69       |
| 8    | 17  | <i>Lutjanus malabaricus</i>      | 0.66                      | 36            | 94                | 0               | 1        |
| 9    | 24  | <i>Lutjanus johnii</i>           | 0.59                      | 27            | 94                | 1               | 4        |
| 10   | 91  | <i>Pomadasys kaakan</i>          | 0.92                      | 2             | 56                | 26              | 21       |
| 12   | 23  | Pinjalo pinjalo                  |                           | unknown       | unknown           | unknown         | unknown  |
| 13   | 55  | <i>Epinephelus epistictus</i>    | 1.34                      | 3             | 21                | 73              | near 100 |
| 14   | 98  | <i>Rachycentron canadum</i>      | 0.96                      | 61            | 97                | 0               | 3        |
| 15   | 63  | <i>Lethrinus lentjan</i>         |                           | unknown       | unknown           | unknown         | unknown  |
| 16   | 41  | <i>Epinephelus latifasciatus</i> |                           | unknown       | unknown           | unknown         | unknown  |
| 17   | 78  | <i>Caranx ignobilis</i>          |                           | unknown       | unknown           | unknown         | unknown  |
| 19   | 75  | <i>Carangoides chrysophrys</i>   |                           | unknown       | unknown           | unknown         | unknown  |



Table 4.2: Risk levels in the fisheries over the most recent 365 days  
 for the top 50 most abundant species by total CODRS samples in WPP 571.

| Rank | #ID | Species                   | Trade Limit | Immature | Exploitation | Mega Spawn | SPR     |
|------|-----|---------------------------|-------------|----------|--------------|------------|---------|
| 1    | 50  | Epinephelus coioides      | medium      | medium   | high         | high       | high    |
| 2    | 45  | Epinephelus areolatus     | low         | low      | low          | low        | low     |
| 3    | 46  | Epinephelus bleekeri      | high        | medium   | medium       | medium     | medium  |
| 4    | 27  | Lutjanus vitta            | low         | low      | high         | high       | high    |
| 5    | 7   | Pristipomoides multidens  | high        | medium   | high         | high       | medium  |
| 6    | 80  | Caranx sexfasciatus       | low         | low      | low          | low        | low     |
| 7    | 39  | Cephalopholis sonnerati   | medium      | low      | low          | low        | low     |
| 8    | 17  | Lutjanus malabaricus      | high        | high     | high         | high       | high    |
| 9    | 24  | Lutjanus johnii           | high        | medium   | high         | high       | high    |
| 10   | 91  | Pomadourys kaakan         | medium      | low      | medium       | medium     | high    |
| 12   | 23  | Pinjalo pinjalo           | unknown     | unknown  | unknown      | unknown    | unknown |
| 13   | 55  | Epinephelus epistictus    | low         | low      | low          | low        | low     |
| 14   | 98  | Rachycentron canadum      | medium      | high     | high         | high       | high    |
| 15   | 63  | Lethrinus lentjan         | unknown     | unknown  | unknown      | unknown    | unknown |
| 16   | 41  | Epinephelus latifasciatus | unknown     | unknown  | unknown      | unknown    | unknown |
| 17   | 78  | Caranx ignobilis          | unknown     | unknown  | unknown      | unknown    | unknown |
| 19   | 75  | Carangoides chrysophrys   | unknown     | unknown  | unknown      | unknown    | unknown |

Table 4.3: Trends during recent years for SPR and relative abundance by size group for the top 50 most abundant species by total CODRS samples in WPP 571.

