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Length-Based Assessment of the Fisheries Targeting Snappers, Groupers and Emperors in Indonesia, Fishery Management Area 716

YKAN Technical Paper

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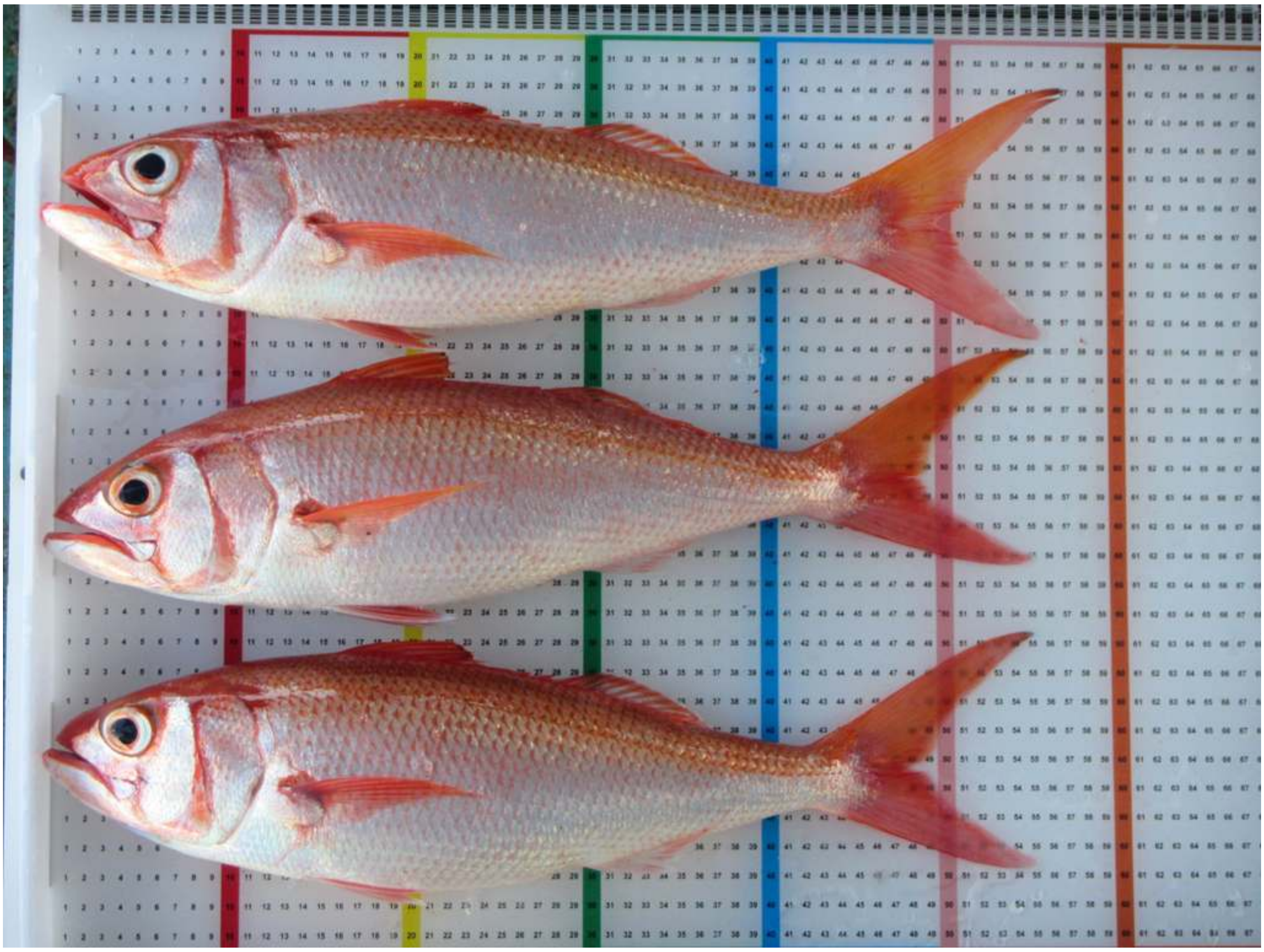

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Abstract

This document provides an overview of fleet characteristics and catch composition of the demersal fishery targeting snappers in Indonesia Fishery Management Area 716. It also presents trends in length-based stock health indicators of the top-20 species in this FMA. The report presents overfishing risk levels of the top 50 species, both in terms of current status and trend. Finally, the report presents a table with the contribution of other species to the total catch. The findings are based on YKAN's Crew-Operated Data Recording System, an initiative that involves fishers in data collection using digital imagery.

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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) 716, covering the southern part of the Celebes Sea, also referred to as the Sulawesi Sea, off East Kalimantan and North Sulawesi and the Southern part of the Philippine Sea in the western Pacific Ocean, between North Halmahera and the Southern Philippines (Figure 1.1). WPP 716 borders WPP 713 in the northern Makassar Strait, WPP 715 in the Molucca Sea, and WPP 717 in the western Pacific Ocean. WPP 716 has international boundaries with Philippines waters and territories to the north and Palauan waters and territories to the East.

The fishing grounds in WPP 716 (Figure 1.2) form a continuous habitat with the shelf area of the Makassar Strait, the northern Celebes Sea, the Maluku Sea, and the Halmahera Sea. Some fleet segments from the southern part of WPP 716 sometimes operate in the adjacent waters of WPP 713, WPP 715 and WPP 717, and vice versa. Fishing boats from East Kalimantan, North Sumatra and North Halmahera sometimes cross WPP boundaries into neighbouring WPPs occasionally also stray in to foreign waters.

The majority of fleets and vessels on the fishing grounds in WPP 716 originate from East Kalimantan, North Sulawesi and North Halmahera, and they generally fish at depths ranging from 50 meters on the shelf to 350 meters down the deeper slopes into the Celebes Sea and western Pacific Ocean. Drop lines, bottom long lines and traps are the most important gear types in the fisheries targeting snappers, groupers, emperors and grunts, but deep set bottom gillnets are also used. 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. Some boats in WPP 716 use multiple gear types, even within single trips, in "mixed gear" fisheries.

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 716, 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[1].

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[2].

[1] http://72.14.187.103:8080/ifish/pub/FishID.pdf
[2] http://72.14.187.103:8080/ifish/pub/IFishAssessmentGuide.pdf

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.

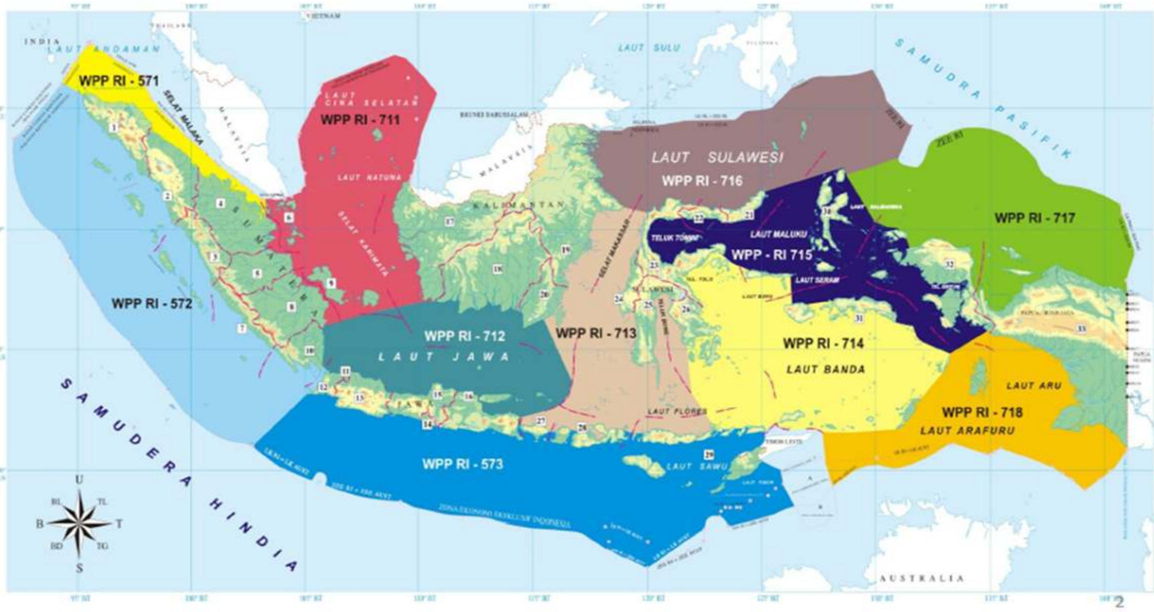


Figure 1.1: Fisheries Management Areas (*Wilayah Pengelolaan Perikanan* or WPP) in Indonesian marine waters.

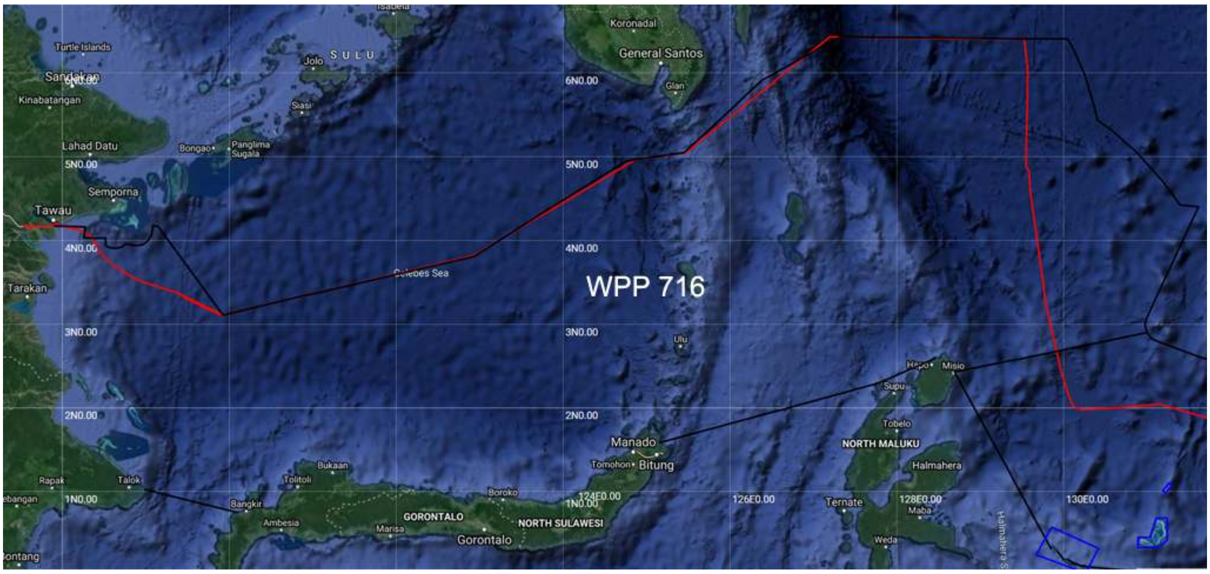


Figure 1.2: Bathymetric map of the WPP 716 including Celebes Sea, in Indonesia. Red lines are EEZ border, black lines are WPP border, blue lines are MPAs.

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 716

Rank	#ID	Species	Reported Trade Limit Weight (g)	$W = a L^b$ a	b	Length Type for a & b TL-FL-SL	Converted Trade Limit L(cm)	Plotted Trade Limit TL(cm)	Sample Sizes
1	17	Lutjanus malabaricus	500	0.009	3.137	FL	33.11	33.11	8954
2	24	Lutjanus johnii	300	0.020	2.907	FL	27.28	28.49	7834
3	50	Epinephelus coioides	1500	0.011	3.084	TL	46.94	46.94	4900
4	5	Etelis radiosus	1000	0.056	2.689	FL	38.05	43.15	2707
5	10	Pristipomoides sieboldii	300	0.022	2.942	FL	25.52	29.21	2359
6	63	Lethrinus lentjan	300	0.020	2.986	FL	25.16	26.35	2334
7	21	Lutjanus erythropterus	500	0.024	2.870	FL	31.79	31.79	1970
8	33	Paracaesio xanthura	300	0.023	3.000	SL	23.64	27.39	1860
9	20	Lutjanus gibbus	500	0.015	3.091	FL	28.87	31.09	1677
10	9	Pristipomoides filamentosus	500	0.038	2.796	FL	29.70	33.27	1676
11	90	Diagramma pictum	500	0.014	2.988	FL	33.08	36.71	1548
12	25	Lutjanus russelli	300	0.020	2.907	FL	27.28	28.49	1520
13	78	Caranx ignobilis	2000	0.027	2.913	FL	46.78	54.36	1332
14	28	Lutjanus boutton	300	0.034	3.000	FL	20.75	21.56	1304
15	62	Variola albimarginata	300	0.012	3.079	FL	26.68	30.44	1109
16	1	Aphareus rutilans	1000	0.015	2.961	FL	42.20	49.61	1106
17	27	Lutjanus vitta	300	0.017	2.978	FL	26.72	27.64	655
18	6	Etelis coruscans	500	0.041	2.758	FL	30.28	37.85	521
19	23	Pinjalo pinjalo	300	0.014	2.970	FL	28.42	31.16	519
20	91	Pomadasys kaakan	300	0.017	2.985	TL	26.57	26.57	498
21	34	Paracaesio kusakarii	500	0.011	3.135	FL	30.96	34.80	477
22	68	Lethrinus rubrioperculatus	300	0.013	3.108	FL	25.48	28.05	473
23	19	Lutjanus timorensis	500	0.009	3.137	FL	33.11	33.34	399
24	60	Plectropomus maculatus	500	0.016	3.000	FL	31.76	31.76	390
25	71	Gymnocranius griseus	500	0.032	2.885	FL	28.43	30.56	284
26	32	Paracaesio gonzalesi	300	0.020	3.050	FL	23.24	24.96	267
27	93	Sphyraena barracuda	1500	0.006	3.011	FL	61.48	69.47	247
28	38	Cephalopholis sexmaculata	300	0.027	3.000	SL	22.37	28.24	238
29	80	Caranx sexfasciatus	2000	0.032	2.930	FL	43.43	49.51	233
30	15	Lutjanus argentimaculatus	500	0.034	2.792	FL	31.22	31.78	228
31	85	Erythrocles schlegelii	1500	0.011	3.040	FL	48.55	53.60	217
32	82	Elagatis bipinnulata	1000	0.013	2.920	FL	46.53	55.37	197
33	7	Pristipomoides multidens	500	0.020	2.944	FL	31.18	34.92	163
34	46	Epinephelus bleekeri	300	0.009	3.126	TL	28.09	28.09	140
35	70	Gymnocranius grandoculis	500	0.032	2.885	FL	28.43	30.53	140
36	2	Aprion virescens	1000	0.023	2.886	FL	40.49	45.90	139
37	4	Etelis boweni	500	0.022	2.950	FL	30.16	32.84	137
38	84	Seriola rivoliana	2000	0.006	3.170	FL	54.23	60.03	135
39	45	Epinephelus areolatus	300	0.011	3.048	FL	28.18	28.77	133
40	79	Caranx lugubris	2000	0.020	3.001	FL	46.51	55.35	124
41	81	Caranx tille	2000	0.032	2.930	FL	43.43	49.51	105
42	66	Lethrinus olivaceus	300	0.029	2.851	FL	25.49	27.50	93
43	92	Cookeolus japonicus	300	0.014	3.000	TL	27.58	27.58	76
44	94	Sphyraena forsteri	500	0.005	3.034	FL	43.51	49.16	73
45	67	Lethrinus amboinensis	300	0.029	2.851	FL	25.49	28.06	69
46	39	Cephalopholis sonnerati	300	0.015	3.058	TL	25.78	25.78	67
47	16	Lutjanus bohar	500	0.016	3.059	FL	29.70	31.31	62
48	37	Cephalopholis miniata	300	0.026	2.864	TL	26.35	26.35	62
49	18	Lutjanus sebae	500	0.009	3.208	FL	29.97	31.26	59
50	29	Lutjanus rivulatus	500	0.008	3.260	FL	29.12	29.97	50

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 716

Rank	Species	2016	2017	2018	2019	2020	2021	2022	2023	2024	Total
1	Lutjanus malabaricus	0	0	0	5162	3792	0	0	0	0	8954
2	Lutjanus johnii	0	0	0	3859	3975	0	0	0	0	7834
3	Epinephelus coioides	0	0	0	3023	1877	0	0	0	0	4900
4	Etelis radiosus	0	0	0	786	1921	0	0	0	0	2707
5	Pristipomoides sieboldii	0	0	0	654	1705	0	0	0	0	2359
6	Lethrinus lentjan	0	0	0	1299	1035	0	0	0	0	2334
7	Lutjanus erythropterus	0	0	0	1215	755	0	0	0	0	1970
8	Paracaesio xanthura	0	0	0	323	1537	0	0	0	0	1860
9	Lutjanus gibbus	0	0	0	911	766	0	0	0	0	1677
10	Pristipomoides filamentosus	0	0	0	241	1435	0	0	0	0	1676
11	Diagramma pictum	0	0	0	860	688	0	0	0	0	1548
12	Lutjanus russelli	0	0	0	1128	392	0	0	0	0	1520
13	Caranx ignobilis	0	0	0	883	449	0	0	0	0	1332
14	Lutjanus boutton	0	0	0	377	927	0	0	0	0	1304
15	Variola albimarginata	0	0	0	295	814	0	0	0	0	1109
16	Aphareus rutilans	0	0	0	274	832	0	0	0	0	1106
17	Lutjanus vitta	0	0	0	403	252	0	0	0	0	655
18	Etelis coruscans	0	0	0	248	273	0	0	0	0	521
19	Pinjalo pinjalo	0	0	0	85	434	0	0	0	0	519
20	Pomadasys kaakan	0	0	0	403	95	0	0	0	0	498
21	Paracaesio kusakarii	0	0	0	93	384	0	0	0	0	477
22	Lethrinus rubrioperculatus	0	0	0	152	321	0	0	0	0	473
23	Lutjanus timorensis	0	0	0	131	268	0	0	0	0	399
24	Plectropomus maculatus	0	0	0	137	253	0	0	0	0	390
25	Gymnocranius griseus	0	0	0	89	195	0	0	0	0	284
26	Paracaesio gonzalesi	0	0	0	15	252	0	0	0	0	267
27	Sphyraena barracuda	0	0	0	118	129	0	0	0	0	247
28	Cephalopholis sexmaculata	0	0	0	77	161	0	0	0	0	238
29	Caranx sexfasciatus	0	0	0	97	136	0	0	0	0	233
30	Lutjanus argentimaculatus	0	0	0	112	116	0	0	0	0	228
31	Erythrocles schlegelii	0	0	0	57	160	0	0	0	0	217
32	Elagatis bipinnulata	0	0	0	86	111	0	0	0	0	197
33	Pristipomoides multidens	0	0	0	54	109	0	0	0	0	163
34	Epinephelus bleekeri	0	0	0	81	59	0	0	0	0	140
35	Gymnocranius grandoculis	0	0	0	33	107	0	0	0	0	140
36	Aprion virescens	0	0	0	56	83	0	0	0	0	139
37	Etelis boweni	0	0	0	60	77	0	0	0	0	137
38	Seriola rivoliana	0	0	0	39	96	0	0	0	0	135
39	Epinephelus areolatus	0	0	0	64	69	0	0	0	0	133
40	Caranx lugubris	0	0	0	10	114	0	0	0	0	124
41	Caranx tille	0	0	0	31	74	0	0	0	0	105
42	Lethrinus olivaceus	0	0	0	43	50	0	0	0	0	93
43	Cookeolus japonicus	0	0	0	16	60	0	0	0	0	76
44	Sphyraena forsteri	0	0	0	35	38	0	0	0	0	73
45	Lethrinus amboinensis	0	0	0	18	51	0	0	0	0	69
46	Cephalopholis sonnerati	0	0	0	11	56	0	0	0	0	67
47	Lutjanus bohar	0	0	0	19	43	0	0	0	0	62
48	Cephalopholis miniata	0	0	0	11	51	0	0	0	0	62
49	Lutjanus sebae	0	0	0	34	25	0	0	0	0	59
50	Lutjanus rivulatus	0	0	0	18	32	0	0	0	0	50

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.

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 2.13), while actual fishing grounds are determined by placing SPOT Trace units on all fishing boats participating in the program. By late 2020, most (over 90%) of the Indonesian coastline had been surveyed and the vast 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 are 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 are not further processed and not included in the dataset. Body weight at length is 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 is 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 verify that individual catches are fully represented by CODRS images and we flag catches when they are incomplete, judging from comparison with the weight converted catch size frequencies. When estimated weights from CODRS are above 90% of landed weights from receipts, they are 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 are 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 are rejected and are not used in any analysis.

2.4 Length-Frequency Distributions, CpUE, and Total Catch

By the end of 2020, 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 iss 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 is 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 are 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 are 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 is combined with fleet activity to establish a measure of effort. With this information, CpUE is 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 are 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) is 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), is derived from SPOT data looking at movement patterns. Fleet size by gear type and boat size category (Table 2.5) is obtained from field surveys, where each vessel is 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, are 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 are used for further calculations. Numbers per size class for each species in the catch are 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), and catch by species for each gear type separately (Tables 2.9 through 2.12).

As the CODRS program is still in final stage of 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 apply the following approach to estimate annual catch. First, within each WPP, we estimate the total catch and the total effort for all fleet segments where we have representation by CODRS. We express annual effort as "tonnage-days", i.e. the GT of each vessel times the annual number of fishing days. Then, we calculate the average catch-per-unit-effort, over all fleet segments that have CODRS representation within each WPP (in metric tons per tonnage-day). This results in one catch-per-unit-effort estimate for each WPP (CPUE-estimate-per-WPP). Then, we calculate the effort, in tonnage-days, for the fleet segments where we do not have CODRS representation, and we multiply 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.

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.

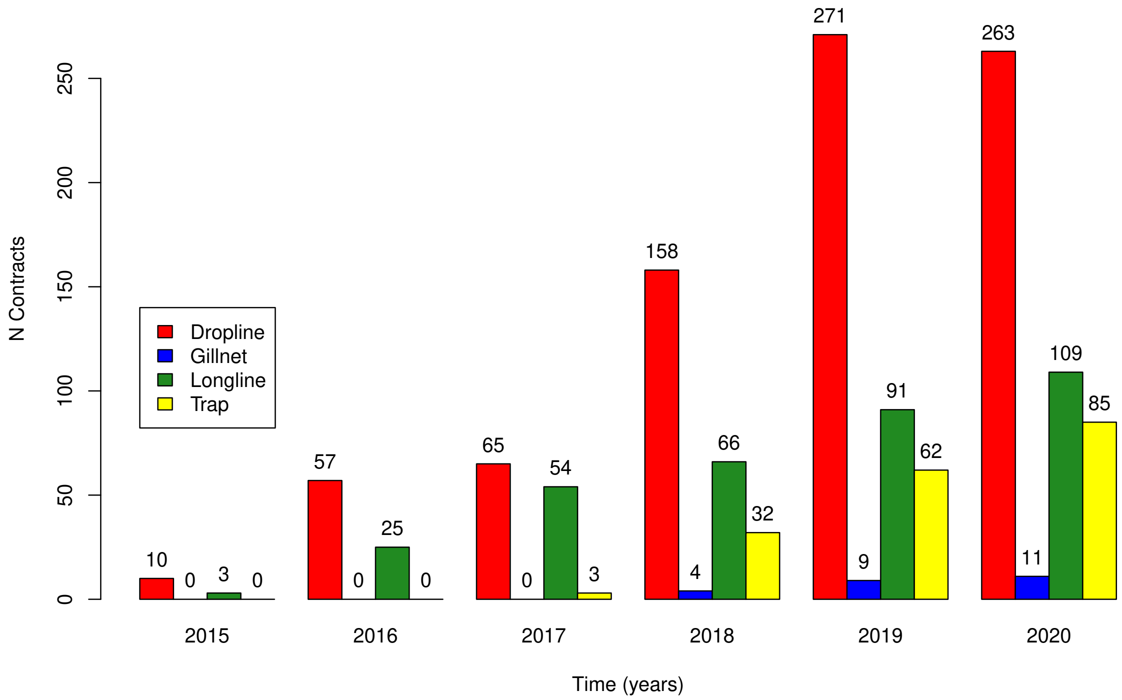


Figure 2.3: Number of CODRS contractors by gear type actively fishing in Indonesian waters.

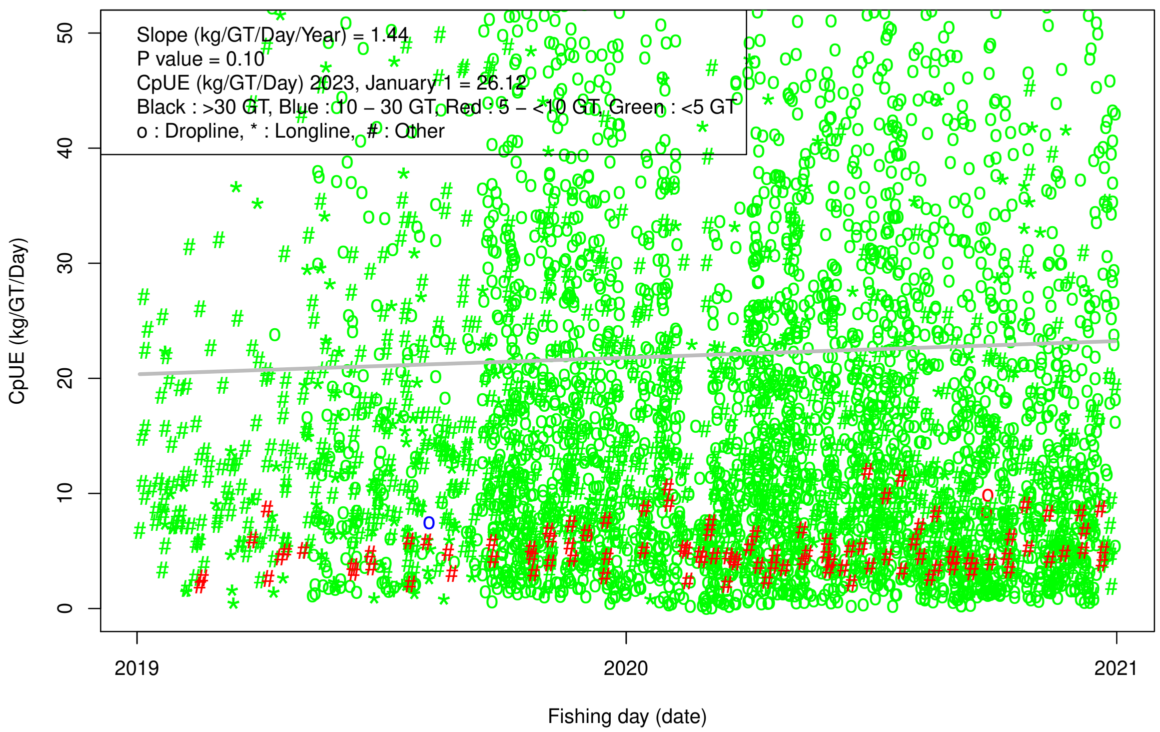


Figure 2.4: Catch per Unit of Effort in WPP 716.

Table 2.1: Number of CODRS deployed by gear type and boat size category in WPP 716

N	Dropline	Longline	Gillnet	Trap	Total
Nano	28	3	NA	5	36
Small	NA	NA	NA	1	1
Medium	NA	NA	NA	NA	0
Large	NA	NA	NA	NA	0
NA	28	3	0	6	37

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 716 in 2020

kg/GT/Day	Dropline	Longline	Gillnet	Trap
Nano	24.75	26.26	NA	12.26
Small	NA	24.35	NA	5.81
Medium	24.35	NA	NA	NA
Large	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 716 in 2020

N	Dropline	Longline	Gillnet	Trap
Nano	2188	137	NA	367
Small	2	2761	NA	67
Medium	2761	NA	NA	NA
Large	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
Nano Dedicated	201	235	224	194
Nano Seasonal	100	118	112	97
Small Dedicated	213	258	247	277
Small Seasonal	107	129	124	139
Medium Dedicated	204	213	258	219
Medium Seasonal	102	107	129	110
Large Dedicated	166	237	151	185
Large Seasonal	83	119	75	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 716

Number of Boat	Dropline	Longline	Gillnet	Trap	Total
Nano Dedicated	65	50	0	10	125
Nano Seasonal	498	0	0	0	498
Small Dedicated	0	4	0	1	5
Small Seasonal	0	0	0	0	0
Medium Dedicated	1	0	0	0	1
Medium Seasonal	0	0	0	0	0
Large Dedicated	0	0	0	0	0
Large Seasonal	0	0	0	0	0
Total	564	54	0	11	629

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 716

Total GT	Dropline	Longline	Gillnet	Trap	Total
Nano Dedicated	51	141	0	25	217
Nano Seasonal	793	0	0	0	793
Small Dedicated	0	20	0	8	28
Small Seasonal	0	0	0	0	0
Medium Dedicated	22	0	0	0	22
Medium Seasonal	0	0	0	0	0
Large Dedicated	0	0	0	0	0
Large Seasonal	0	0	0	0	0
Total	866	161	0	33	1059

Table 2.7: Total catch in metric tons per year by fishing gear and boat size category in WPP 716 in 2020

Total Catch	Dropline	Longline	Gillnet	Trap	Total
Nano Dedicated	254	868	0	60	1182
Nano Seasonal	1962	0	0	0	1962
Small Dedicated	0	126	0	12	138
Small Seasonal	0	0	0	0	0
Medium Dedicated	109	0	0	0	109
Medium Seasonal	0	0	0	0	0
Large Dedicated	0	0	0	0	0
Large Seasonal	0	0	0	0	0
Total	2325	993	0	72	3391

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 716 in 2020.

Species	Weight MT	Weight %	Cumulative % Weight	Immature % Number	Immature % Weight	Risk Immature
Etelis radiosus	1188	35	35	37	14	High
Aphareus rutilans	208	6	41	77	43	High
Caranx ignobilis	169	5	46	26	7	Med
Pristipomoides filamentosus	158	5	51	90	75	High
Caranx sexfasciatus	153	5	55	2	0	Low
Gymnocranius grandoculis	130	4	59	12	2	Med
Etelis coruscans	121	4	63	53	30	High
Sphyraena barracuda	104	3	66	39	17	High
Pristipomoides sieboldii	96	3	69	41	27	High
Erythrocles schlegelii	89	3	71	10	1	Med
Lutjanus gibbus	87	3	74	45	21	High
Pristipomoides multidens	85	3	76	41	19	High
Paracaesio xanthura	82	2	79	52	34	High
Lutjanus boutton	71	2	81	27	9	Med
Lethrinus olivaceus	67	2	83	NA	NA	
Aprion virescens	61	2	85	43	21	High
Lethrinus rubrioperculatus	49	1	86	2	0	Low
Etelis boweni	43	1	87	50	18	High
Elagatis bipinnulata	35	1	88	12	3	Med
Seriola rivoliana	35	1	89	50	15	High
Total Top 20 Species	3029	89	89	44	20	High
Total Top 100 Species	3391	100	100	43	21	High

Table 2.9: Top 20 species by volume in Dropline fisheries with % immature fish in the catch in WPP 716 in 2020.

Species	Weight MT	Weight %	Cumulative % Weight	Immature % Number	Immature % Weight	Risk Immature
Etelis radiosus	1120	48	48	37	14	High
Aphareus rutilans	176	8	56	77	43	High
Pristipomoides filamentosus	144	6	62	90	75	High
Etelis coruscans	117	5	67	53	30	High
Pristipomoides sieboldii	92	4	71	41	27	High
Erythrocles schlegelii	82	4	74	10	1	Med
Paracaesio xanthura	78	3	78	52	34	High
Caranx ignobilis	48	2	80	7	2	Low
Caranx sexfasciatus	45	2	82	2	0	Low
Sphyraena barracuda	43	2	84	39	17	High
Etelis boweni	41	2	85	50	18	High
Elagatis bipinnulata	34	1	87	12	3	Med
Paracaesio kusakarii	30	1	88	97	86	High
Seriola rivoliana	29	1	89	50	15	High
Variola albimarginata	27	1	91	23	7	Med
Paracaesio gonzalesi	27	1	92	3	1	Low
Lutjanus gibbus	25	1	93	80	56	High
Aprion virescens	21	1	94	43	21	High
Lutjanus boutton	18	1	95	60	36	High
Pristipomoides multidens	15	1	95	NA	NA	
Total Top 20 Species	2214	95	95	53	23	High
Total Top 100 Species	2325	100	100	52	23	High

Table 2.10: Top 20 species by volume in Longline fisheries with % immature fish in the catch in WPP 716 in 2020.

Species	Weight MT	Weight %	Cumulative % Weight	Immature % Number	Immature % Weight	Risk Immature
Caranx ignobilis	118	12	12	NA	NA	
Gymnocranius grandoculis	117	12	24	12	2	Med
Caranx sexfasciatus	108	11	35	NA	NA	
Pristipomoides multidens	70	7	42	41	19	High
Etelis radiosus	68	7	48	NA	NA	
Lutjanus gibbus	62	6	55	18	8	Med
Sphyraena barracuda	61	6	61	NA	NA	
Lethrinus olivaceus	60	6	67	NA	NA	
Lutjanus boutton	53	5	72	0	0	Low
Lethrinus rubrioperculatus	42	4	76	1	0	Low
Aprion virescens	40	4	80	NA	NA	
Aphareus rutilans	31	3	84	NA	NA	
Lutjanus argentimaculatus	21	2	86	NA	NA	
Lethrinus amboinensis	17	2	87	NA	NA	
Pristipomoides filamentosus	14	1	89	NA	NA	
Gymnocranius griseus	13	1	90	4	1	Low
Lutjanus rivulatus	11	1	91	NA	NA	
Lutjanus bohar	10	1	92	NA	NA	
Diagramma pictum	9	1	93	NA	NA	
Epinephelus coioides	8	1	94	NA	NA	
Total Top 20 Species	933	94	94	9	6	Low
Total Top 100 Species	993	100	100	9	6	Low

Table 2.11: Top 20 species by volume in Gillnet fisheries with % immature fish in the catch in WPP 716 in 2020.

Species	Weight MT	Weight %	Cumulative % Weight	Immature % Number	Immature % Weight	Risk Immature
NA	NA	NA	NA	NA	NA	NA
NA	NA	NA	NA	NA	NA	NA
NA	NA	NA	NA	NA	NA	NA
NA	NA	NA	NA	NA	NA	NA
NA	NA	NA	NA	NA	NA	NA
NA	NA	NA	NA	NA	NA	NA
NA	NA	NA	NA	NA	NA	NA
NA	NA	NA	NA	NA	NA	NA
NA	NA	NA	NA	NA	NA	NA
NA	NA	NA	NA	NA	NA	NA
NA	NA	NA	NA	NA	NA	NA
NA	NA	NA	NA	NA	NA	NA
NA	NA	NA	NA	NA	NA	NA
NA	NA	NA	NA	NA	NA	NA
NA	NA	NA	NA	NA	NA	NA
NA	NA	NA	NA	NA	NA	NA
NA	NA	NA	NA	NA	NA	NA
NA	NA	NA	NA	NA	NA	NA
NA	NA	NA	NA	NA	NA	NA
NA	NA	NA	NA	NA	NA	NA
Total Top 20 Species	0	0	0	NA	NA	NA
Total Top 100 Species	0	0	0	NA	NA	NA

Table 2.12: Top 20 species by volume in Trap fisheries with % immature fish in the catch in WPP 716 in 2020.

Species	Weight MT	Weight %	Cumulative % Weight	Immature % Number	Immature % Weight	Risk Immature
Epinephelus coioides	21	29	29	23	9	Med
Lutjanus johnii	16	22	51	85	65	High
Lutjanus malabaricus	16	21	72	90	78	High
Lethrinus lentjan	3	4	76	3	1	Low
Caranx ignobilis	3	4	80	98	92	High
Diagramma pictum	3	4	84	23	9	Med
Pinjalo pinjalo	2	3	87	29	11	Med
Lutjanus erythropterus	2	3	90	62	39	High
Plectropomus maculatus	2	3	93	2	0	Low
Lutjanus russelli	1	1	94	10	5	Med
Lutjanus argentimaculatus	1	1	95	56	44	High
Caranx tille	1	1	96	35	14	High
Lutjanus vitta	0	1	97	1	0	Low
Epinephelus bleekeri	0	0	97	5	2	Low
Carangoides fulvoguttatus	0	0	98	NA	NA	
Lethrinus olivaceus	0	0	98	NA	NA	
Lutjanus timorensis	0	0	98	48	31	High
Pomadasys kaakan	0	0	99	29	19	Med
Plectropomus leopardus	0	0	99	NA	NA	
Carangoides gymnostethus	0	0	99	NA	NA	
Total Top 20 Species	72	99	99	61	41	High
Total Top 100 Species	72	100	100	61	41	High

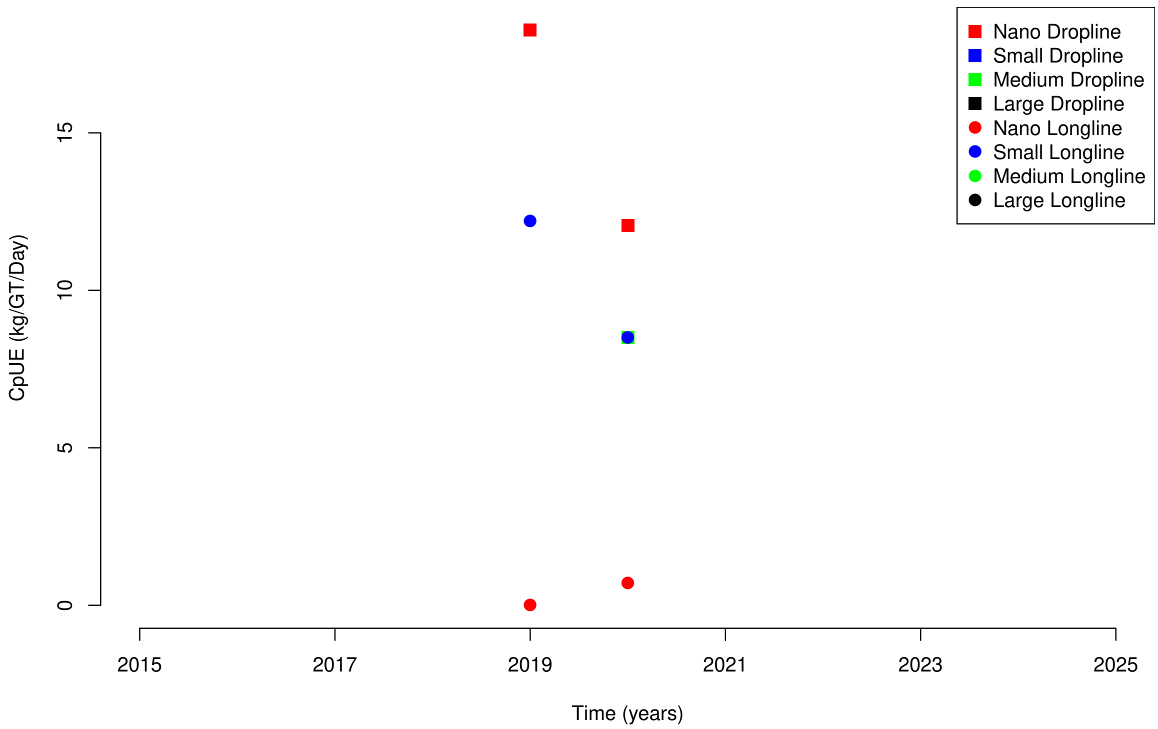


Figure 2.5: Catch per Unit of Effort per calendar year for Etelis radiosus
in WPP 716 for Dropline and Longline catches by fleet segment.
Solid lines and dashed lines for trends in Dropline CpUE and Longline CpUE respectively.

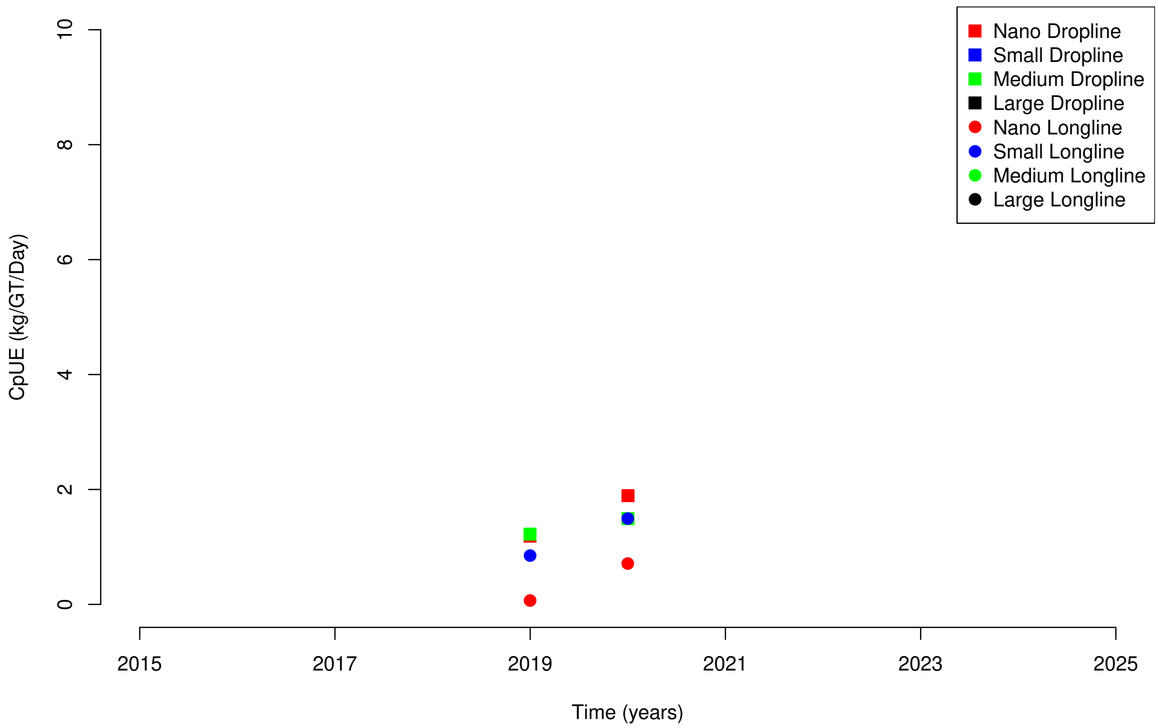


Figure 2.6: Catch per Unit of Effort per calendar year for Aphareus rutilans
in WPP 716 for Dropline and Longline catches by fleet segment.
Solid lines and dashed lines for trends in Dropline CpUE and Longline CpUE respectively.

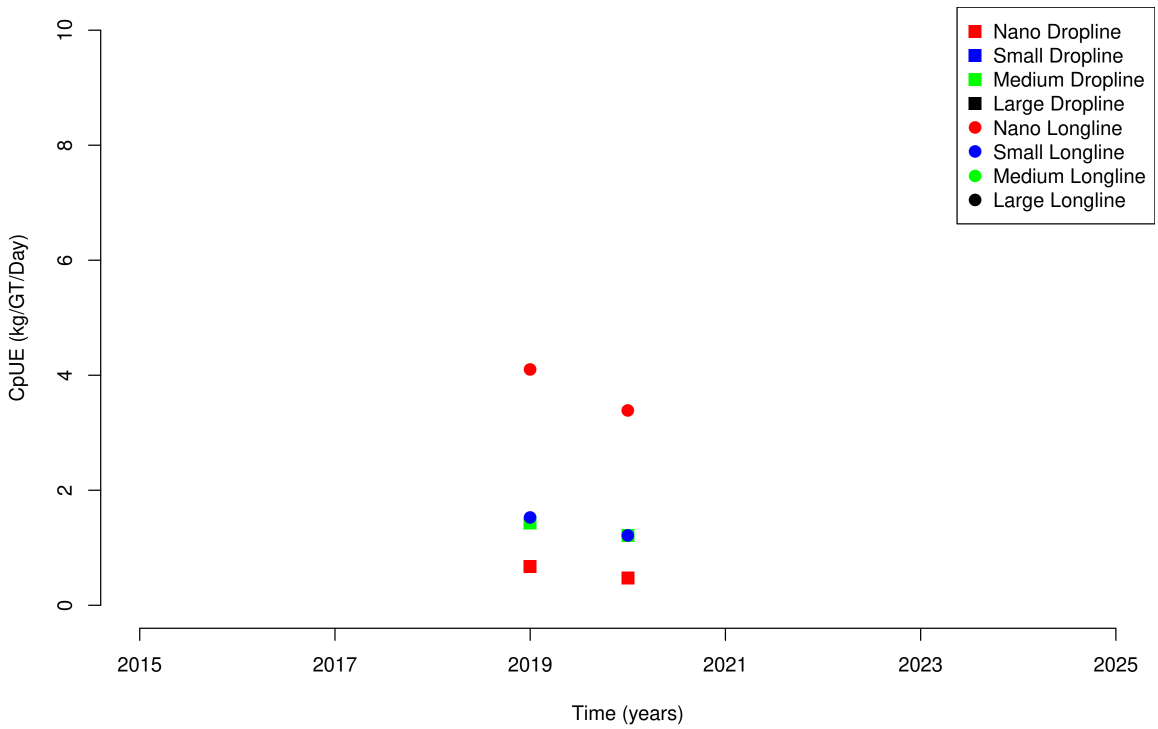


Figure 2.7: Catch per Unit of Effort per calendar year for Caranx ignobilis
in WPP 716 for Dropline and Longline catches by fleet segment.
Solid lines and dashed lines for trends in Dropline CpUE and Longline CpUE respectively.