| Rank | #ID | Species                    | % Immature | % Large Mature | % Mega Spawner | % SPR   |
|------|-----|----------------------------|------------|----------------|----------------|---------|
| 1    | 50  | Epinephelus coioides       | unknown    | unknown        | unknown        | unknown |
| 2    | 45  | Epinephelus areolatus      | unknown    | unknown        | unknown        | unknown |
| 3    | 46  | Epinephelus bleekeri       | unknown    | unknown        | unknown        | unknown |
| 4    | 27  | Lutjanus vitta             | unknown    | unknown        | unknown        | unknown |
| 5    | 7   | Pristipomoides multidentis | unknown    | unknown        | unknown        | unknown |
| 6    | 80  | Caranx sexfasciatus        | unknown    | unknown        | unknown        | unknown |
| 7    | 39  | Cephalopholis sonnerati    | unknown    | unknown        | unknown        | unknown |
| 8    | 17  | Lutjanus malabaricus       | unknown    | unknown        | unknown        | unknown |
| 9    | 24  | Lutjanus johnii            | unknown    | unknown        | unknown        | unknown |
| 10   | 91  | Pomadasys kaakan           | unknown    | unknown        | unknown        | unknown |
| 12   | 23  | Pinjalo pinjalo            | unknown    | unknown        | unknown        | unknown |
| 13   | 55  | Epinephelus epistictus     | unknown    | unknown        | unknown        | unknown |
| 14   | 98  | Rachycentron canadum       | unknown    | unknown        | unknown        | unknown |
| 15   | 63  | Lethrinus lentjan          | unknown    | unknown        | unknown        | unknown |
| 16   | 41  | Epinephelus latifasciatus  | unknown    | unknown        | unknown        | unknown |
| 17   | 78  | Caranx ignobilis           | unknown    | unknown        | unknown        | unknown |
| 19   | 75  | Carangoides chrysophrys    | unknown    | unknown        | unknown        | unknown |

## 5 Discussion and conclusions

Fishing with traps and bottom long lines for snappers, groupers, emperors and grunts in WPP 571 occurs on shelf areas throughout the Malacca Strait. Preferred trap and bottom long line fishing grounds have a relatively flat bottom profile at depths ranging from 50 to 150 meters. Drop line fishing for the same general species spectrum occurs around deep reefs in the Malacca Strait, and on the slopes dropping into the southern Andaman Sea, mainly at depths between 50 and 350 meters. Snappers, groupers, emperors and grunts in WPP 571 are also targeted with deep set bottom gillnets, but mostly in “mixed gear” fisheries, which operate traps, simultaneously with hook and line gear.

The deep water trap and hook and line fisheries for snappers, groupers and emperors are fairly clean fisheries when it comes to the species spectrum in the catch, even though they are much more species-rich than is sometimes assumed, also within the snapper category. There is some by-catch of small sharks, cobia, trevallies and other species (Table 5.7 and 5.8), which are not discarded but also sold, into separate supply lines. The catch of snappers, groupers and emperors usually goes to traders supplying middle and higher end local and export markets for those specific species groups.

Drop line fisheries are characterized by a very low impact on habitat at the fishing grounds, whereas some more (but still limited) impact from entanglement can be expected from traps and bottom long lines. No major impact is evident from either one of the two demersal hook and line fisheries, certainly nothing near what is caused for example by destructive dragging gear. However, due to limited available habitat (fishing grounds) and predictable locations of fish concentrations, combined with a very high fishing effort on the best known fishing grounds, as well as the targeting of juveniles, there is a very high potential for overfishing in the demersal fisheries for snappers groupers and emperors.

Risks of overfishing is high for all the larger snappers which are commonly targeted in WPP 571 (Table 4.1 and Table 4.2), and SPR is dangerously low (Table 5.1) especially for those species which complete their life cycle in the habitats covered by the fishing grounds and which at the same time are easily caught with drop line and bottom long line gears. Snapper feeding aggregations are at predictable and well known locations and the snappers are therefore among the most vulnerable species in these fisheries. Fishing mortality (from deep slope hook and line fisheries combined with trap and gillnet fisheries) for all major target snapper species seems to be unacceptably high while the catches of these species include large percentages of relatively small and immature specimen. For many species of snappers, sizes are consistently targeted and landed well below the size where these fish reach maturity. Large specimen of the major target species are already becoming extremely rare on the main fishing grounds.

Fishing effort and fishing mortality have been far too high in recent years in WPP 571 and the situation is currently not improving. Time trends for the top 10 snapper species (ranked by abundance) show continued decline of the stocks, judging from trends in size based indicators (Table 4.3). Those trends in length based indicators can also be compared with trends in CpUE by gear types and boat size category (Tables 5.2 to 5.6), although fishing at aggregating sites (including bottom FADs) may be masking the direct effect on CpUE. We do see that for many fleet segments the CpUE is lower in WPP 571 than in some of the Eastern fisheries management areas, which may be part of the reason that many long line vessels from Sumatra fish all the way in the East.