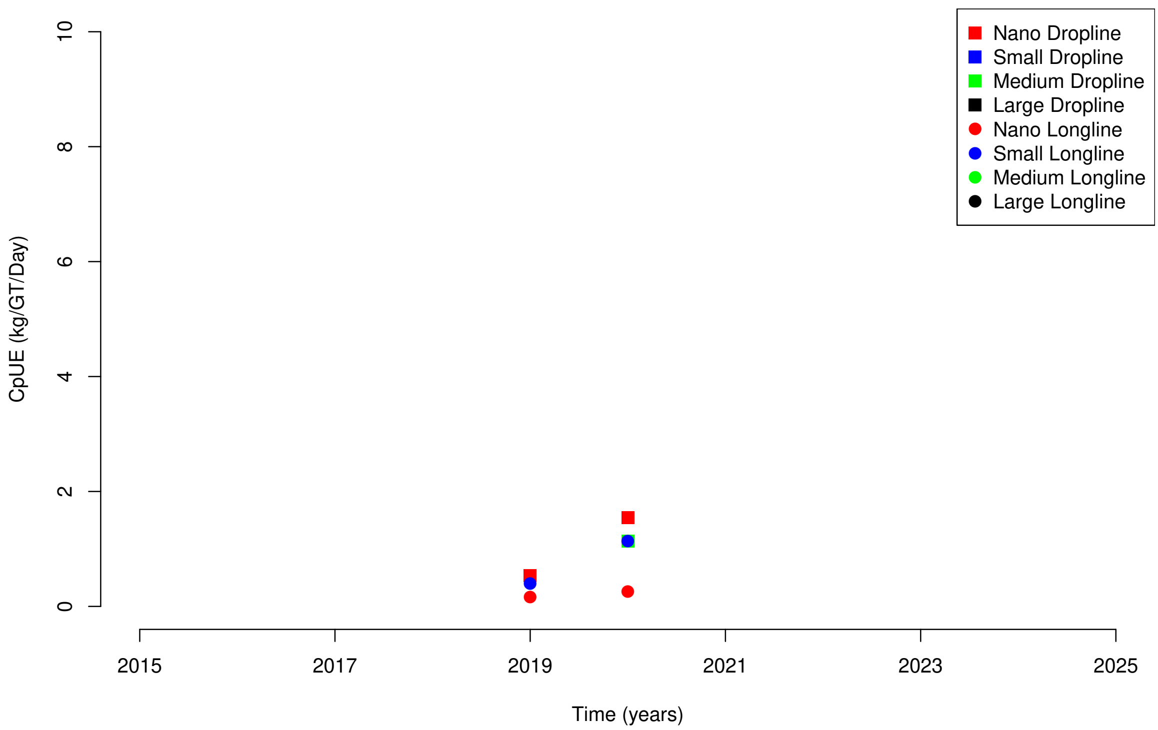


Figure 2.8: Catch per Unit of Effort per calendar year for Pristipomoides filamentosus
in WPP 716 for Dropline and Longline catches by fleet segment.
Solid lines and dashed lines for trends in Dropline CpUE and Longline CpUE respectively.

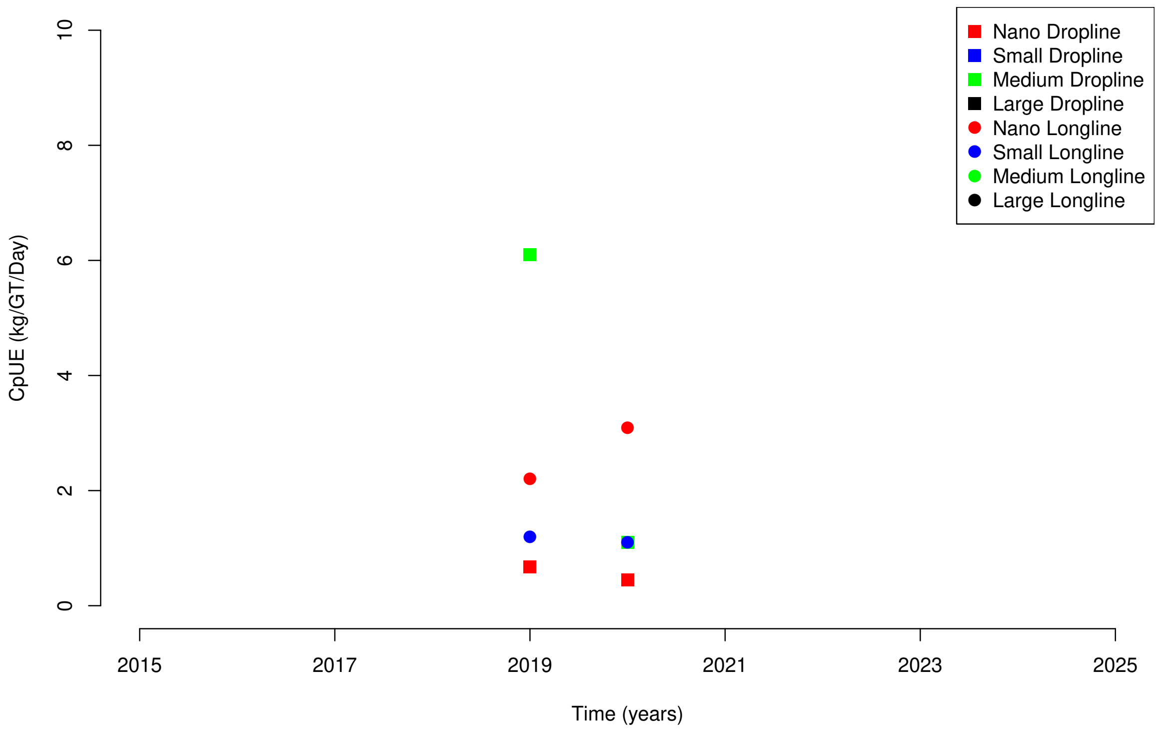


Figure 2.9: Catch per Unit of Effort per calendar year for Caranx sexfasciatus in WPP 716 for Dropline and Longline catches by fleet segment. Solid lines and dashed lines for trends in Dropline CpUE and Longline CpUE respectively.

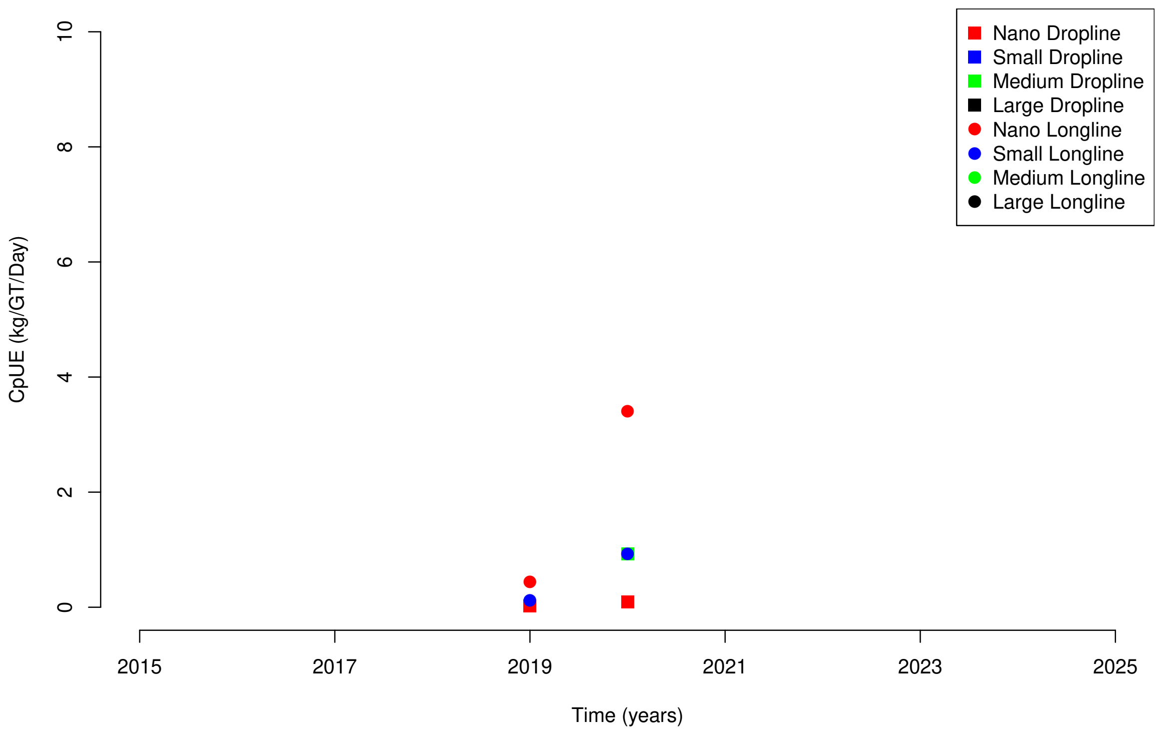


Figure 2.10: Catch per Unit of Effort per calendar year for Gymnocranius grandoculis in WPP 716 for Dropline and Longline catches by fleet segment. Solid lines and dashed lines for trends in Dropline CpUE and Longline CpUE respectively.

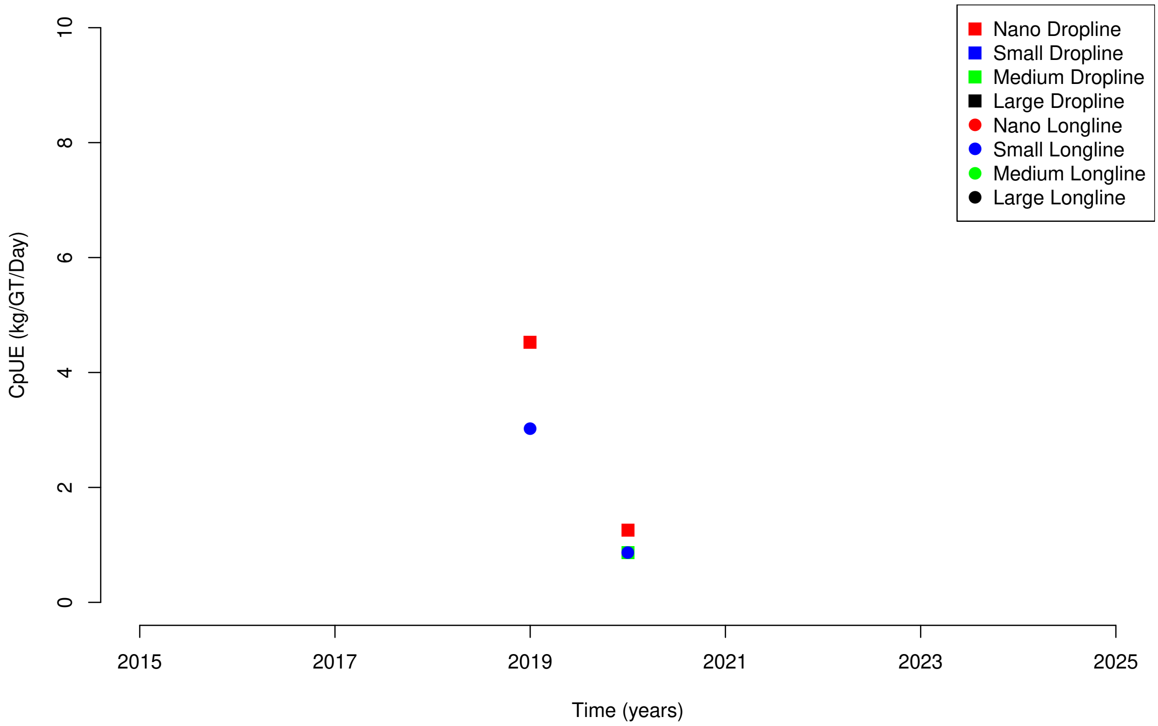


Figure 2.11: Catch per Unit of Effort per calendar year for Etelis coruscans in WPP 716 for Dropline and Longline catches by fleet segment.
Solid lines and dashed lines for trends in Dropline CpUE and Longline CpUE respectively.

Table 2.13: 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	Trap	2	6
2	571	Desa Sungai Kuruk III	Aceh Tamiang	Small	Trap	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	Desa Belawan Lama	Kota Medan	Small	Trap	10	50
6	571	Desa Beurawang	Kota Sabang	Nano	Dropline	1	4
7	571	PP. Pasiran	Kota Sabang	Nano	Dropline	2	3
8	571	PP. Pasiran	Kota Sabang	Small	Dropline	1	8
9	571	Desa Sei Bilah	Langkat	Medium	Trap	2	22
10	571	Desa Sei Bilah	Langkat	Nano	Dropline	1	4
11	571	Desa Sei Bilah	Langkat	Small	Dropline	2	18
12	571	Desa Sei Bilah	Langkat	Small	Trap	2	16
13	571	Desa Ujung Kampung	Langkat	Medium	Trap	1	12
14	571	Desa Ujung Kampung	Langkat	Nano	Trap	6	27
15	571	Desa Ujung Kampung	Langkat	Small	Trap	3	20
16	571	Pangkalan Susu	Langkat	Nano	Trap	38	114
17	571	Pelabuhan Ujung Kampung	Langkat	Medium	Trap	1	13
18	571	PPI. Pangkalan Brandan	Langkat	Nano	Trap	32	131
19	571	PPI. Pangkalan Brandan	Langkat	Small	Trap	2	14
20	571	PP. Ujung Blang	Lhokseumawe	Nano	Longline	7	11
21	571	Desa Sialang Buah	Serdang Bedagai	Medium	Longline	1	13
22	571	Desa Sialang Buah	Serdang Bedagai	Nano	Longline	2	7
23	571	Desa Sialang Buah	Serdang Bedagai	Small	Longline	3	22
24	571	Sialang Buah	Serdang Bedagai	Nano	Longline	11	44
25	571	Sialang Buah	Serdang Bedagai	Small	Longline	4	30
26	571	Teluk Mengkudu	Serdang Bedagai	Small	Longline	5	48
27	572	Kuala Bubon	Aceh Barat	Medium	Trap	2	21
28	572	Kuala Bubon	Aceh Barat	Small	Trap	2	14
29	572	PP. Ujoeng Baroh	Aceh Barat	Nano	Longline	1	4
30	572	PP. Ujoeng Baroh	Aceh Barat	Small	Dropline	1	6
31	572	PP. Ujoeng Baroh	Aceh Barat	Small	Longline	1	5
32	572	PP. Ujong Baroeh	Aceh Barat	Nano	Dropline	8	28
33	572	PP. Ujong Baroeh	Aceh Barat	Nano	Longline	3	12
34	572	PP. Ujong Baroeh	Aceh Barat	Small	Dropline	14	84
35	572	PP. Ujong Baroeh	Aceh Barat	Small	Longline	3	21
36	572	PP. Ujong Baroeh	Aceh Barat	Small	Trap	2	10
37	572	Susoh	Aceh Barat Daya	Medium	Dropline	1	11
38	572	Susoh	Aceh Barat Daya	Small	Dropline	2	12
39	572	Desa Lampuyang	Aceh Besar	Nano	Dropline	15	22
40	572	PP. Lhok Bengkuang	Aceh Selatan	Nano	Dropline	5	6
41	572	PP. Lhok Bengkuang	Aceh Selatan	Nano	Longline	8	26
42	572	PP. Lhok Bengkuang	Aceh Selatan	Small	Dropline	2	12
43	572	PP. Lhok Bengkuang	Aceh Selatan	Small	Longline	27	165
44	572	PP. Meukek	Aceh Selatan	Nano	Longline	1	3
45	572	Desa Pulau Balai	Aceh Singkil	Medium	Gillnet	1	10
46	572	Desa Pulau Balai	Aceh Singkil	Nano	Trap	6	29
47	572	PP. Lampulo	Banda Aceh	Nano	Dropline	1	4
48	572	PP. Lampulo	Banda Aceh	Nano	Longline	2	6
49	572	PP. Lampulo	Banda Aceh	Small	Dropline	8	49
50	572	PP. Lampulo	Banda Aceh	Small	Longline	1	6
51	572	PPS Lampulo	Banda Aceh	Small	Dropline	9	63
52	572	PP. Sikakap	Kepulauan Mentawai	Nano	Dropline	1	3
53	572	PP. Tuapejat	Kepulauan Mentawai	Medium	Dropline	2	24
54	572	PP. Tuapejat	Kepulauan Mentawai	Small	Dropline	2	18
55	572	PP. Pulau Baai	Kota Bengkulu	Large	Trap	1	31
56	572	PP. Pulau Baai	Kota Bengkulu	Medium	Dropline	8	107
57	572	PP. Pulau Baai	Kota Bengkulu	Medium	Gillnet	7	153
58	572	PP. Pulau Baai	Kota Bengkulu	Nano	Dropline	4	16

Table 2.13: 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. Pulau Baai	Kota Bengkulu	Small	Dropline	12	70
60	572	PP. Pulau Baai	Kota Bengkulu	Small	Gillnet	1	6
61	572	Desa Taluak	Kota Pariaman	Nano	Longline	10	16
62	572	Desa Keuneukai	Kota Sabang	Nano	Dropline	2	3
63	572	PP. Sibolga	Kota Sibolga	Medium	Trap	6	87
64	572	PP. Sibolga	Kota Sibolga	Nano	Dropline	4	14
65	572	PP. Sibolga	Kota Sibolga	Nano	Trap	12	47
66	572	PP. Sibolga	Kota Sibolga	Small	Dropline	3	18
67	572	PP. Sibolga	Kota Sibolga	Small	Trap	9	55
68	572	PP. Muara Piluk Bakauheni	Lampung	Nano	Longline	16	43
69	572	PP. Muara Piluk Bakauheni	Lampung	Small	Longline	1	5
70	572	PP. Pasar Bantal	Mukomuko	Small	Dropline	20	100
71	572	Kec. Teluk Dalam	Nias Selatan	Nano	Dropline	5	18
72	572	Desa Botolakha	Nias Utara	Small	Dropline	25	197
73	572	Desa Helera	Nias Utara	Nano	Longline	13	21
74	572	Desa Helera	Nias Utara	Small	Longline	2	11
75	572	Muara Padang	Padang	Medium	Longline	1	11
76	572	Muara Padang	Padang	Small	Dropline	4	21
77	572	PP. Bungus	Padang	Small	Longline	1	8
78	572	PP. Muaro	Padang	Medium	Dropline	4	52
79	572	PP. Muaro	Padang	Medium	Longline	5	61
80	572	PP. Muaro	Padang	Small	Dropline	1	5
81	572	PP. Muaro	Padang	Small	Longline	5	41
82	572	Pantai Ulakan	Padang Pariaman	Nano	Longline	10	17
83	572	PP. Labuan	Pandeglang	Small	Dropline	29	152
84	572	PP. Carocok Tarusan	Pesisir Selatan	Medium	Longline	4	40
85	572	PP. Kambang	Pesisir Selatan	Medium	Longline	3	30
86	572	Desa Pulau Tunda	Serang	Nano	Dropline	5	23
87	572	Desa Pulau Tunda	Serang	Small	Dropline	16	103
88	573	Desa Alor Kecil	Alor	Nano	Dropline	25	17
89	573	PP. Kedonganan	Badung	Nano	Dropline	30	56
90	573	PP. Grajagan	Banyuwangi	Nano	Dropline	452	1446
91	573	PP. Grajagan	Banyuwangi	Small	Dropline	150	780
92	573	PP. Pancer	Banyuwangi	Medium	Dropline	1	15
93	573	PP. Pancer	Banyuwangi	Nano	Dropline	174	348
94	573	PP. Pancer	Banyuwangi	Small	Dropline	125	625
95	573	Atapupu	Belu	Nano	Dropline	2	3
96	573	PP. Atapupu	Belu	Nano	Dropline	3	4
97	573	PP. Rompo	Bima	Nano	Dropline	15	15
98	573	PP. Rompo	Bima	Nano	Longline	57	44
99	573	PP. Sape	Bima	Nano	Dropline	162	553
100	573	PP. Sape	Bima	Small	Dropline	1	6
101	573	PP.Tambakrejo	Blitar	Nano	Longline	15	30
102	573	PP.Tambakrejo	Blitar	Small	Longline	1	6
103	573	Jetis	Cilacap	Nano	Longline	30	26
104	573	Pelabuhan Benoa	Denpasar	Medium	Dropline	11	241
105	573	Pelabuhan Benoa	Denpasar	Medium	Longline	1	27
106	573	PP. Tenau Kupang	Denpasar	Medium	Dropline	1	22
107	573	PP. Hu'u	Dompu	Small	Dropline	38	236
108	573	PP. Puger	Jember	Nano	Longline	50	160
109	573	Desa Yeh Kuning	Jembrana	Nano	Longline	150	126
110	573	PP. Pengambengan	Jembrana	Nano	Longline	20	40
111	573	Desa Tablolong	Kupang	Nano	Dropline	36	97
112	573	Pelabuhan Benoa	Kupang	Medium	Dropline	1	27
113	573	Pelabuhan Sulamu	Kupang	Nano	Dropline	50	87
114	573	PP. Mayangan	Kupang	Medium	Longline	1	29
115	573	PP. Oeba Kupang	Kupang	Nano	Dropline	5	5
116	573	PP. Tenau Kupang	Kupang	Medium	Dropline	21	347