Overall we are currently looking mainly at a high risk of overfishing for all major snapper species in WPP 571, combined with a worrisome trend of deterioration in these snapper stocks, based on the size based stock assessments from the bottom long line fisheries. Interestingly though, the groupers seem to be less vulnerable to the deep slope hook and line fisheries than the snappers are. Impact by the deep slope drop line and long line fisheries on grouper populations is limited compared to the snappers. This may be because most groupers are staying closer to high rugosity bottom habitat, which is avoided by long line vessels due to risk of entanglement, while drop line fishers are targeting schooling snappers that are hovering higher in the water column, above the grouper habitat.

Fishing mortality (from deep demersal fisheries) in large mature groupers seems to be considerably lower than what we see for the snappers. Groupers generally mature as females at a size relative to their maximum size which is lower than for snappers. This strategy enables them to reproduce before they are being caught, although fecundity is still relatively low at sizes below the optimum length. Fecundity for the population as a whole peaks at the optimum size for each species, and this is also the size around which sex change from females to males happens in groupers. Separate analysis of all grouper data shows that most groupers have already reached or passed their optimum size (and the size where sex change takes place) when they are caught by the deep slope hook and line fisheries.

For those grouper species which spend all or most of their life cycle in deep water habitats, the relatively low vulnerability to the deep slope hook and line fisheries is very good news. For other grouper species which spend major parts of their life cycle in shallower habitats, like coral reefs or mangroves or estuaries for example, the reality is that their populations in general are in extremely bad shape due to excessive fishing pressure by small scale fisheries in those shallower habitats. This situation is also evident for a few snapper species such as for example the mangrove jack.

Overall there is a clear scope for some straightforward fisheries improvements supported by relatively uncomplicated fisheries management policies and regulations. Our first recommendation for industry-led fisheries improvements is for traders to adjust trading limits (incentives to fishers) species by species (which they are basically doing already) to the length at maturity for each species. For a number of important species the trade limits need adjustments upwards, with government support through regulations on minimum allowable sizes. Many of the deep water snappers are traded at sizes that are too small, and this impairs sustainability. The impact is clearly visible already in landed catches.

Adjustment upwards of trading limits towards the size at first maturity would be a straightforward improvement in these fisheries. By refusing undersized fish in high value supply lines, the market can provide incentives for captains of fishing boats to target larger specimen. The captains can certainly do this by using their day to day experiences, selecting locations, fishing depths, habitat types, hook sizes, etc. Literature data shows habitat separation between size groups in many species, as well as size selectivity of specific hook sizes. Captains know about this from experience.

Besides size selectivity, fishing effort is a very important factor in resulting overall catch and size frequency of the catch. All major target snappers show a rapid decline in numbers above the size where the species becomes most vulnerable to the fisheries. This

rapid decline in numbers, as visible in the LFD graphs, indicates a high fishing mortality for the vulnerable size classes. Fishing effort is probably too high to be sustainable and many species seem to be at risk in the deep drop and long line fisheries, judging from a number of indicators as presented in this report. At present these fisheries show clear signs of over-exploitation in WPP 571.

One urgently needed fisheries management intervention is to cap fishing effort (number of boats) at current level and to start looking at incentives for effort reductions. A reduction of effort will need to be supported and implemented by government to ensure an even playing field among fishing companies. An improved licensing system and an effort control system based on the Indonesia's mandatory Vessel Monitoring System, using more accurate data on Gross Tonnage for all fishing boats, could be used to better manage fishing effort. Continuous monitoring of trends in the various presented indicators will show in which direction these fisheries are heading and what the effects are of any fisheries management measures in future years.

Government policies and regulations are needed and can be formulated to support fishers and traders with the implementation of improvements across the sector. Our recommendations for supporting government policies in relation to the snapper fisheries include:

- Use scientific (Latin) fish names in fisheries management and in trade.
- Incorporate length-based assessments in management of specific fisheries.
- Develop species-specific length based regulations for these fisheries.
- Implement a controlled access management system for regulation of fishing effort on specific fishing grounds.
- Increase public awareness on unknown species and preferred size classes by species.
- Incorporate traceability systems in fleet management by fisheries and by fishing ground.

Recommendations for specific regulations may include:

- Make mandatory correct display of scientific name (correct labeling) of all traded fish (besides market name).
- Adopt legal minimum sizes for specific or even all traded species, at the length at maturity for each species.
- Make mandatory for each fishing vessel of all sizes to carry a simple GPS tracking device that needs to be functioning at all times. Indonesia already has a mandatory Vessel Monitoring System for vessels larger than 30 GT, so Indonesia could consider expanding this requirement to fishing vessels of smaller sizes.
- Cap fishing effort in the snapper fisheries at the current level and explore options to reduce effort to more sustainable levels.

Table 5.1: SPR values over the period 2016 to 2024 for the top 20 most abundant species in CODRS samples in WPP 571, based on total catch LFD analysis, for all gear types combined and adjusted for relative effort by gear type.

| Rank | Species                          | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 |
|------|----------------------------------|------|------|------|------|------|------|------|------|------|
| 1    | <i>Epinephelus coioides</i>      | NA   | NA   | NA   | 24   | 19   | NA   | NA   | NA   | NA   |
| 2    | <i>Epinephelus areolatus</i>     | NA   | NA   | NA   | 67   | 38   | NA   | NA   | NA   | NA   |
| 3    | <i>Epinephelus bleekeri</i>      | NA   | NA   | NA   | 32   | 37   | NA   | NA   | NA   | NA   |
| 4    | <i>Lutjanus vitta</i>            | NA   | NA   | NA   | 1    | 0    | NA   | NA   | NA   | NA   |
| 5    | <i>Pristipomoides multidens</i>  | NA   | NA   | NA   | 30   | 32   | NA   | NA   | NA   | NA   |
| 6    | <i>Caranx sexfasciatus</i>       | NA   | NA   | NA   | 29   | 52   | NA   | NA   | NA   | NA   |
| 7    | <i>Cephalopholis sonnerati</i>   | NA   | NA   | NA   | 85   | 82   | NA   | NA   | NA   | NA   |
| 8    | <i>Lutjanus malabaricus</i>      | NA   | NA   | NA   | 0    | NA   | NA   | NA   | NA   | NA   |
| 9    | <i>Lutjanus johnii</i>           | NA   | NA   | NA   | 5    | 5    | NA   | NA   | NA   | NA   |
| 10   | <i>Pomadasys kaakan</i>          | NA   | NA   | NA   | NA   | 21   | NA   | NA   | NA   | NA   |
| 11   | <i>Lutjanus russelli</i>         | NA   | NA   | NA   | NA   | NA   | NA   | NA   | NA   | NA   |
| 12   | <i>Pinjalo pinjalo</i>           | NA   | NA   | NA   | 1    | NA   | NA   | NA   | NA   | NA   |
| 13   | <i>Epinephelus epistictus</i>    | NA   | NA   | NA   | NA   | NA   | NA   | NA   | NA   | NA   |
| 14   | <i>Rachycentron canadum</i>      | NA   | NA   | NA   | NA   | NA   | NA   | NA   | NA   | NA   |
| 15   | <i>Lethrinus lentjan</i>         | NA   | NA   | NA   | NA   | NA   | NA   | NA   | NA   | NA   |
| 16   | <i>Epinephelus latifasciatus</i> | NA   | NA   | NA   | NA   | NA   | NA   | NA   | NA   | NA   |
| 17   | <i>Caranx ignobilis</i>          | NA   | NA   | NA   | NA   | NA   | NA   | NA   | NA   | NA   |
| 18   | <i>Lutjanus argentimaculatus</i> | NA   | NA   | NA   | NA   | NA   | NA   | NA   | NA   | NA   |
| 19   | <i>Carangoides chrysophrys</i>   | NA   | NA   | NA   | NA   | NA   | NA   | NA   | NA   | NA   |
| 20   | <i>Pristipomoides typus</i>      | NA   | NA   | NA   | NA   | NA   | NA   | NA   | NA   | NA   |