Table 2.13: 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	573	PP. Tenau Kupang	Kupang	Medium	Longline	3	72
118	573	PP. Tenau Kupang	Kupang	Nano	Dropline	6	22
119	573	PP. Tenau Kupang	Kupang	Small	Dropline	21	166
120	573	Desa Tapolango	Lembata	Nano	Dropline	20	14
121	573	Desa waijarang	Lembata	Nano	Dropline	20	14
122	573	PP. Hadakewa	Lembata	Nano	Dropline	30	26
123	573	PP. Tanjung Luar	Lombok Timur	Medium	Longline	14	141
124	573	PP. Tanjung Luar	Lombok Timur	Nano	Dropline	15	36
125	573	PP. Tanjung Luar	Lombok Timur	Nano	Longline	39	101
126	573	Pulau Maringkik	Lombok Timur	Medium	Longline	1	10
127	573	Pulau Maringkik	Lombok Timur	Small	Longline	3	22
128	573	TPI Kampung Ujung	Manggarai Barat	Nano	Dropline	60	74
129	573	PP. Poumako	Mimika	Medium	Gillnet	1	29
130	573	PP. Watukarung	Pacitan	Nano	Longline	100	222
131	573	PP Cikidang	Pangandaran	Small	Gillnet	8	50
132	573	PP. Cikidang	Pangandaran	Nano	Gillnet	2	9
133	573	Desa Batutua	Rote Ndao	Nano	Dropline	9	11
134	573	Desa Oeseli	Rote Ndao	Nano	Dropline	2	2
135	573	Dusun Papela	Rote Ndao	Nano	Dropline	20	21
136	573	Sukabumi	Sukabumi	Nano	Longline	50	50
137	573	KSOP Kelas III Kupang	Sumba Barat	Nano	Dropline	35	80
138	573	Pelabuhan Waingapu	Sumba Barat	Nano	Dropline	8	14
139	573	Pelabuhan Waingapu	Sumba Barat	Nano	Longline	7	16
140	573	Desa Pulau Bungin	Sumbawa	Nano	Dropline	29	23
141	573	Desa Pulau Bungin	Sumbawa	Nano	Longline	15	12
142	573	Labuhan Mapin	Sumbawa	Nano	Dropline	61	43
143	573	Labuhan Mapin	Sumbawa	Nano	Longline	35	17
144	573	PP Labuhan Lalar	Sumbawa	Nano	Dropline	25	22
145	573	PP. Wini	Timor Tengah Utara	Nano	Dropline	7	12
146	711	PP. Sungailiat	Bangka	Medium	Trap	1	10
147	711	PP. Sungailiat	Bangka	Small	Dropline	1	6
148	711	PP. Sungailiat	Bangka	Small	Trap	17	133
149	711	PP. Kurau	Bangka Tengah	Small	Trap	30	159
150	711	Batam	Batam	Medium	Trap	2	56
151	711	Batam	Batam	Small	Dropline	2	12
152	711	Batam	Batam	Small	Trap	2	13
153	711	PP. Manggar	Belitung	Small	Trap	1	9
154	711	PP. Tanjung Pandan	Belitung	Medium	Trap	9	164
155	711	PP. Tanjung Pandan	Belitung	Nano	Dropline	108	250
156	711	PP. Tanjung Pandan	Belitung	Nano	Trap	63	202
157	711	PP. Tanjung Pandan	Belitung	Small	Dropline	5	27
158	711	PP. Tanjung Pandan	Belitung	Small	Trap	72	450
159	711	Tanjung Binga	Belitung	Small	Trap	20	192
160	711	PP. Manggar Belitung Timur	Belitung Timur	Medium	Trap	3	42
161	711	PP. Manggar Belitung Timur	Belitung Timur	Nano	Dropline	5	21
162	711	PP. Manggar Belitung Timur	Belitung Timur	Nano	Trap	1	4
163	711	PP. Manggar Belitung Timur	Belitung Timur	Small	Dropline	2	10
164	711	PP. Manggar Belitung Timur	Belitung Timur	Small	Trap	87	481
165	711	PP. Kijang	Bintan	Medium	Dropline	2	33
166	711	PP. Kijang	Bintan	Medium	Trap	241	4587
167	711	PP. Kijang	Bintan	Nano	Trap	2	8
168	711	PP. Kijang	Bintan	Small	Dropline	10	66
169	711	PP. Kijang	Bintan	Small	Trap	204	1385
170	711	Moro	Karimun	Small	Trap	1	7
171	711	Tanjung Balai Karimun	Karimun	Medium	Longline	5	111
172	711	PP. Tarempa	Kepulauan Anambas	Nano	Dropline	202	298
173	711	PP. Tarempa	Kepulauan Anambas	Nano	Trap	19	24
174	711	PP. Tarempa	Kepulauan Anambas	Small	Dropline	11	63

Table 2.13: 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
175	711	PPI Ladan	Kepulauan Anambas	Nano	Dropline	73	182
176	711	PPI Ladan	Kepulauan Anambas	Small	Dropline	1	5
177	711	Pangkal Balam	Kota Pangkalpinang	Nano	Dropline	2	7
178	711	Pangkal Balam	Kota Pangkalpinang	Nano	Trap	1	4
179	711	Pangkal Balam	Kota Pangkalpinang	Small	Trap	12	67
180	711	PP. Muara Sungai Baturusa	Kota Pangkalpinang	Nano	Trap	3	12
181	711	PP. Muara Sungai Baturusa	Kota Pangkalpinang	Small	Trap	9	51
182	711	Dermaga Kayu Sededap	Natuna	Nano	Dropline	1	5
183	711	Desa Air Nusa	Natuna	Nano	Dropline	23	43
184	711	Desa Air Ringau	Natuna	Nano	Dropline	12	18
185	711	Desa Batu Ampar	Natuna	Nano	Dropline	5	4
186	711	Desa Batu Brilian	Natuna	Nano	Dropline	21	44
187	711	Desa Batu Brilian	Natuna	Nano	Trap	1	4
188	711	Desa Pakkalung	Natuna	Nano	Dropline	1	2
189	711	Desa Sabang Mawang Barat	Natuna	Small	Dropline	12	72
190	711	Desa Sedanau	Natuna	Nano	Dropline	22	79
191	711	Desa Sepempang	Natuna	Small	Dropline	22	132
192	711	Desa Serantas_ Teluk Lagong	Natuna	Nano	Dropline	23	69
193	711	Desa Subi besar	Natuna	Nano	Dropline	23	69
194	711	Desa Tanjung Belau	Natuna	Nano	Dropline	31	56
195	711	Desa Tanjung Kumbik Utara	Natuna	Small	Dropline	15	90
196	711	Desa Tanjung Setelung	Natuna	Nano	Dropline	9	16
197	711	Desa Tanjung Setelung	Natuna	Nano	Trap	18	39
198	711	Desa Tanjung Setelung	Natuna	Small	Trap	3	18
199	711	Desa Teluk Buton	Natuna	Nano	Dropline	26	78
200	711	Natuna	Natuna	Large	Longline	3	94
201	711	Pelabuhan Harapan Air Putih	Natuna	Nano	Dropline	59	159
202	711	Pelabuhan Harapan Air Putih	Natuna	Small	Dropline	1	6
203	711	Pelabuhan Midai	Natuna	Medium	Dropline	1	12
204	711	Pelabuhan Midai	Natuna	Medium	Trap	2	22
205	711	Pelabuhan Midai	Natuna	Small	Dropline	2	11
206	711	Pelabuhan Pasir Putih	Natuna	Nano	Dropline	1	2
207	711	Pelabuhan Pering	Natuna	Medium	Dropline	2	30
208	711	Pelabuhan Pering	Natuna	Nano	Dropline	21	78
209	711	Pelabuhan Pering	Natuna	Small	Dropline	1	8
210	711	Pelabuhan Sabang Barat-Midai	Natuna	Medium	Trap	1	11
211	711	Pelabuhan Sabang Barat-Midai	Natuna	Small	Dropline	2	11
212	711	Pelabuhan Tanjung	Natuna	Nano	Dropline	30	59
213	711	Pering	Natuna	Nano	Dropline	1	4
214	711	PP. Pering	Natuna	Small	Dropline	1	5
215	711	PP. Tarempa	Natuna	Medium	Longline	1	18
216	711	Pulau Tiga Natuna	Natuna	Small	Dropline	1	8
217	711	Tanjung Balai Karimun	Natuna	Large	Longline	11	350
218	711	Tanjung Balai Karimun	Natuna	Medium	Longline	43	1223
219	711	PP. Bajomulyo	Pati	Large	Longline	1	85
220	711	PP. Kuala Mempawah	Pontianak	Medium	Trap	2	20
221	711	PP. Kuala Mempawah	Pontianak	Small	Trap	3	19
222	712	PP. Tanjung Pandan	Belitung	Nano	Trap	2	7
223	712	PP. Tanjung Pandan	Belitung	Small	Trap	12	63
224	712	Desa Parang	Jepara	Medium	Trap	26	404
225	712	Desa Parang	Jepara	Small	Trap	65	468
226	712	Pelabuhan Kartini, Jepara	Jepara	Nano	Longline	15	21
227	712	PP. Karimun Jawa	Jepara	Medium	Trap	8	104
228	712	PP. Karimun Jawa	Jepara	Small	Trap	4	37
229	712	TPI. Ujungbatu	Jepara	Nano	Longline	3	4
230	712	Kelurahan Pulau Kelapa Dua	Kepulauan Seribu	Small	Dropline	9	62
231	712	Kelurahan Pulau Pari	Kepulauan Seribu	Nano	Trap	2	9
232	712	Kelurahan Pulau Pari	Kepulauan Seribu	Small	Trap	3	17

Table 2.13: 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	712	Kelurahan Pulau Untung Jawa	Kepulauan Seribu	Nano	Trap	20	36
234	712	Kelurahan Pulau Untung Jawa	Kepulauan Seribu	Small	Trap	8	51
235	712	PP. Brondong	Lamongan	Medium	Dropline	167	2158
236	712	PP. Brondong	Lamongan	Medium	Longline	14	176
237	712	PP. Brondong	Lamongan	Small	Dropline	115	880
238	712	PP. Brondong	Lamongan	Small	Longline	1	9
239	712	PP. Bajomulyo	Pati	Large	Longline	30	1432
240	712	PP. Bajomulyo	Pati	Medium	Longline	13	355
241	712	PP. Asem Doyong	Pemalang	Small	Dropline	10	57
242	712	PP. Mayangan	Probolinggo	Medium	Longline	1	29
243	712	PP. Pondok Mimbo	Situbondo	Nano	Longline	100	156
244	712	Desa Bancamara	Sumenep	Medium	Dropline	2	28
245	712	Desa Bancamara	Sumenep	Nano	Dropline	1	4
246	712	Desa Bancamara	Sumenep	Small	Dropline	102	702
247	712	Desa Masalima	Sumenep	Small	Dropline	12	84
248	712	Pagerungan Besar	Sumenep	Medium	Longline	4	41
249	712	Pagerungan Besar	Sumenep	Nano	Longline	21	28
250	712	Pagerungan Besar	Sumenep	Small	Longline	45	312
251	712	Pagerungan Kecil	Sumenep	Nano	Longline	30	36
252	712	PP. Dungkek	Sumenep	Medium	Dropline	3	32
253	712	PP. Dungkek	Sumenep	Nano	Dropline	2	9
254	712	PP. Dungkek	Sumenep	Small	Dropline	7	43
255	712	Sumenep	Sumenep	Small	Dropline	300	2196
256	712	Pagatan	Tanah Bumbu	Small	Dropline	2	10
257	712	PP. Cituis	Tanggerang	Small	Trap	7	64
258	713	PP. Filial Klandasan	Balikpapan	Nano	Dropline	2	8
259	713	PP. Filial Klandasan	Balikpapan	Small	Dropline	22	126
260	713	PP. Klandasan	Balikpapan	Small	Dropline	3	21
261	713	PP. Manggar Baru	Balikpapan	Medium	Dropline	16	274
262	713	PP. Manggar Baru	Balikpapan	Nano	Longline	1	3
263	713	PP. Manggar Baru	Balikpapan	Small	Dropline	1	6
264	713	PP. Manggar Baru	Balikpapan	Small	Longline	7	39
265	713	PP. Tanjung Pandan	Belitung	Nano	Trap	1	3
266	713	PP. Tanjung Pandan	Belitung	Small	Dropline	1	5
267	713	PP. Tanjung Pandan	Belitung	Small	Trap	4	21
268	713	PP. Kore	Bima	Nano	Dropline	10	33
269	713	Lok Tuan	Bontang	Nano	Dropline	4	13
270	713	PP. Tanjung Limau	Bontang	Nano	Dropline	5	11
271	713	PP. Tanjung Limau	Bontang	Small	Dropline	4	24
272	713	Tanjung Laut	Bontang	Nano	Dropline	1	1
273	713	Desa Sangsit	Buleleng	Nano	Dropline	50	15
274	713	PP. Dannuang	Bulukumba	Nano	Dropline	20	20
275	713	PP. Kalumeme	Bulukumba	Nano	Dropline	20	20
276	713	PP. Kota Bulukumba	Bulukumba	Nano	Dropline	300	300
277	713	PP. Keramat	Dompu	Nano	Longline	10	4
278	713	PP. Malaju	Dompu	Nano	Dropline	1	1
279	713	PP. Malaju	Dompu	Nano	Longline	1	0
280	713	PP. Malaju	Dompu	Small	Dropline	10	52
281	713	PP. Soro Kempo	Dompu	Nano	Longline	32	13
282	713	PP. Soro Kempo	Dompu	Small	Dropline	17	88
283	713	PP. Labean	Donggala	Nano	Dropline	27	24
284	713	Anawoi	Kolaka	Medium	Trap	5	64
285	713	PP. Beba	Kota Makassar	Medium	Dropline	25	349
286	713	PP. Beba	Kota Makassar	Medium	Longline	61	735
287	713	PP. Beba	Kota Makassar	Nano	Longline	1	3
288	713	PP. Beba	Kota Makassar	Small	Dropline	1	8
289	713	PP. Beba	Kota Makassar	Small	Longline	3	24
290	713	Gang Kakap, Muara Jawa	Kutai Kartanegara	Nano	Longline	20	60

Table 2.13: 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	713	Kampung Terusan	Kutai Kartanegara	Small	Longline	10	85
292	713	Kuala Samboja	Kutai Kartanegara	Small	Longline	3	15
293	713	Pantai Biru Kersik	Kutai Kartanegara	Nano	Dropline	16	48
294	713	Semangkok	Kutai Kartanegara	Nano	Dropline	10	31
295	713	Maloy	Kutai Timur	Small	Dropline	1	5
296	713	Muara Selangkau	Kutai Timur	Nano	Dropline	40	120
297	713	PP. Kenyamukan	Kutai Timur	Medium	Dropline	3	32
298	713	PP. Kenyamukan	Kutai Timur	Nano	Dropline	40	40
299	713	PP. Kenyamukan	Kutai Timur	Small	Dropline	11	75
300	713	PP. Sangatta	Kutai Timur	Medium	Dropline	1	10
301	713	PP. Sangatta	Kutai Timur	Small	Dropline	5	31
302	713	PP. Brondong	Lamongan	Medium	Trap	1	19
303	713	Desa Wangatoa	Lembata	Nano	Dropline	20	23
304	713	Majene	Majene	Nano	Longline	38	114
305	713	Majene	Majene	Small	Dropline	1	7
306	713	Majene	Majene	Small	Longline	12	84
307	713	Pelabuhan Majene	Majene	Nano	Longline	34	96
308	713	PP. Rangas Majene	Majene	Nano	Longline	2	6
309	713	PP. Kasiwa	Mamuju	Nano	Dropline	31	93
310	713	PP. Kasiwa	Mamuju	Small	Dropline	4	20
311	713	PP. Labuhan Bajo	Manggarai Barat	Nano	Dropline	40	15
312	713	PP. Konge	Nagekeo	Nano	Dropline	30	8
313	713	Sumbawa	Pangkep	Nano	Longline	50	50
314	713	Muara Pasir	Paser	Nano	Longline	10	20
315	713	PP. Bajomulyo	Pati	Large	Longline	3	130
316	713	Kampung Pejala	Penajam Paser Utara	Nano	Dropline	2	7
317	713	Kampung Pejala	Penajam Paser Utara	Small	Dropline	17	85
318	713	Nenang	Penajam Paser Utara	Small	Trap	50	253
319	713	PP. Mayangan	Probolinggo	Medium	Longline	1	27
320	713	Desa Labuhan Sangoro	Sumbawa	Nano	Longline	20	37
321	713	Labuhan Sumbawa	Sumbawa	Medium	Dropline	1	17
322	713	Labuhan Sumbawa	Sumbawa	Nano	Dropline	3	12
323	713	Labuhan Sumbawa	Sumbawa	Small	Dropline	4	27
324	713	PP. Labuhan Terata	Sumbawa	Nano	Dropline	4	7
325	713	PP. Beba	Takalar	Medium	Dropline	2	25
326	713	PP. Beba	Takalar	Medium	Gillnet	12	185
327	713	PP. Beba	Takalar	Medium	Longline	19	244
328	713	PP. Beba	Takalar	Small	Dropline	2	17
329	713	PP. Beba	Takalar	Small	Gillnet	1	9
330	714	Kabola	Alor	Nano	Dropline	15	10
331	714	Kokar	Alor	Nano	Dropline	100	88
332	714	Banggai Kepulauan	Banggai Kepulauan	Nano	Dropline	10	10
333	714	Banggai Laut	Banggai Laut	Nano	Dropline	50	50
334	714	Bontosi	Banggai Laut	Nano	Dropline	1	3
335	714	Desa Bontosi	Banggai Laut	Nano	Dropline	1	2
336	714	Desa Matanga	Banggai Laut	Nano	Longline	5	4
337	714	Desa Tinakin Laut	Banggai Laut	Nano	Dropline	1	1
338	714	Kasuari	Banggai Laut	Nano	Longline	14	16
339	714	PP. Tanjung Pandan	Belitung	Small	Dropline	1	6
340	714	Desa Balimu	Buton	Nano	Dropline	5	6
341	714	Kelurahan Watolo	Buton Tengah	Nano	Gillnet	4	4
342	714	Kelurahan Watolo	Buton Tengah	Nano	Longline	13	13
343	714	Desa Tanjung Batu	Kepulauan Tanimbar	Nano	Dropline	1	2
344	714	Kampung Babar	Kepulauan Tanimbar	Nano	Dropline	1	4
345	714	Kampung Barbar	Kepulauan Tanimbar	Nano	Dropline	6	12
346	714	Pasar Baru Omele Saumlaki	Kepulauan Tanimbar	Nano	Dropline	6	13
347	714	Pasar Baru Omele Saumlaki	Kepulauan Tanimbar	Nano	Longline	1	3
348	714	Pasar Lama Saumlaki	Kepulauan Tanimbar	Nano	Dropline	1	2

Table 2.13: 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
349	714	Saumlaki	Kepulauan Tanimbar	Nano	Dropline	3	8
350	714	PPI Soropia	Konawe	Medium	Trap	1	12
351	714	PPI Soropia	Konawe	Nano	Trap	1	1
352	714	Desa Labengki	Konawe Utara	Nano	Dropline	5	5
353	714	Labengki	Konawe Utara	Nano	Dropline	4	5
354	714	Labengki	Konawe Utara	Nano	Longline	1	1
355	714	Asilulu	Maluku Tengah	Nano	Dropline	30	56
356	714	Batu Lubang	Maluku Tengah	Nano	Dropline	30	53
357	714	PP. Tulehu	Maluku Tengah	Large	Dropline	1	34
358	714	Desa Langgur	Maluku Tenggara	Small	Dropline	1	10
359	714	Desa Selayar	Maluku Tenggara	Nano	Dropline	5	7
360	714	Desa Watdek	Maluku Tenggara	Small	Dropline	5	32
361	714	PP. Kema	Minahasa Utara	Large	Dropline	1	30
362	714	Desa Bahonsuai	Morowali	Nano	Dropline	3	3
363	714	Desa Moahino	Morowali	Nano	Longline	2	4
364	714	Desa Umbele	Morowali	Nano	Dropline	2	2
365	714	Desa Umbele	Morowali	Nano	Longline	2	4
366	714	Desa Limbo	Pulau Taliabu	Nano	Longline	30	18
367	714	Dusun Anauni	Seram Bagian Barat	Nano	Dropline	15	15
368	714	Dusun Anauni	Seram Bagian Barat	Nano	Longline	35	44
369	714	Dusun Huaroa	Seram Bagian Barat	Nano	Dropline	50	74
370	714	Dusun Huhua	Seram Bagian Barat	Nano	Dropline	20	27
371	714	Dusun Naeselan	Seram Bagian Barat	Nano	Dropline	20	33
372	714	Dusun Patinea	Seram Bagian Barat	Nano	Dropline	15	21
373	714	Dusun Pohon Batu	Seram Bagian Barat	Nano	Dropline	10	11
374	714	Dusun Waisela	Seram Bagian Barat	Nano	Dropline	4	4
375	714	Desa Mangon	Tual	Small	Dropline	1	7
376	714	PP. Tual	Tual	Medium	Dropline	1	28
377	714	PP. Tual	Tual	Nano	Dropline	1	2
378	714	PP. Tual	Tual	Small	Dropline	4	25
379	714	Binongko	Wakatobi	Medium	Dropline	1	13
380	714	Binongko	Wakatobi	Nano	Dropline	28	16
381	714	Dermaga Desa Wali	Wakatobi	Small	Dropline	1	5
382	714	Desa Lagongga	Wakatobi	Nano	Dropline	7	26
383	714	Desa Lagongga	Wakatobi	Small	Dropline	1	6
384	714	Desa Wali	Wakatobi	Nano	Dropline	2	8
385	714	Pelabuhan Lagelewa	Wakatobi	Nano	Dropline	1	3
386	715	Desa Jayabakti	Banggai	Nano	Dropline	51	40
387	715	Desa Jayabakti	Banggai	Nano	Longline	5	4
388	715	Pagimana	Banggai	Nano	Dropline	2	4
389	715	Pangkalaseang	Banggai	Nano	Dropline	10	10
390	715	Kampung Sekar	Fakfak	Nano	Dropline	7	7
391	715	Kampung Sosar, Kokas	Fakfak	Nano	Dropline	7	7
392	715	Kampung Ugar	Fakfak	Nano	Dropline	17	11
393	715	Pasar Sorpeha	Fakfak	Nano	Dropline	9	22
394	715	PP. PP. Dulan Pok-Pok	Fakfak	Nano	Dropline	215	206
395	715	Bacan	Halmahera Selatan	Nano	Dropline	9	5
396	715	Bacan	Halmahera Selatan	Nano	Longline	1	0
397	715	Bacan Barat	Halmahera Selatan	Nano	Dropline	6	2
398	715	Bacan Tengah	Halmahera Selatan	Nano	Dropline	24	8
399	715	Bacan Timur	Halmahera Selatan	Nano	Dropline	4	1
400	715	Bacan Utara	Halmahera Selatan	Nano	Dropline	5	2
401	715	Desa Akegula	Halmahera Selatan	Nano	Dropline	15	16
402	715	Desa Amasing Kota Barat	Halmahera Selatan	Nano	Longline	1	2
403	715	Desa Babang	Halmahera Selatan	Nano	Dropline	7	4
404	715	Desa Jikotamo	Halmahera Selatan	Nano	Dropline	15	20
405	715	Desa Laiwui	Halmahera Selatan	Nano	Dropline	12	13
406	715	Desa Lalei	Halmahera Selatan	Nano	Dropline	29	17