Table 5.2: CpUE (kg/GT/day) trends by fleet segment for *Epinephelus coioides* in WPP 571

| CpUE            | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 |
|-----------------|------|------|------|------|------|------|------|------|------|
| Nano Dropline   | NA   | NA   | NA   | 3.1  | 4.3  | NA   | NA   | NA   | NA   |
| Nano Longline   | NA   | NA   | NA   | 6.6  | 5.3  | NA   | NA   | NA   | NA   |
| Small Dropline  | NA   | NA   | NA   | NA   | NA   | NA   | NA   | NA   | NA   |
| Small Longline  | NA   | NA   | NA   | 6.6  | 0.9  | NA   | NA   | NA   | NA   |
| Medium Dropline | NA   | NA   | NA   | NA   | NA   | NA   | NA   | NA   | NA   |
| Medium Longline | NA   | NA   | NA   | NA   | NA   | NA   | NA   | NA   | NA   |
| Large Dropline  | NA   | NA   | NA   | NA   | NA   | NA   | NA   | NA   | NA   |
| Large Longline  | NA   | NA   | NA   | NA   | NA   | NA   | NA   | NA   | NA   |

Table 5.3: CpUE (kg/GT/day) trends by fleet segment for *Pristipomoides multidens* in WPP 571

| CpUE            | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 |
|-----------------|------|------|------|------|------|------|------|------|------|
| Nano Dropline   | NA   | NA   | NA   | 0.4  | 6.1  | NA   | NA   | NA   | NA   |
| Nano Longline   | NA   | NA   | NA   | 2.3  | 2.6  | NA   | NA   | NA   | NA   |
| Small Dropline  | NA   | NA   | NA   | NA   | NA   | NA   | NA   | NA   | NA   |
| Small Longline  | NA   | NA   | NA   | 2.3  | 0.1  | NA   | NA   | NA   | NA   |
| Medium Dropline | NA   | NA   | NA   | NA   | NA   | NA   | NA   | NA   | NA   |
| Medium Longline | NA   | NA   | NA   | NA   | NA   | NA   | NA   | NA   | NA   |
| Large Dropline  | NA   | NA   | NA   | NA   | NA   | NA   | NA   | NA   | NA   |
| Large Longline  | NA   | NA   | NA   | NA   | NA   | NA   | NA   | NA   | NA   |

Table 5.4: CpUE (kg/GT/day) trends by fleet segment for *Epinephelus bleekeri* in WPP 571

| CpUE            | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 |
|-----------------|------|------|------|------|------|------|------|------|------|
| Nano Dropline   | NA   | NA   | NA   | 0.1  | 1.6  | NA   | NA   | NA   | NA   |
| Nano Longline   | NA   | NA   | NA   | 1.4  | 1.6  | NA   | NA   | NA   | NA   |
| Small Dropline  | NA   | NA   | NA   | NA   | NA   | NA   | NA   | NA   | NA   |
| Small Longline  | NA   | NA   | NA   | 1.4  | 0.0  | NA   | NA   | NA   | NA   |
| Medium Dropline | NA   | NA   | NA   | NA   | NA   | NA   | NA   | NA   | NA   |
| Medium Longline | NA   | NA   | NA   | NA   | NA   | NA   | NA   | NA   | NA   |
| Large Dropline  | NA   | NA   | NA   | NA   | NA   | NA   | NA   | NA   | NA   |
| Large Longline  | NA   | NA   | NA   | NA   | NA   | NA   | NA   | NA   | NA   |

Table 5.5: CpUE (kg/GT/day) trends by fleet segment for *Epinephelus areolatus* in WPP 571

| CpUE            | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 |
|-----------------|------|------|------|------|------|------|------|------|------|
| Nano Dropline   | NA   | NA   | NA   | 0.5  | 0.6  | NA   | NA   | NA   | NA   |
| Nano Longline   | NA   | NA   | NA   | 0.6  | 1.0  | NA   | NA   | NA   | NA   |
| Small Dropline  | NA   | NA   | NA   | NA   | NA   | NA   | NA   | NA   | NA   |
| Small Longline  | NA   | NA   | NA   | 0.6  | 0.5  | NA   | NA   | NA   | NA   |
| Medium Dropline | NA   | NA   | NA   | NA   | NA   | NA   | NA   | NA   | NA   |
| Medium Longline | NA   | NA   | NA   | NA   | NA   | NA   | NA   | NA   | NA   |
| Large Dropline  | NA   | NA   | NA   | NA   | NA   | NA   | NA   | NA   | NA   |
| Large Longline  | NA   | NA   | NA   | NA   | NA   | NA   | NA   | NA   | NA   |

Table 5.6: CpUE (kg/GT/day) trends by fleet segment for all species in WPP 571

| CpUE            | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 |
|-----------------|------|------|------|------|------|------|------|------|------|
| Nano Dropline   | NA   | NA   | NA   | 44.5 | 19.6 | NA   | NA   | NA   | NA   |
| Nano Longline   | NA   | NA   | NA   | 13.7 | 13.7 | NA   | NA   | NA   | NA   |
| Small Dropline  | NA   | NA   | NA   | NA   | NA   | NA   | NA   | NA   | NA   |
| Small Longline  | NA   | NA   | NA   | 13.7 | 4.1  | NA   | NA   | NA   | NA   |
| Medium Dropline | NA   | NA   | NA   | NA   | NA   | NA   | NA   | NA   | NA   |
| Medium Longline | NA   | NA   | NA   | NA   | NA   | NA   | NA   | NA   | NA   |
| Large Dropline  | NA   | NA   | NA   | NA   | NA   | NA   | NA   | NA   | NA   |
| Large Longline  | NA   | NA   | NA   | NA   | NA   | NA   | NA   | NA   | NA   |

Table 5.7: Sample sizes over the period 2016 to 2024 for the others species in WPP 571 Dropline

| Family Name    | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | Total | %Catch |
|----------------|------|------|------|------|------|------|------|------|------|-------|--------|
| Ariidae        | 0    | 0    | 0    | 5    | 1    | 0    | 0    | 0    | 0    | 6     | 0.013  |
| Balistidae     | 0    | 0    | 0    | 5    | 0    | 0    | 0    | 0    | 0    | 5     | 0.011  |
| Caesionidae    | 0    | 0    | 0    | 4    | 3    | 0    | 0    | 0    | 0    | 7     | 0.015  |
| Carangidae     | 0    | 0    | 0    | 31   | 14   | 0    | 0    | 0    | 0    | 45    | 0.095  |
| Chaetodontidae | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0     | 0.000  |
| Clupeidae      | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0     | 0.000  |
| Coryphaenidae  | 0    | 0    | 0    | 0    | 22   | 0    | 0    | 0    | 0    | 22    | 0.047  |
| Dasyatidae     | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0     | 0.000  |
| Elopidae       | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0     | 0.000  |
| Ephippidae     | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0     | 0.000  |
| Epinephelidae  | 0    | 0    | 0    | 4    | 0    | 0    | 0    | 0    | 0    | 4     | 0.008  |
| Haemulidae     | 0    | 0    | 0    | 17   | 0    | 0    | 0    | 0    | 0    | 17    | 0.036  |
| Hemiramphidae  | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0     | 0.000  |
| Holocentridae  | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0     | 0.000  |
| Istiophoridae  | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0     | 0.000  |
| Labridae       | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0     | 0.000  |
| Lethrinidae    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0     | 0.000  |
| Lobotidae      | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0     | 0.000  |
| Lutjanidae     | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0     | 0.000  |
| Malacanthidae  | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0     | 0.000  |
| Mugilidae      | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0     | 0.000  |
| Mullidae       | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0     | 0.000  |
| Muraenesocidae | 0    | 0    | 0    | 2    | 0    | 0    | 0    | 0    | 0    | 2     | 0.004  |
| Nemipteridae   | 0    | 0    | 0    | 49   | 0    | 0    | 0    | 0    | 0    | 49    | 0.104  |
| Other          | 0    | 0    | 0    | 26   | 0    | 0    | 0    | 0    | 0    | 26    | 0.055  |
| Priacanthidae  | 0    | 0    | 0    | 11   | 0    | 0    | 0    | 0    | 0    | 11    | 0.023  |
| Rachycentridae | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0     | 0.000  |
| Rays           | 0    | 0    | 0    | 3    | 3    | 0    | 0    | 0    | 0    | 6     | 0.013  |
| Scaridae       | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0     | 0.000  |
| Scombridae     | 0    | 0    | 0    | 1    | 2    | 0    | 0    | 0    | 0    | 3     | 0.006  |
| Sharks         | 0    | 0    | 0    | 13   | 2    | 0    | 0    | 0    | 0    | 15    | 0.032  |
| Siganidae      | 0    | 0    | 0    | 14   | 0    | 0    | 0    | 0    | 0    | 14    | 0.030  |
| Sphyraenidae   | 0    | 0    | 0    | 2    | 0    | 0    | 0    | 0    | 0    | 2     | 0.004  |
| Terapontidae   | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0     | 0.000  |
| Tetraodontidae | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0     | 0.000  |
| Trichiuridae   | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0     | 0.000  |
| Total          | 0    | 0    | 0    | 187  | 47   | 0    | 0    | 0    | 0    | 234   | 0.495  |