Table 2.13: 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
407	715	Desa Sali Kecil	Halmahera Selatan	Nano	Dropline	20	8
408	715	Desa Tabapoma	Halmahera Selatan	Nano	Dropline	11	4
409	715	Gane Barat	Halmahera Selatan	Nano	Dropline	15	5
410	715	Gane Timur Selatan	Halmahera Selatan	Nano	Dropline	40	13
411	715	Kep. Batang Lomang	Halmahera Selatan	Nano	Dropline	12	4
412	715	Kep. Joronga	Halmahera Selatan	Nano	Dropline	7	2
413	715	Mandioli Selatan	Halmahera Selatan	Nano	Dropline	13	4
414	715	Mandioli Utara	Halmahera Selatan	Nano	Dropline	17	5
415	715	Pasar Tembal	Halmahera Selatan	Nano	Dropline	30	13
416	715	Puau Obilatu	Halmahera Selatan	Nano	Dropline	10	3
417	715	Pulau Obi	Halmahera Selatan	Nano	Dropline	62	18
418	715	Buli	Halmahera Timur	Nano	Dropline	7	7
419	715	Halmahera Timur	Halmahera Timur	Nano	Dropline	48	78
420	715	Desa Trikora	Kaimana	Nano	Dropline	10	10
421	715	Kampung Air Merah	Kaimana	Nano	Dropline	33	33
422	715	Kampung Air Tiba	Kaimana	Nano	Dropline	10	10
423	715	Namatota	Kaimana	Medium	Dropline	2	49
424	715	Namatota	Kaimana	Medium	Longline	2	30
425	715	PU. Kaimana	Kaimana	Large	Longline	1	30
426	715	PU. Kaimana	Kaimana	Medium	Longline	2	43
427	715	Pasar Galala	Kota Tidore Kepulauan	Nano	Dropline	10	10
428	715	Desa Sawai	Maluku Tengah	Nano	Dropline	55	61
429	715	PP. Kema	Minahasa Utara	Large	Dropline	3	130
430	715	PP. Kema	Minahasa Utara	Medium	Dropline	11	320
431	715	Desa Geser	Seram Bagian Timur	Nano	Dropline	44	62
432	715	Desa Kilfura	Seram Bagian Timur	Nano	Dropline	31	27
433	715	Desa Kiltay	Seram Bagian Timur	Nano	Dropline	25	25
434	715	Desa Namalena	Seram Bagian Timur	Nano	Dropline	26	26
435	715	Desa Pantai Pos, Bula	Seram Bagian Timur	Nano	Dropline	10	17
436	715	Desa Pantai Pos, Bula	Seram Bagian Timur	Nano	Longline	10	17
437	715	Desa Waru	Seram Bagian Timur	Nano	Longline	2	3
438	715	Pulau Parang	Seram Bagian Timur	Nano	Dropline	10	17
439	715	Desa Kali Remu	Sorong	Nano	Dropline	2	6
440	715	Desa Kali Remu	Sorong	Nano	Trap	1	3
441	715	Jembatan Puri Sorong	Sorong	Medium	Dropline	4	75
442	715	Jembatan Puri Sorong	Sorong	Small	Dropline	3	20
443	715	PP. Sorong	Sorong	Medium	Dropline	9	170
444	715	PP. Sorong	Sorong	Medium	Longline	1	17
445	715	PP. Sorong	Sorong	Medium	Trap	10	153
446	715	PP. Sorong	Sorong	Nano	Dropline	3	11
447	715	PP. Sorong	Sorong	Small	Trap	2	18
448	715	Bajugan	Tolitoli	Nano	Dropline	10	6
449	716	Biduk-biduk	Berau	Medium	Dropline	1	22
450	716	Biduk-biduk	Berau	Nano	Dropline	23	69
451	716	Desa Tanjung Batu	Berau	Nano	Dropline	64	192
452	716	Giring-giring	Berau	Nano	Dropline	22	66
453	716	Labuan Cermin	Berau	Nano	Dropline	1	3
454	716	P. Derawan	Berau	Nano	Trap	4	7
455	716	Pantai Harapan	Berau	Nano	Dropline	20	60
456	716	Tanjung Batu	Berau	Nano	Trap	6	18
457	716	Tanjung Batu	Berau	Small	Trap	1	8
458	716	Teluk Sulaiman	Berau	Nano	Dropline	29	87
459	716	Desa Sampiro	Bolaang Mongondow Utara	Nano	Dropline	11	4
460	716	Desa Bulontio	Gorontalo Utara	Nano	Dropline	11	5
461	716	Desa Buluwatu	Gorontalo Utara	Nano	Dropline	21	16
462	716	Desa Huntokalo	Gorontalo Utara	Nano	Dropline	10	3
463	716	Desa Tihengo	Gorontalo Utara	Nano	Dropline	26	7
464	716	Desa Dalako Bembanehe	Kepulauan Sangihe	Nano	Dropline	4	2

Table 2.13: 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	716	Desa Lipang	Kepulauan Sangihe	Nano	Dropline	5	2
466	716	Desa Paruruang	Kepulauan Sangihe	Nano	Dropline	16	8
467	716	Desa Parururang	Kepulauan Sangihe	Nano	Dropline	5	2
468	716	Kampung Lipang	Kepulauan Sangihe	Nano	Dropline	5	1
469	716	Sangihe	Kepulauan Sangihe	Nano	Dropline	2	0
470	716	Tariang Baru	Kepulauan Sangihe	Nano	Longline	4	3
471	716	Buhias	Kepulauan Sitaro	Nano	Dropline	153	124
472	716	Mahongsawang Tagulandang	Kepulauan Sitaro	Nano	Dropline	8	4
473	716	Mongsawang	Kepulauan Sitaro	Nano	Dropline	16	6
474	716	Pulau Biaro	Kepulauan Sitaro	Nano	Dropline	29	7
475	716	Desa Damau	Kepulauan Talaud	Nano	Dropline	8	3
476	716	Dusun Bawunian	Kepulauan Talaud	Nano	Dropline	26	29
477	716	Belakang BRI, Selumit Pantai	Tarakan	Nano	Longline	46	138
478	716	Belakang BRI, Selumit Pantai	Tarakan	Small	Longline	4	20
479	716	Mamburungan Dalam	Tarakan	Nano	Dropline	48	144
480	717	Biak	Biak	Nano	Dropline	1796	1793
481	717	Desa Nikakamp	Biak	Nano	Dropline	4	7
482	717	Desa Tanjung Barari	Biak	Nano	Dropline	5	4
483	717	Fanindi Pantai	Manokwari	Nano	Dropline	10	26
484	717	Kampung Arowi 2	Manokwari	Nano	Dropline	4	9
485	717	Kampung Borobudur 2	Manokwari	Nano	Dropline	12	30
486	717	Kampung Fanindi	Manokwari	Nano	Dropline	20	22
487	717	Kampung Kimi	Nabire	Nano	Dropline	1	1
488	717	Kampung Smoker	Nabire	Nano	Dropline	4	9
489	717	Kampung Waharia	Nabire	Nano	Dropline	2	2
490	717	Pasar Kalibobo	Nabire	Nano	Dropline	1	4
491	717	PP. Sanoba	Nabire	Nano	Dropline	4	14
492	717	Wasior	Teluk Wondama	Nano	Dropline	19	23
493	718	PP. Nizam Zachman	Jakarta Utara	Large	Longline	4	205
494	718	Namatota	Kaimana	Large	Longline	1	72
495	718	Dusun Wamar Desa Durjela	Kepulauan Aru	Medium	Longline	4	73
496	718	PP. Bajomulyo	Kepulauan Aru	Large	Gillnet	1	82
497	718	PP. Benjina	Kepulauan Aru	Large	Longline	2	92
498	718	PP. Dobo	Kepulauan Aru	Large	Gillnet	8	527
499	718	PP. Dobo	Kepulauan Aru	Large	Longline	10	596
500	718	PP. Dobo	Kepulauan Aru	Medium	Dropline	93	1658
501	718	PP. Dobo	Kepulauan Aru	Medium	Gillnet	5	121
502	718	PP. Dobo	Kepulauan Aru	Medium	Longline	10	185
503	718	PP. Dobo	Kepulauan Aru	Nano	Dropline	11	30
504	718	PP. Dobo	Kepulauan Aru	Nano	Longline	8	23
505	718	PP. Dobo	Kepulauan Aru	Small	Dropline	7	56
506	718	PP. Dobo	Kepulauan Aru	Small	Longline	1	7
507	718	PP. Kaimana	Kepulauan Aru	Large	Longline	1	51
508	718	PP. Klidang Lor	Kepulauan Aru	Large	Gillnet	1	73
509	718	PP. Mayangan	Kepulauan Aru	Large	Longline	19	1405
510	718	PP. Merauke	Kepulauan Aru	Large	Longline	4	397
511	718	PP. Nizam Zachman	Kepulauan Aru	Large	Gillnet	1	92
512	718	PP. Pekalongan	Kepulauan Aru	Large	Gillnet	1	115
513	718	PU. Dobo	Kepulauan Aru	Large	Gillnet	3	285
514	718	PU. Dobo	Kepulauan Aru	Large	Longline	36	2670
515	718	Saumlaki	Kepulauan Tanimbar	Nano	Dropline	37	109
516	718	Saumlaki	Kepulauan Tanimbar	Small	Dropline	1	5
517	718	Saumlaki	Kepulauan Tanimbar	Small	Longline	5	37
518	718	PP. Bajomulyo	Merauke	Large	Gillnet	1	91
519	718	PP. Merauke	Merauke	Large	Gillnet	48	3873
520	718	PP. Merauke	Merauke	Large	Longline	2	213
521	718	PP. Merauke	Merauke	Medium	Gillnet	5	138
522	718	PP. Nizam Zachman	Merauke	Large	Gillnet	13	841

Table 2.13: 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
523	718	PP. Nizam Zachman	Merauke	Large	Longline	1	60
524	718	PP. Poumako	Merauke	Medium	Gillnet	3	88
525	718	PP. Tegal	Merauke	Large	Gillnet	1	148
526	718	PP. Bajomulyo	Mimika	Large	Longline	1	82
527	718	PP. Dobo	Mimika	Large	Gillnet	1	75
528	718	PP. Mayangan	Mimika	Large	Gillnet	1	129
529	718	PP. Merauke	Mimika	Large	Gillnet	2	123
530	718	PP. Merauke	Mimika	Medium	Gillnet	2	49
531	718	PP. Muara Angke	Mimika	Large	Gillnet	1	92
532	718	PP. Nizam Zachman	Mimika	Large	Gillnet	1	88
533	718	PP. Paumako	Mimika	Large	Gillnet	1	30
534	718	PP. Paumako	Mimika	Medium	Gillnet	2	58
535	718	PP. Pekalongan	Mimika	Large	Gillnet	1	112
536	718	PP. Pomako	Mimika	Medium	Gillnet	1	16
537	718	PP. Poumako	Mimika	Large	Gillnet	2	60
538	718	PP. Poumako	Mimika	Medium	Gillnet	12	284
539	718	PP. Poumako	Mimika	Small	Gillnet	3	28
540	718	Timika	Mimika	Medium	Longline	3	88
541	718	PP. Bajomulyo	Pati	Large	Longline	1	119
542	718	Bagansiapiapi	Probolinggo	Large	Longline	1	40
543	718	PP. Dobo	Probolinggo	Large	Longline	2	142
544	718	PP. Mayangan	Probolinggo	Large	Gillnet	3	124
545	718	PP. Mayangan	Probolinggo	Large	Longline	34	2103
546	718	PP. Mayangan	Probolinggo	Medium	Longline	7	199
547	718	Probolinggo	Probolinggo	Large	Longline	20	1460
548	718	PP. Lappa	Sinjai	Large	Dropline	1	35
549	718	PP. Lappa	Sinjai	Medium	Dropline	10	235
550	718	PP. Bajomulyo	Tual	Large	Longline	1	87
		TOTAL				11536	62678

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 (Lmat), optimum harvest size (Lopt: Beverton, 1992), asymptotic length (Linf), and maximum total length (Lmax). Procedures for estimation of these length based life history characteristics are explained in the "Guide to Length Based Stock Assessment" (Mous et al., 2020). 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). Graphs for the Top 20 species 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 five 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-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-mat AND "TradeLimit" is lower than or equal to 1.1 * L-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-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 therefore consider a majority in the catch around or above the optimum harvest size (large matures) 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 (large mature fish). 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 as a fraction of the spawning stock biomass of that population if it would have been pristine (Meester et al 2001). We calculated SPR on a per-recruit basis from life-history parameters M, F, K, and Linf, and from gear selectivity parameters in the smaller part of the size spectrum caught by the fishery.

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 bheq of the R Fishmethods package. For this estimation, we used the length range of the catch length-frequency distribution starting with the length 5% higher than the modal length and ending with the 99th percentile. We assumed that Z, and its constituents M and F, were constant over length range that we used to estimate Z. We calculated F (fishing mortality) as the difference between Z and M, assuming full selectivity for the size range starting at modal length and ending with the largest fish in the catch. We assumed an S-shaped (logistic) selectivity curve, with 99% selectivity achieved at modal length, and with the length at 50% selectivity halfway between the first percentile and modal length of the catch length-frequency distribution.

Gislason et al (2010) provides evidence that M increases with decreasing length, and fisheries scientists agree that the smaller size classes of each fish species experience higher mortality than larger fish due to higher predation risk. The method we used for calculating Z, however, assumes a Z that is constant, implicating a constant M, over the length range over which we estimated Z. To iron out this inconsistency, we applied the Gislason et al (2010) empirical relationship to the length classes (1 cm width) over which we estimated Z, we calculated the average M over these size classes, and we applied that average to the Z estimation range. Outside this range (i.e., at lengths below 1.05 times modal length and lengths above the 99th percentile), we assumed a varying M following Gislason's formula (Mous et al., 2020).

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 Bo to be the lower limit reference point for stock size, minimizing the impact of fishing. Using SPR and B/Bo 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. Risk levels on the basis of SPR estimates are determined as follows:

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 716 however, is landed in East Kalimantan, North Sulawesi and North Halmahera, and sent to processing centres in Kalimantan and Sulawesi.

The current report with length based stock assessments for groupers, snappers, emperors and grunts in WPP 716 is based on catches that were made on WPP 716 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 coastlines of East Kalimantan, North Sulawesi and North Halmahera (Figures 3.4 and 3.6) operate in WPP 716 as well as in neighbouring WPP like WPP 713, WPP 715 and WPP 717, and even sometimes in Philippines waters in the north. The Spot Trace data from the WPP 716 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 sometimes even in neighbouring countries.

Coordination of management across WPP boundaries is especially important when fishing grounds are continues 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 716, many vessels are fishing right around the border separating different management areas.

Potential IUU issues related to fish landed at ports in WPP 716 include the illegal operation by various fleets outside Indonesian waters in the southern Celebes and Philippine Seas. 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.

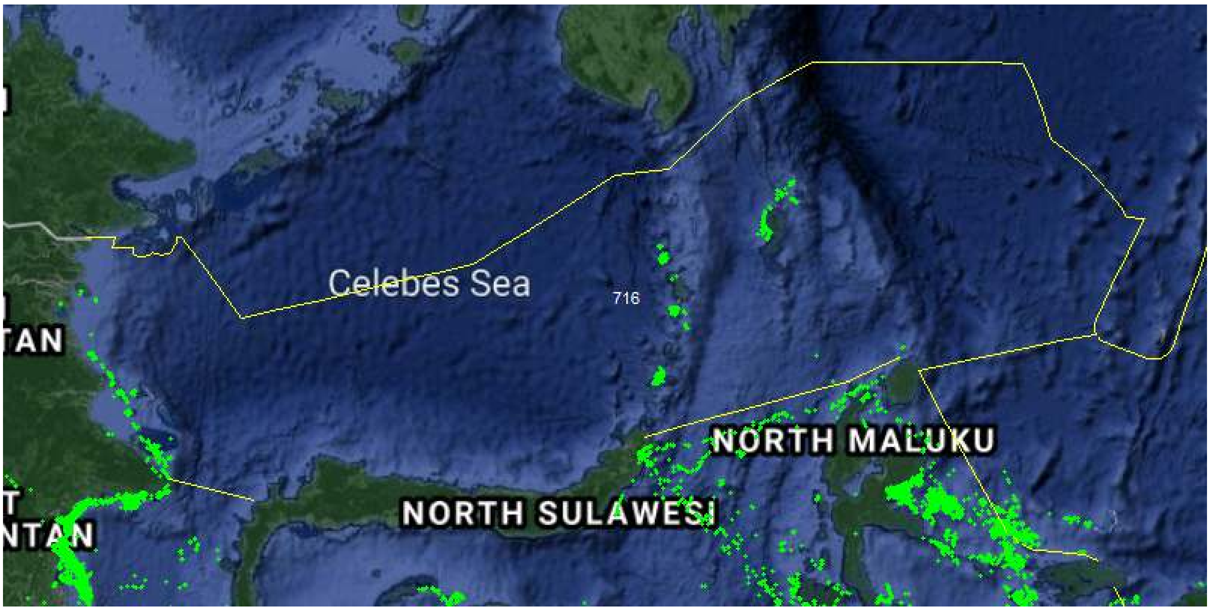


Figure 3.1: Fishing positions of dropliners participating in the CODRS program over the years 2014 - 2019 in WPP 716, as reported by Spot Trace. Reported positions during steaming, anchoring, or docking are excluded from this map.

Figure 3.2: Fishing positions of longliners participating in the CODRS program over the years 2014 - 2019 in WPP 716, as reported by Spot Trace. Reported positions during steaming, anchoring, or docking are excluded from this map.

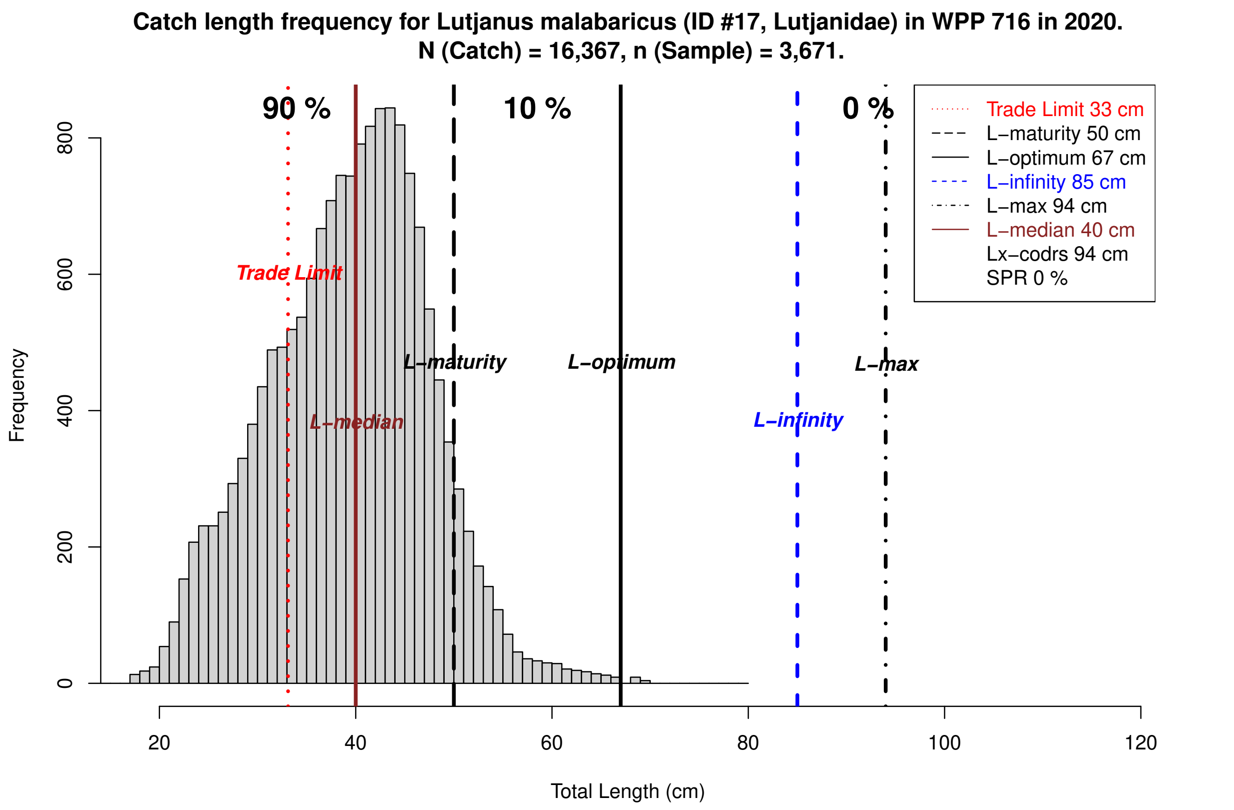
Figure 3.3: Fishing positions of vessels applying more than one gear, participating in the CODRS program over the years 2014 - 2019 in WPP 716, as reported by Spot Trace. Gears used by the vessels in this group are a combination of droplines, longlines, traps, and gillnets. Reported positions during steaming, anchoring, or docking are excluded from this map.

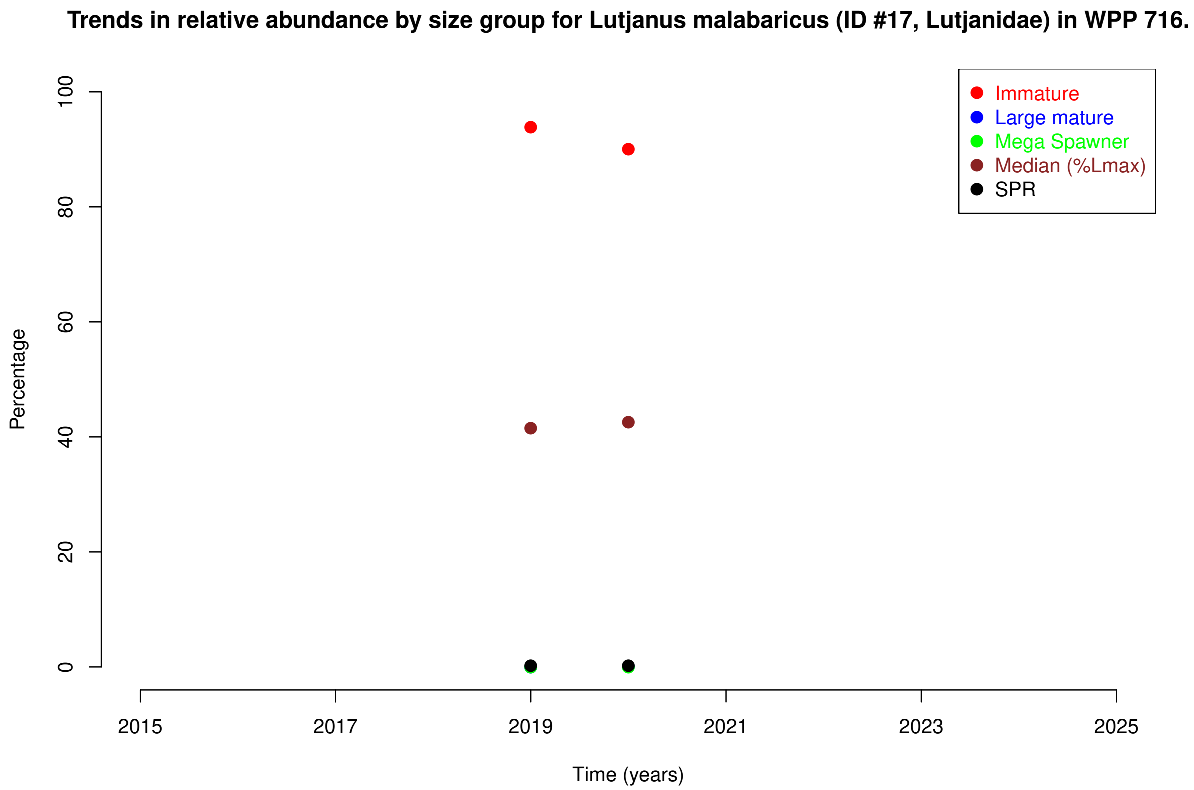
Figure 3.4: A typical snapper fishing boat from Kepulauan Sitaro, Sulawesi Utara, operating in the Celebes Sea (WPP 571) and on nearby fishing grounds.

Figure 3.5: A typical snapper fishing boat from Kepulauan Sitaro, Sulawesi Utara, operating in the Celebes Sea (WPP 571) and on nearby fishing grounds.

Figure 3.6: A typical snapper fishing boat from Kepulauan Berau, Kalimantan Utara, operating in the Celebes Sea (WPP 571) and on nearby fishing grounds.

4 Length-based assessments of Top 20 most abundant species in CODRS samples





The percentages of Lutjanus malabaricus (ID #17, Lutjanidae) in 2020.
N (Catch) =16,367, n (Sample) = 3,671
Immature (< 50cm): 90%
Small mature (>= 50cm, < 67cm): 10%
Large mature (>= 67cm): 0%
Mega spawner (>= 73.7cm): 0% (subset of large mature fish)
Spawning Potential Ratio: 0 %

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.

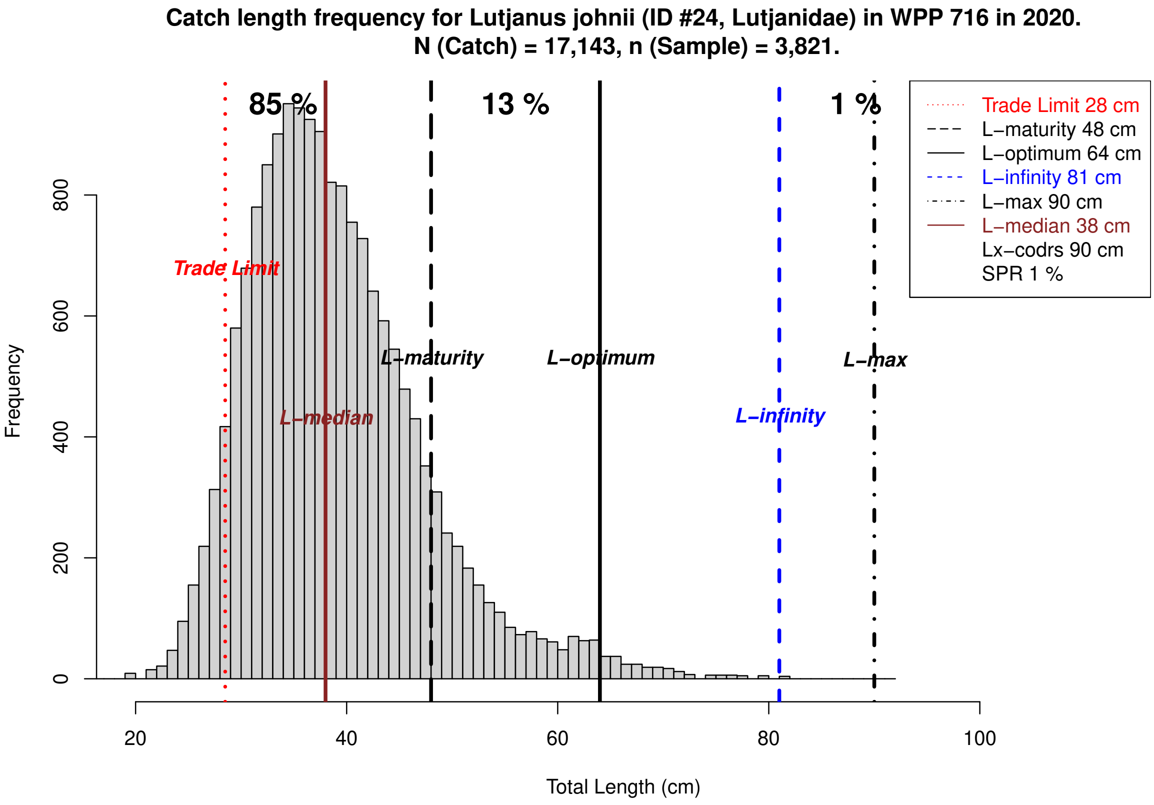
The majority of the fish in the catch have not had a chance to reproduce before capture. This fishery is most likely overfished already if fishing mortality is high for all size classes in the population. An immediate shift away from targeting juvenile fish and a reduction in overall fishing pressure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

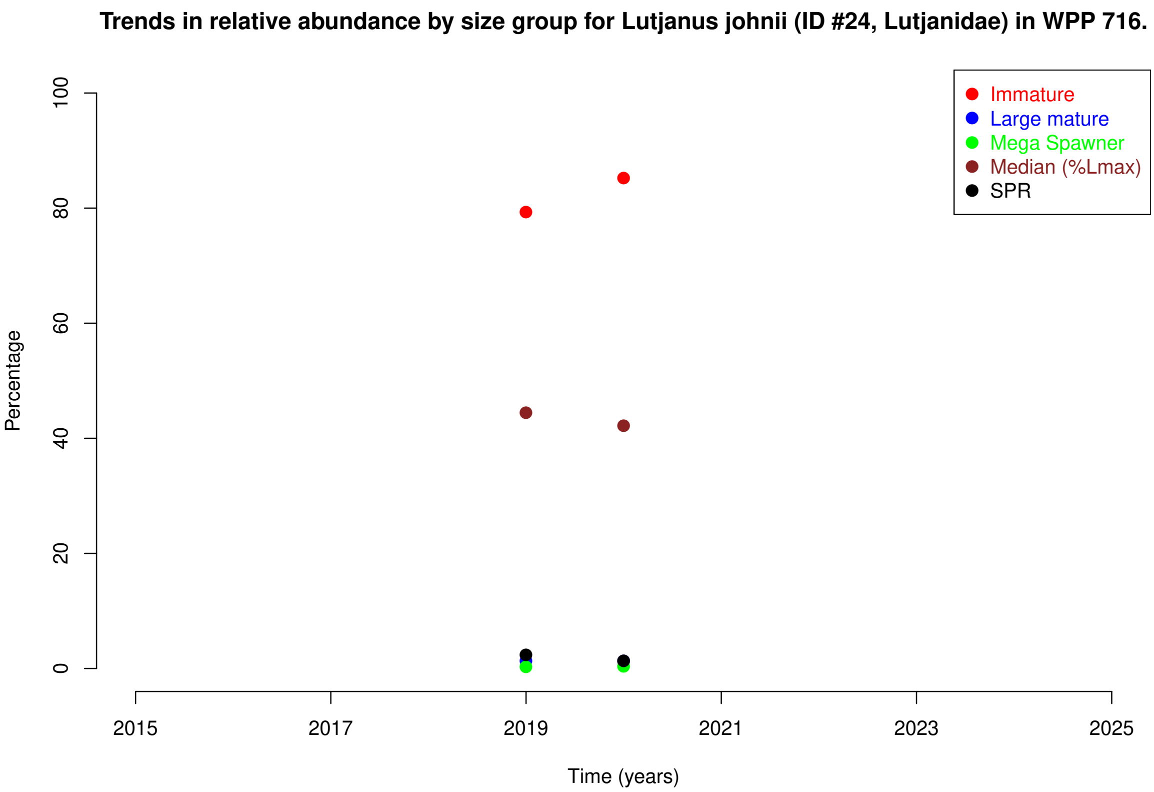
The vast majority of the fish in the catch have not yet achieved their growth potential. The harvest of small fish promotes growth overfishing and the size distribution for this species indicates that over exploitation through growth overfishing may already be happening. Risk level is high.

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 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.


Catch length frequency for Lutjanus johnii (ID #24, Lutjanidae) in WPP 716 in 2020.
N (Catch) = 17,143, n (Sample) = 3,821.
85 %
13 %
1 %
Trade Limit 28 cm
L–maturity 48 cm
L–optimum 64 cm
L–infinity 81 cm
L–max 90 cm
L–median 38 cm
Lx–codrs 90 cm
SPR 1 %
Trade Limit
L–maturity
L–optimum
L–max
L–median
L–infinity
Frequency
Total Length (cm)
0
200
400
600
800
20
40
60
80
100


Trends in relative abundance by size group for Lutjanus johnii (ID #24, Lutjanidae) in WPP 716.
Immature
Large mature
Mega Spawner
Median (%Lmax)
SPR
Percentage
Time (years)
0
20
40
60
80
100
2015
2017
2019
2021
2023
2025

The percentages of Lutjanus johnii (ID #24, Lutjanidae) in 2020.
N (Catch) =17,143, n (Sample) = 3,821
Immature (< 48cm): 85%
Small mature (>= 48cm, < 64cm): 13%
Large mature (>= 64cm): 1%
Mega spawner (>= 70.4cm): 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.

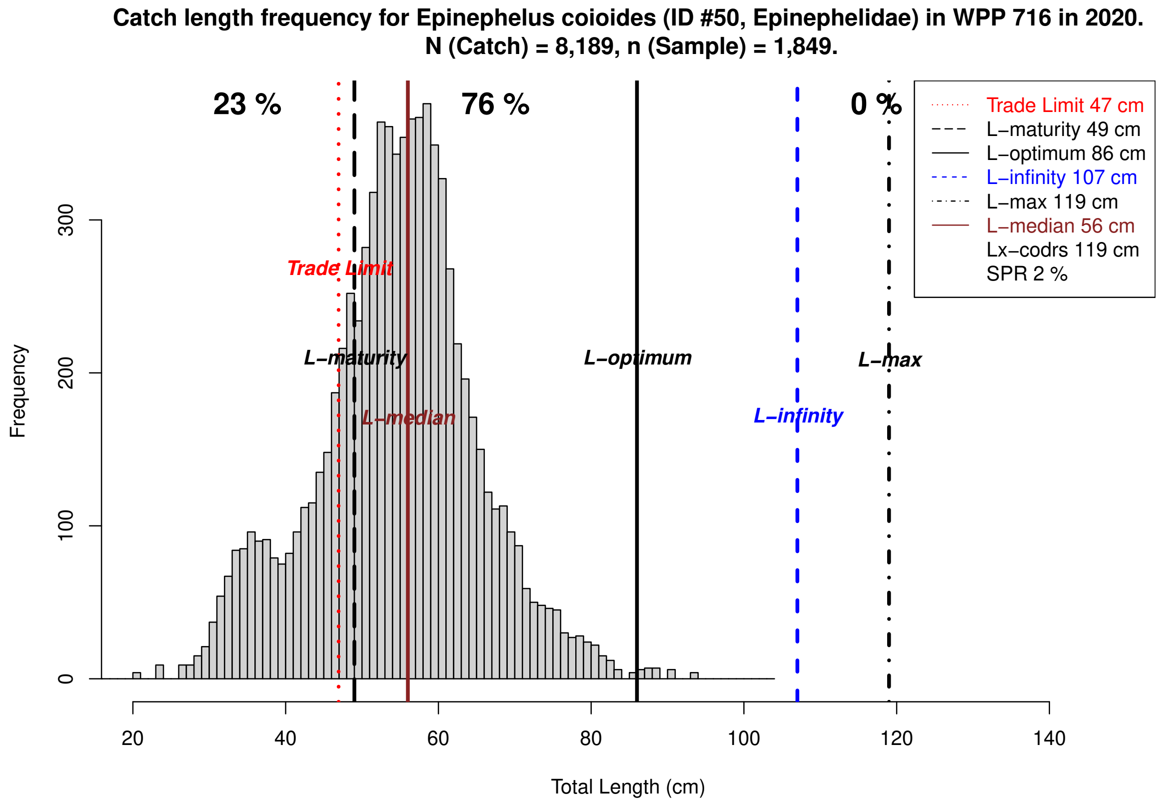
The majority of the fish in the catch have not had a chance to reproduce before capture. This fishery is most likely overfished already if fishing mortality is high for all size classes in the population. An immediate shift away from targeting juvenile fish and a reduction in overall fishing pressure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

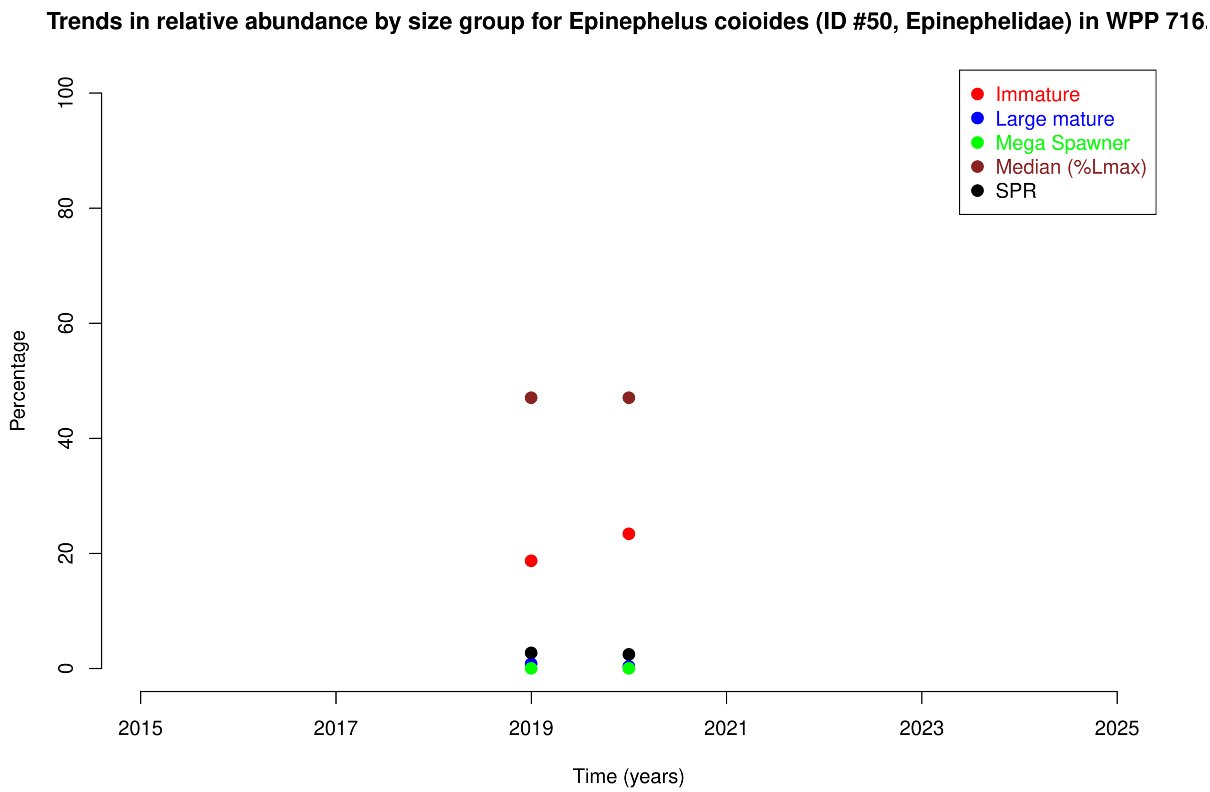
The vast majority of the fish in the catch have not yet achieved their growth potential. The harvest of small fish promotes growth overfishing and the size distribution for this species indicates that over exploitation through growth overfishing may already be happening. Risk level is high.

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 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.


Catch length frequency for Epinephelus coioides (ID #50, Epinephelidae) in WPP 716 in 2020.
N (Catch) = 8,189, n (Sample) = 1,849.
23 %
76 %
0 %
Trade Limit 47 cm
L–maturity 49 cm
L–optimum 86 cm
L–infinity 107 cm
L–max 119 cm
L–median 56 cm
Lx–codrs 119 cm
SPR 2 %
Trade Limit
L–maturity
L–median
L–optimum
L–infinity
L–max
Frequency
Total Length (cm)


Trends in relative abundance by size group for Epinephelus coioides (ID #50, Epinephelidae) in WPP 716.
Immature
Large mature
Mega Spawner
Median (%Lmax)
SPR
Percentage
Time (years)

The percentages of Epinephelus coioides (ID #50, Epinephelidae) in 2020.
N (Catch) =8,189, n (Sample) = 1,849
Immature (< 49cm): 23%
Small mature (>= 49cm, < 86cm): 76%
Large mature (>= 86cm): 0%
Mega spawner (>= 94.6cm): 0% (subset of large mature fish)
Spawning Potential Ratio: 2 %

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.