Table 5.8: Sample sizes over the period 2016 to 2024 for the others species in WPP 571 Longline

| Family Name    | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | Total | %Catch |
|----------------|------|------|------|------|------|------|------|------|------|-------|--------|
| Ariidae        | 0    | 0    | 0    | 0    | 50   | 0    | 0    | 0    | 0    | 50    | 0.106  |
| Balistidae     | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0     | 0.000  |
| Caesionidae    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0     | 0.000  |
| Carangidae     | 0    | 0    | 0    | 0    | 4    | 0    | 0    | 0    | 0    | 4     | 0.008  |
| Chaetodontidae | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0     | 0.000  |
| Clupeidae      | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0     | 0.000  |
| Coryphaenidae  | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0     | 0.000  |
| Dasyatidae     | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0     | 0.000  |
| Elopidae       | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0     | 0.000  |
| Ephippidae     | 0    | 0    | 0    | 0    | 1    | 0    | 0    | 0    | 0    | 1     | 0.002  |
| Epinephelidae  | 0    | 0    | 0    | 0    | 1    | 0    | 0    | 0    | 0    | 1     | 0.002  |
| Haemulidae     | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0     | 0.000  |
| Hemiramphidae  | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0     | 0.000  |
| Holocentridae  | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0     | 0.000  |
| Istiophoridae  | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0     | 0.000  |
| Labridae       | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0     | 0.000  |
| Lethrinidae    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0     | 0.000  |
| Lobotidae      | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0     | 0.000  |
| Lutjanidae     | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0     | 0.000  |
| Malacanthidae  | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0     | 0.000  |
| Mugilidae      | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0     | 0.000  |
| Mullidae       | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0     | 0.000  |
| Muraenesocidae | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0     | 0.000  |
| Nemipteridae   | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0     | 0.000  |
| Other          | 0    | 0    | 0    | 0    | 1    | 0    | 0    | 0    | 0    | 1     | 0.002  |
| Priacanthidae  | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0     | 0.000  |
| Rachycentridae | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0     | 0.000  |
| Rays           | 0    | 0    | 0    | 0    | 27   | 0    | 0    | 0    | 0    | 27    | 0.057  |
| Scaridae       | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0     | 0.000  |
| Scombridae     | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0     | 0.000  |
| Sharks         | 0    | 0    | 0    | 0    | 8    | 0    | 0    | 0    | 0    | 8     | 0.017  |
| Siganidae      | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0     | 0.000  |
| Sphyraenidae   | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0     | 0.000  |
| Terapontidae   | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0     | 0.000  |
| Tetraodontidae | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0     | 0.000  |
| Trichiuridae   | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0    | 0     | 0.000  |
| Total          | 0    | 0    | 0    | 0    | 92   | 0    | 0    | 0    | 0    | 92    | 0.195  |

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