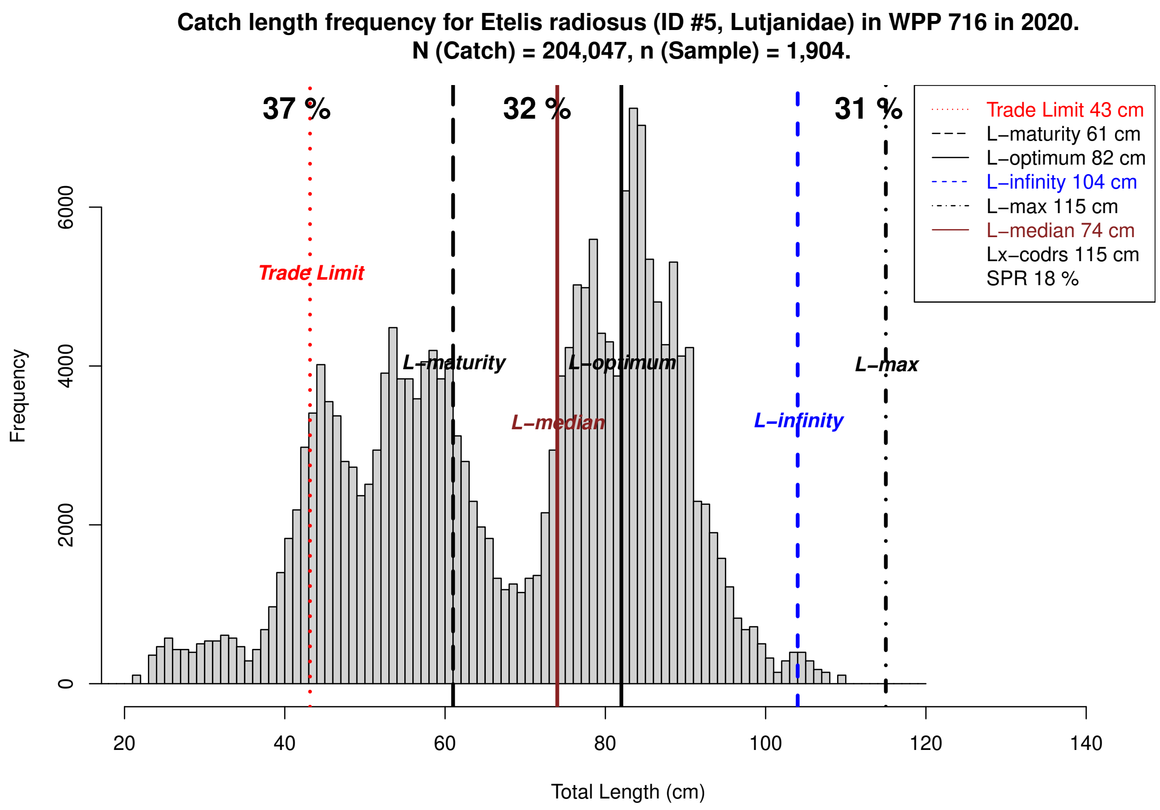
Between 20% and 30% of the fish in the catch are specimens that have not yet reproduced. This is reason for concern in terms of potential overfishing through overharvesting of juveniles, if fishing pressure is high and percentages immature fish would further rise. Targeting larger fish and avoiding small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

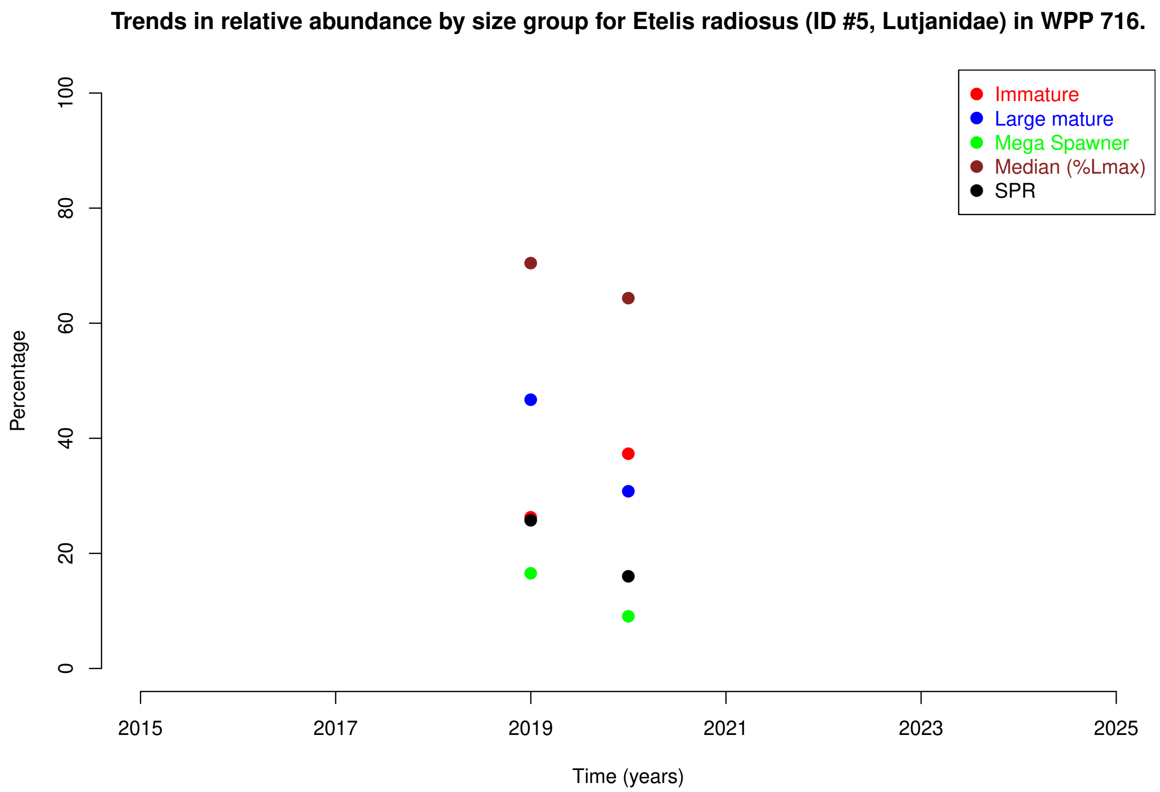
The vast majority of the fish in the catch have not yet achieved their growth potential. The harvest of small fish promotes growth overfishing and the size distribution for this species indicates that over exploitation through growth overfishing may already be happening. Risk level is high.

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.


Catch length frequency for Etelis radiosus (ID #5, Lutjanidae) in WPP 716 in 2020.
N (Catch) = 204,047, n (Sample) = 1,904.
37 %
32 %
31 %
Trade Limit 43 cm
L−maturity 61 cm
L−optimum 82 cm
L−infinity 104 cm
L−max 115 cm
L−median 74 cm
Lx−codrs 115 cm
SPR 18 %
Trade Limit
L−maturity
L−optimum
L−median
L−infinity
L−max
Frequency
Total Length (cm)


Trends in relative abundance by size group for Etelis radiosus (ID #5, Lutjanidae) in WPP 716.
Immature
Large mature
Mega Spawner
Median (%Lmax)
SPR
Percentage
Time (years)

The percentages of Etelis radiosus (ID #5, Lutjanidae) in 2020.
N (Catch) =204,047, n (Sample) = 1,904
Immature (< 61cm): 37%
Small mature (>= 61cm, < 82cm): 32%
Large mature (>= 82cm): 31%
Mega spawner (>= 90.2cm): 9% (subset of large mature fish)
Spawning Potential Ratio: 18 %

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.

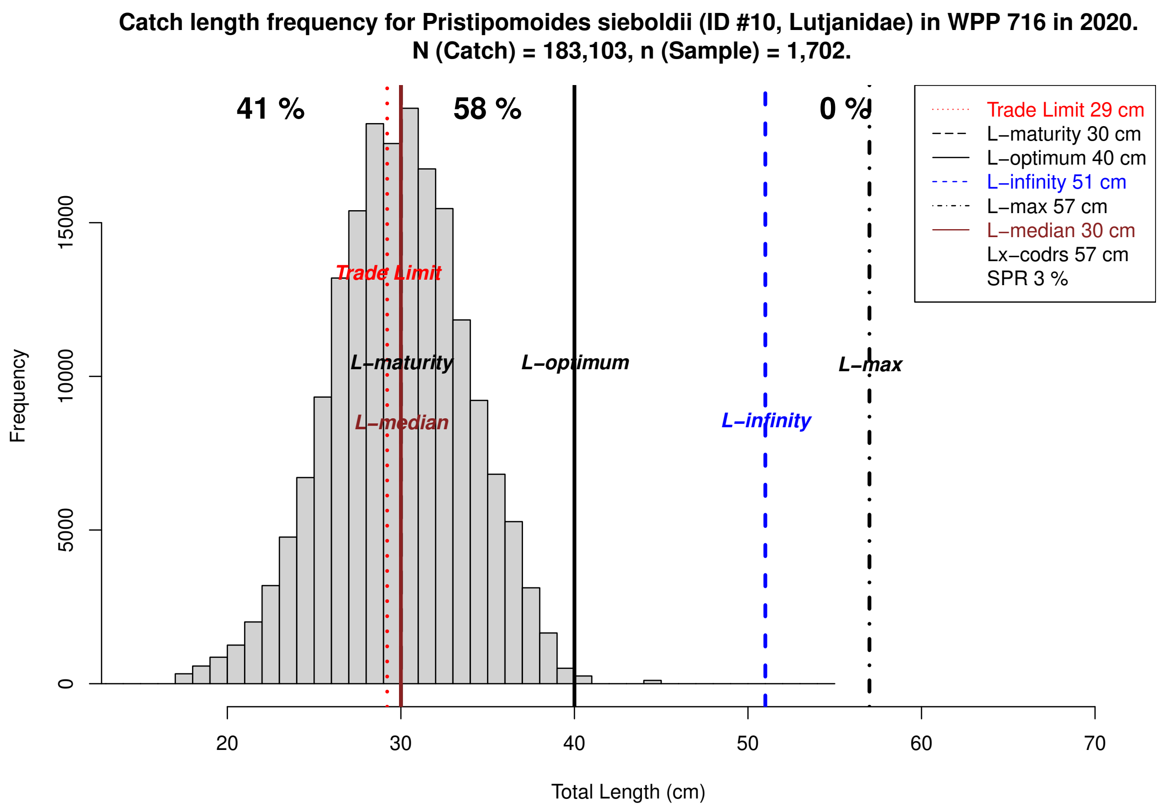
Between 30% and 50% of the fish in the catch are immature and have not had a chance to reproduce before capture. The fishery is in immediate danger of overfishing through overharvesting of juveniles, if fishing pressure is high. Catching small and immature fish needs to be actively avoided and a limit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

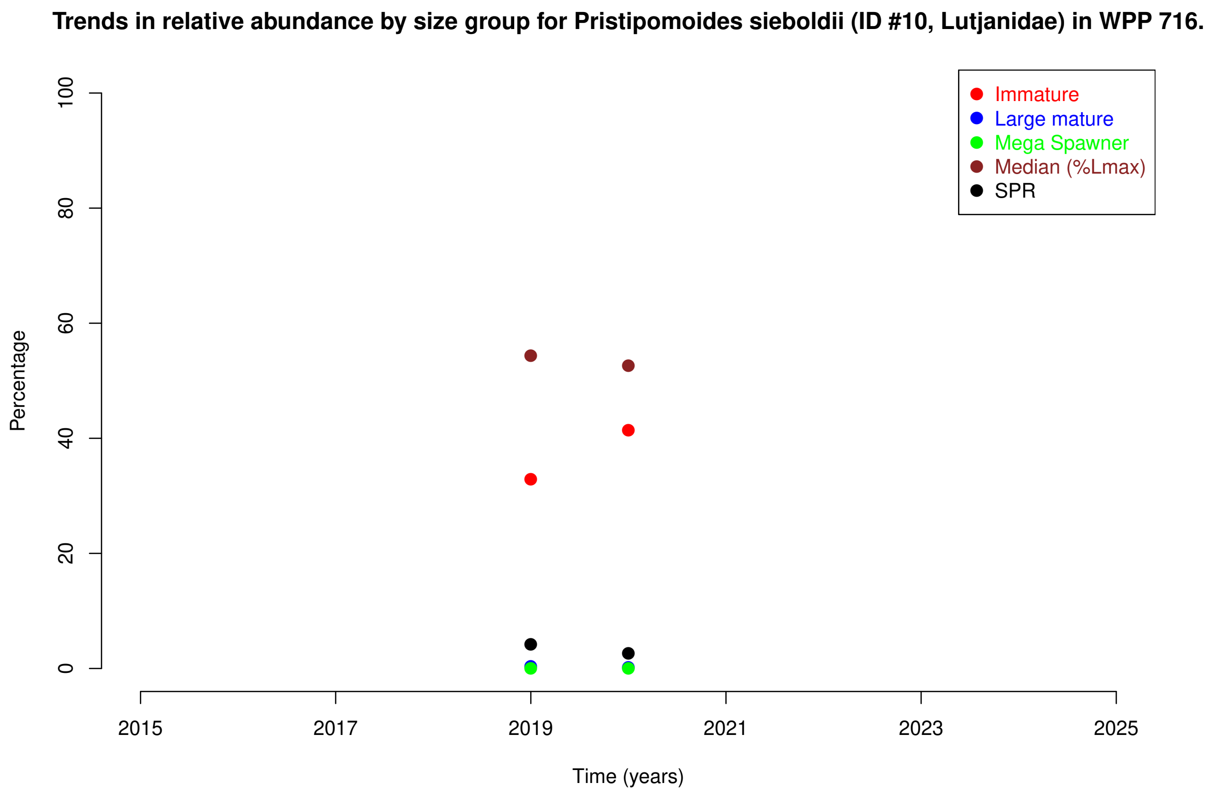
The vast majority of the fish in the catch have not yet achieved their growth potential. The harvest of small fish promotes growth overfishing and the size distribution for this species indicates that over exploitation through growth overfishing may already be happening. Risk level is high.

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 Etelis radiosus (ID #5, 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.


Catch length frequency for Pristipomoides sieboldii (ID #10, Lutjanidae) in WPP 716 in 2020.
N (Catch) = 183,103, n (Sample) = 1,702.
41 %
58 %
0 %
Trade Limit 29 cm
L−maturity 30 cm
L−optimum 40 cm
L−infinity 51 cm
L−max 57 cm
L−median 30 cm
Lx−codrs 57 cm
SPR 3 %
Trade Limit
L−maturity
L−optimum
L−max
L−median
L−infinity
Frequency
0
5000
10000
15000
20
30
40
50
60
70
Total Length (cm)


Trends in relative abundance by size group for Pristipomoides sieboldii (ID #10, Lutjanidae) in WPP 716.
Immature
Large mature
Mega Spawner
Median (%Lmax)
SPR
Percentage
0
20
40
60
80
100
2015
2017
2019
2021
2023
2025
Time (years)

The percentages of Pristipomoides sieboldii (ID #10, Lutjanidae) in 2020.
N (Catch) =183,103, n (Sample) = 1,702
Immature (< 30cm): 41%
Small mature (>= 30cm, < 40cm): 58%
Large mature (>= 40cm): 0%
Mega spawner (>= 44cm): 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.

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.

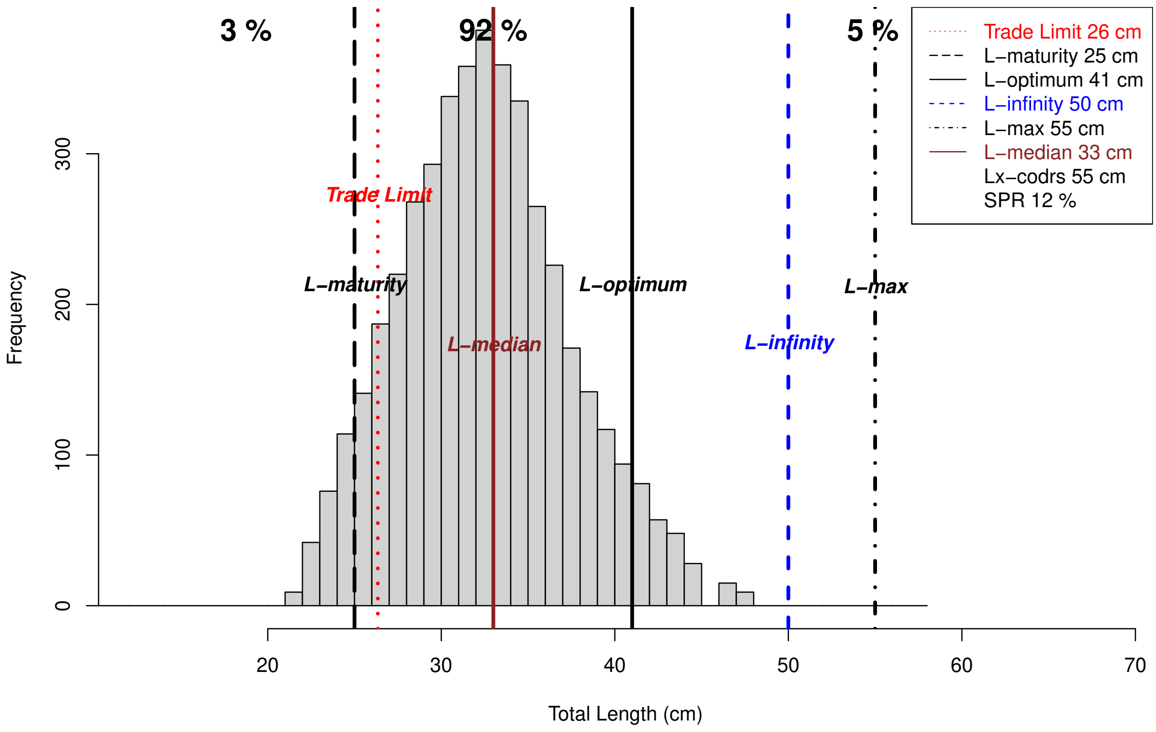
The vast majority of the fish in the catch have not yet achieved their growth potential. The harvest of small fish promotes growth overfishing and the size distribution for this species indicates that over exploitation through growth overfishing may already be happening. Risk level is high.

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.

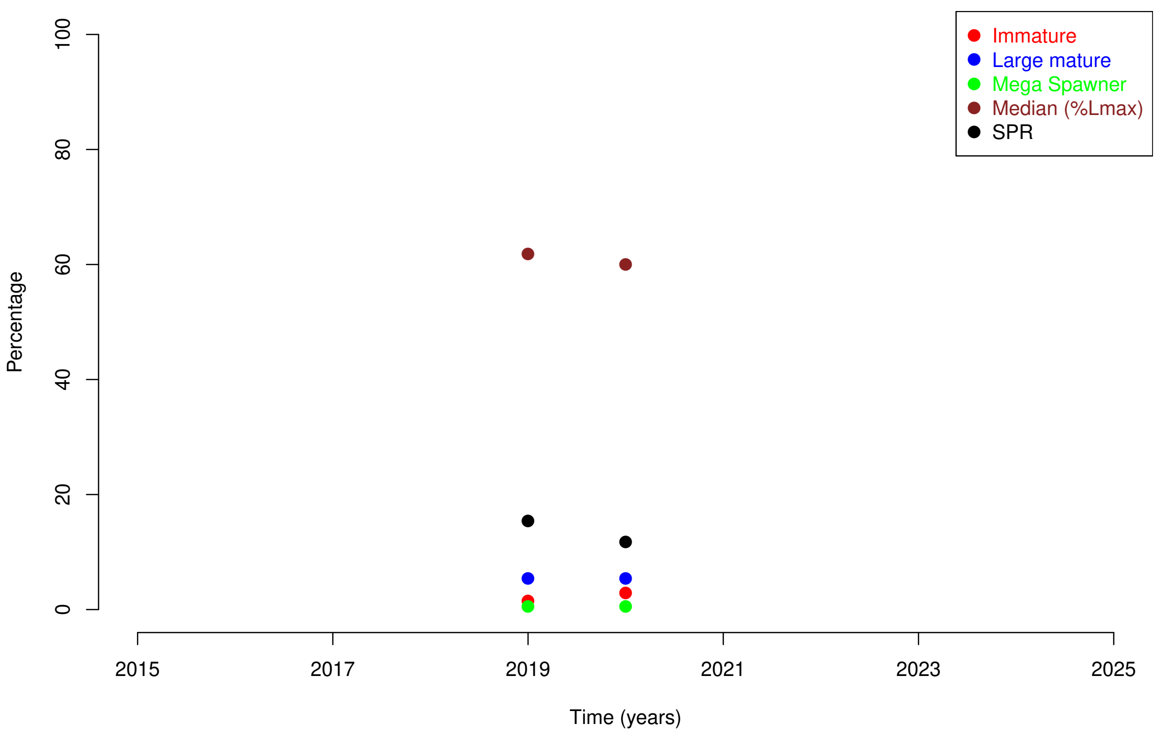
SPR is less than 25%. The fishery probably over-exploits the stock, and there is a substantial risk that the fishery will cause severe decline of the stock if fishing effort is not reduced. Risk level is high.

Trends in relative abundance by size group for Pristipomoides sieboldii (ID #10, 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.

**Catch length frequency for Lethrinus lentjan (ID #63, Lethrinidae) in WPP 716 in 2020.
N (Catch) = 4,375, n (Sample) = 1,024.**



Trends in relative abundance by size group for Lethrinus lentjan (ID #63, Lethrinidae) in WPP 716.



The percentages of Lethrinus lentjan (ID #63, Lethrinidae) in 2020.
N (Catch) =4,375, n (Sample) = 1,024
Immature (< 25cm): 3%
Small mature (>= 25cm, < 41cm): 92%
Large mature (>= 41cm): 5%
Mega spawner (>= 45.1cm): 1% (subset of large mature fish)
Spawning Potential Ratio: 12 %

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.

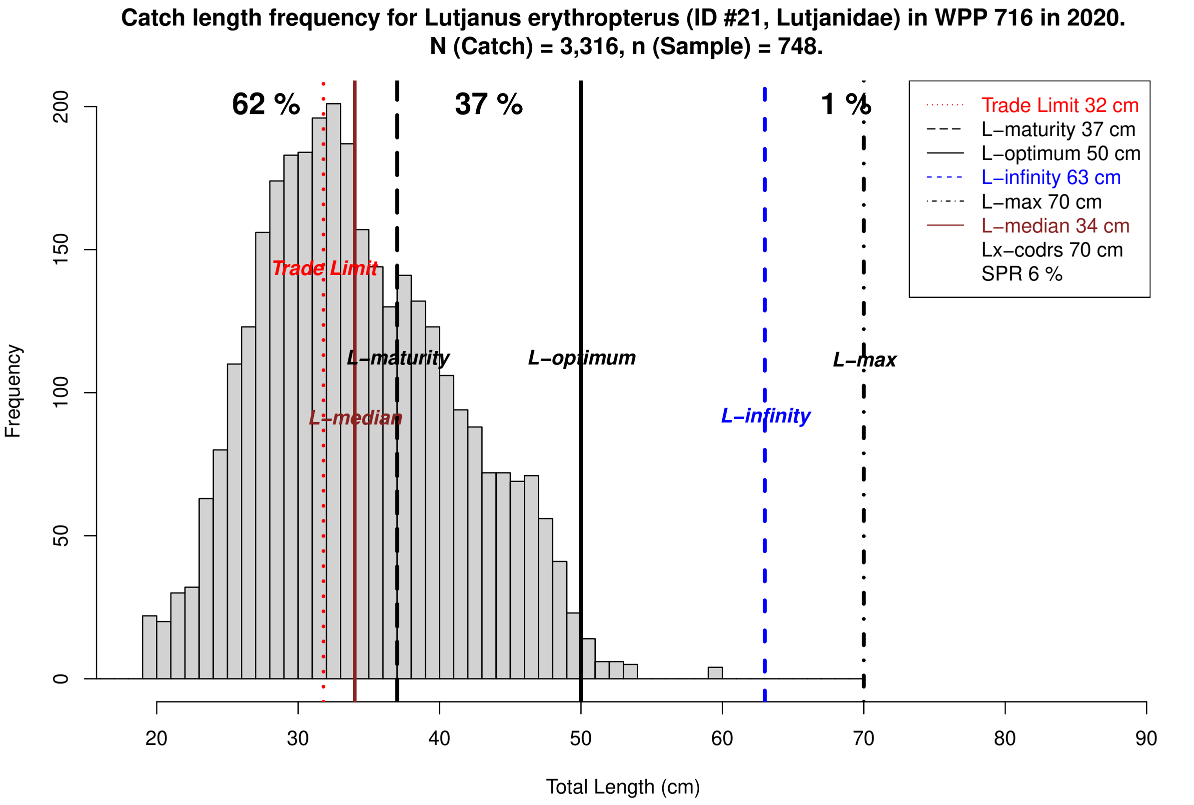
At least 90% of the fish in the catch are mature specimens that have spawned at least once before they were caught. The fishery does not depend on immature size classes for this species and is considered safe for this indicator. This fishery will not be causing overfishing through over harvesting of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

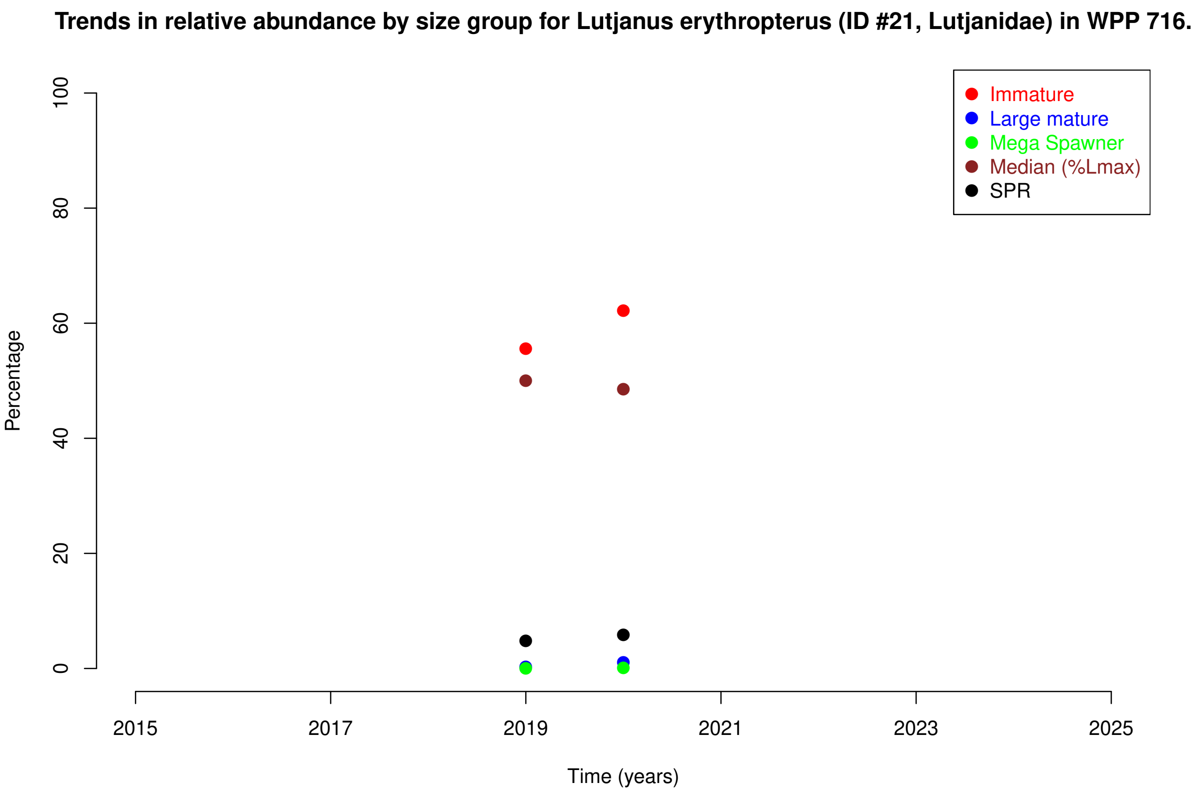
The vast majority of the fish in the catch have not yet achieved their growth potential. The harvest of small fish promotes growth overfishing and the size distribution for this species indicates that over exploitation through growth overfishing may already be happening. Risk level is high.

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.


Catch length frequency for Lutjanus erythropterus (ID #21, Lutjanidae) in WPP 716 in 2020.
N (Catch) = 3,316, n (Sample) = 748.
62 %
37 %
1 %
Trade Limit 32 cm
L−maturity 37 cm
L−optimum 50 cm
L−infinity 63 cm
L−max 70 cm
L−median 34 cm
Lx−codrs 70 cm
SPR 6 %
Trade Limit
L−maturity
L−optimum
L−max
L−median
L−infinity
Frequency
Total Length (cm)


Trends in relative abundance by size group for Lutjanus erythropterus (ID #21, Lutjanidae) in WPP 716.
Immature
Large mature
Mega Spawner
Median (%Lmax)
SPR
Percentage
Time (years)

The percentages of Lutjanus erythropterus (ID #21, Lutjanidae) in 2020.
N (Catch) =3,316, n (Sample) = 748
Immature (< 37cm): 62%
Small mature (>= 37cm, < 50cm): 37%
Large mature (>= 50cm): 1%
Mega spawner (>= 55cm): 0% (subset of large mature fish)
Spawning Potential Ratio: 6 %

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.

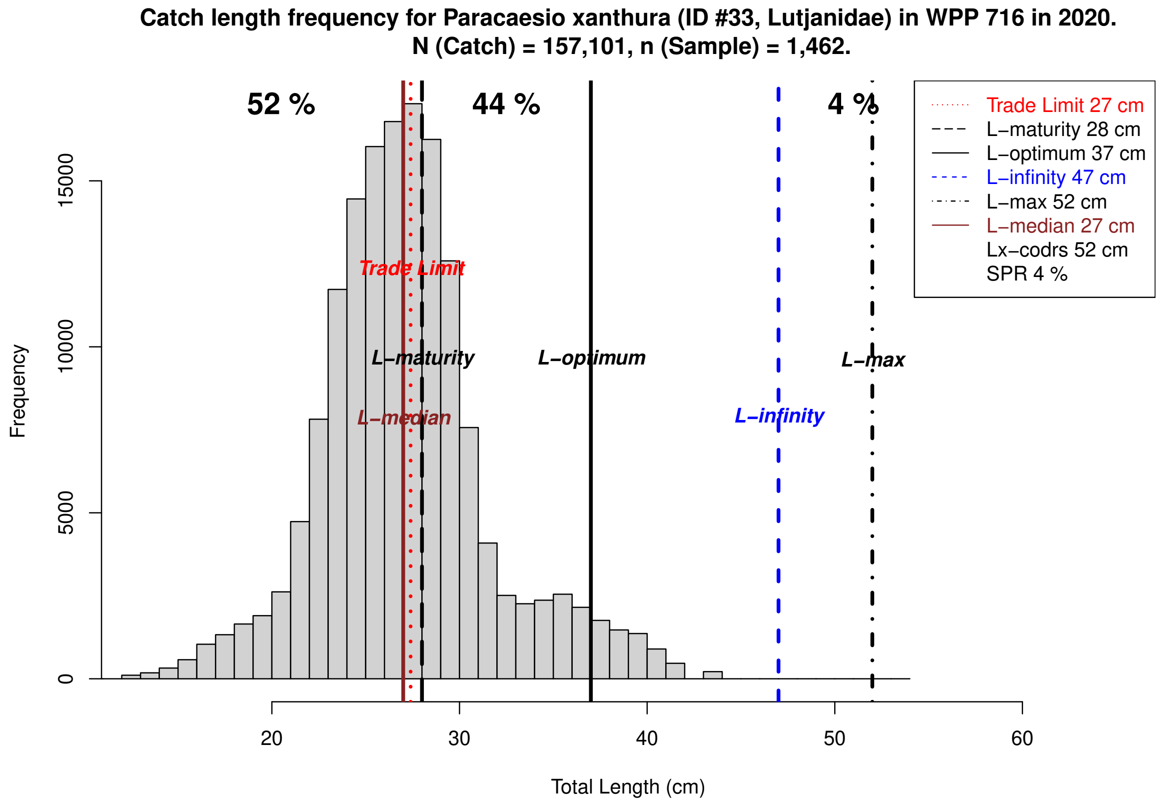
The majority of the fish in the catch have not had a chance to reproduce before capture. This fishery is most likely overfished already if fishing mortality is high for all size classes in the population. An immediate shift away from targeting juvenile fish and a reduction in overall fishing pressure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

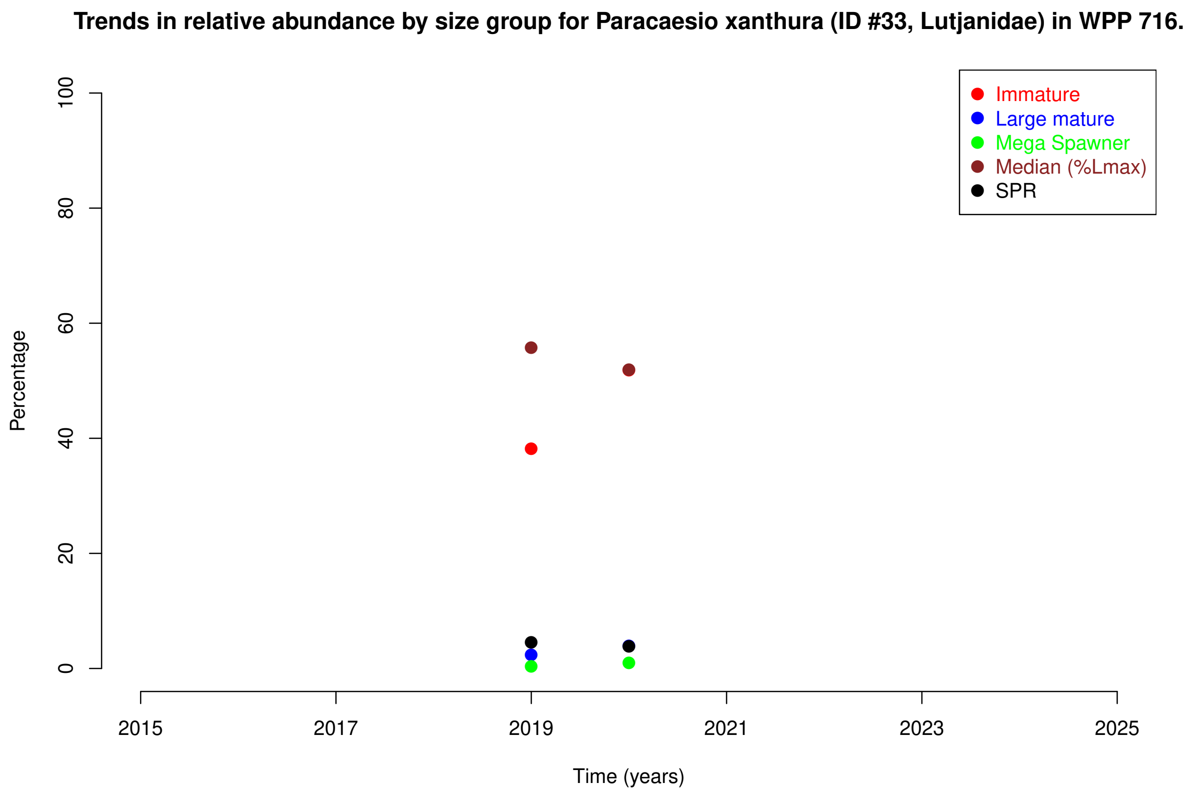
The vast majority of the fish in the catch have not yet achieved their growth potential. The harvest of small fish promotes growth overfishing and the size distribution for this species indicates that over exploitation through growth overfishing may already be happening. Risk level is high.

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 Lutjanus erythropterus (ID #21, 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.


Catch length frequency for Paracaesio xanthura (ID #33, Lutjanidae) in WPP 716 in 2020.
N (Catch) = 157,101, n (Sample) = 1,462.
52 %
44 %
4 %
Trade Limit 27 cm
L−maturity 28 cm
L−optimum 37 cm
L−infinity 47 cm
L−max 52 cm
L−median 27 cm
Lx−codrs 52 cm
SPR 4 %
Trade Limit
L−maturity
L−optimum
L−max
L−median
L−infinity
Frequency
Total Length (cm)


Trends in relative abundance by size group for Paracaesio xanthura (ID #33, Lutjanidae) in WPP 716.
Immature
Large mature
Mega Spawner
Median (%Lmax)
SPR
Percentage
Time (years)

The percentages of Paracaesio xanthura (ID #33, Lutjanidae) in 2020.
N (Catch) =157,101, n (Sample) = 1,462
Immature (< 28cm): 52%
Small mature (>= 28cm, < 37cm): 44%
Large mature (>= 37cm): 4%
Mega spawner (>= 40.7cm): 1% (subset of large mature fish)
Spawning Potential Ratio: 4 %

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.

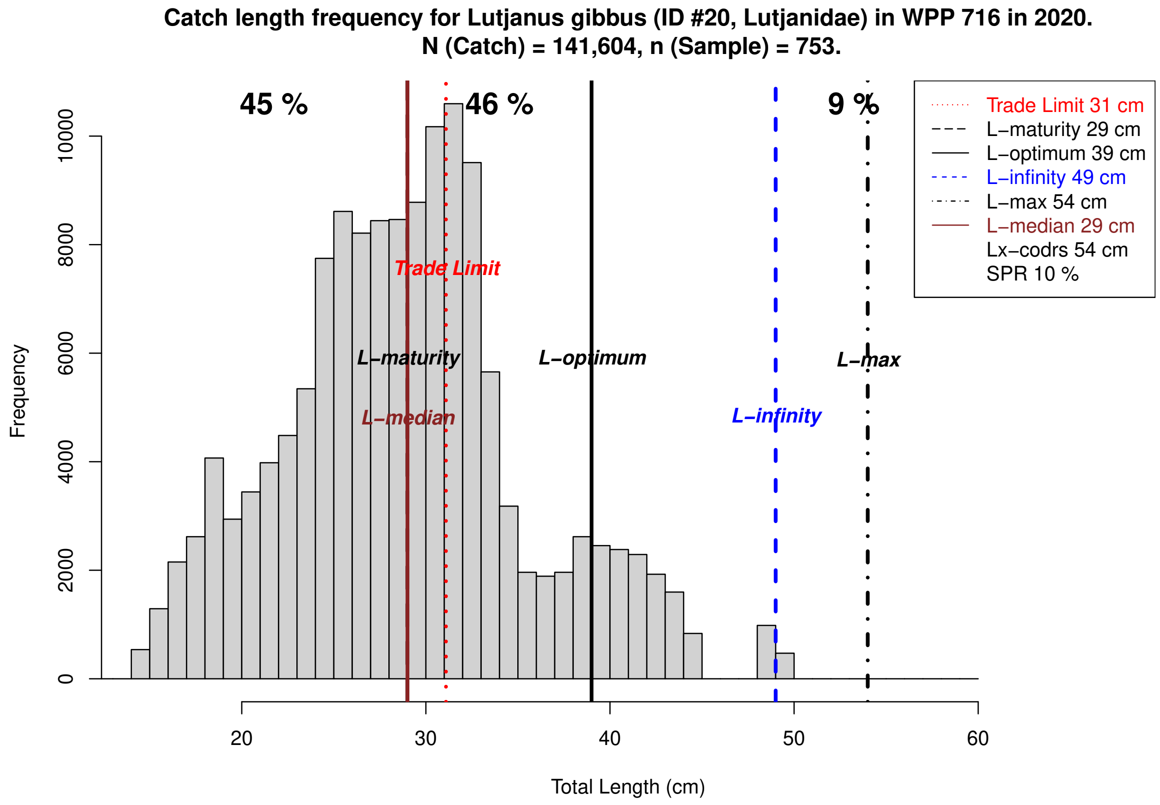
The majority of the fish in the catch have not had a chance to reproduce before capture. This fishery is most likely overfished already if fishing mortality is high for all size classes in the population. An immediate shift away from targeting juvenile fish and a reduction in overall fishing pressure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

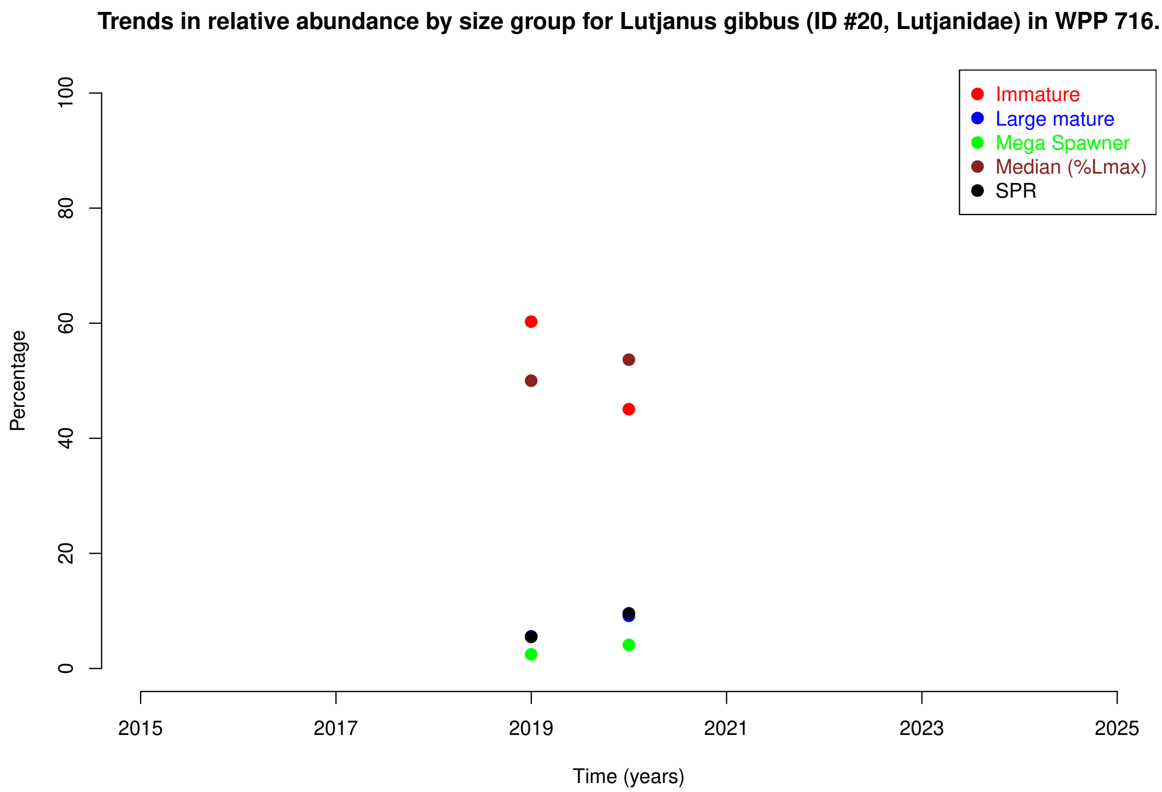
The vast majority of the fish in the catch have not yet achieved their growth potential. The harvest of small fish promotes growth overfishing and the size distribution for this species indicates that over exploitation through growth overfishing may already be happening. Risk level is high.

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 Paracaesio xanthura (ID #33, 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.


Catch length frequency for Lutjanus gibbus (ID #20, Lutjanidae) in WPP 716 in 2020.
N (Catch) = 141,604, n (Sample) = 753.
45 %
46 %
9 %
Trade Limit 31 cm
L–maturity 29 cm
L–optimum 39 cm
L–infinity 49 cm
L–max 54 cm
L–median 29 cm
Lx–codrs 54 cm
SPR 10 %
Trade Limit
L–maturity
L–optimum
L–max
L–median
L–infinity
Frequency
Total Length (cm)


Trends in relative abundance by size group for Lutjanus gibbus (ID #20, Lutjanidae) in WPP 716.
Immature
Large mature
Mega Spawner
Median (%Lmax)
SPR
Percentage
Time (years)

The percentages of Lutjanus gibbus (ID #20, Lutjanidae) in 2020.
N (Catch) =141,604, n (Sample) = 753
Immature (< 29cm): 45%
Small mature (>= 29cm, < 39cm): 46%
Large mature (>= 39cm): 9%
Mega spawner (>= 42.9cm): 4% (subset of large mature fish)
Spawning Potential Ratio: 10 %

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.

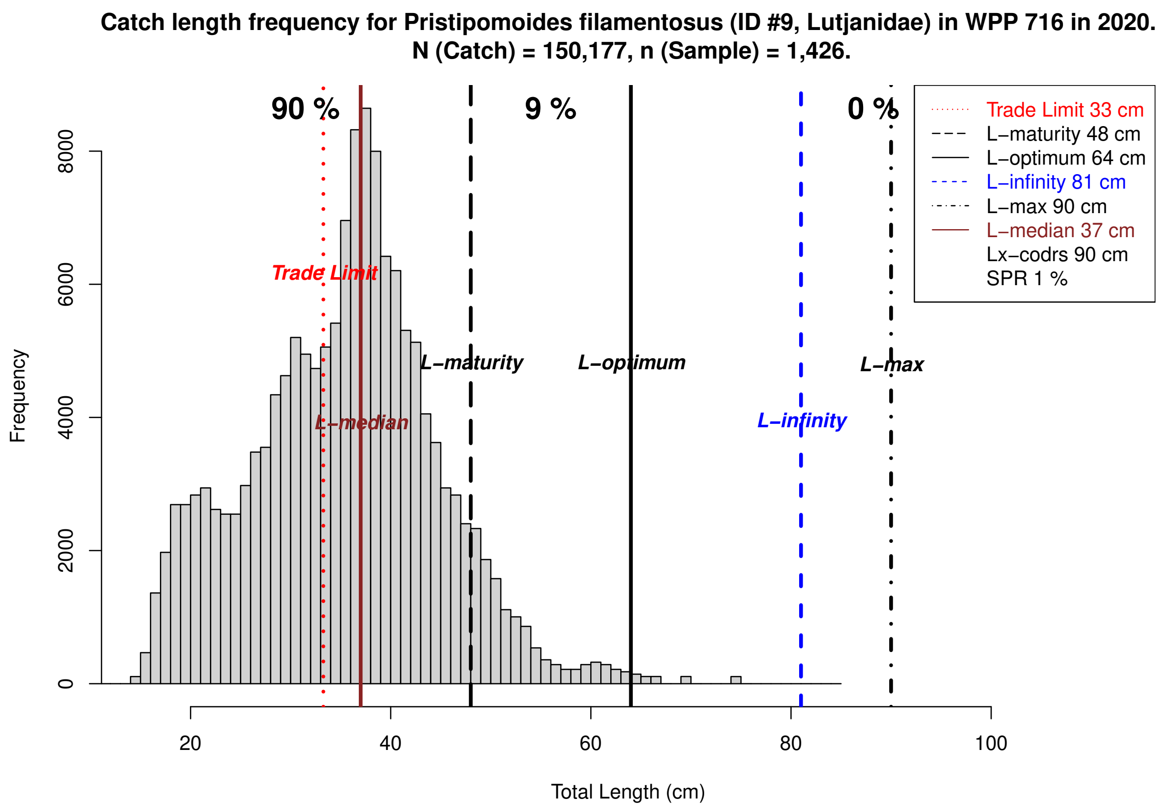
Between 30% and 50% of the fish in the catch are immature and have not had a chance to reproduce before capture. The fishery is in immediate danger of overfishing through overharvesting of juveniles, if fishing pressure is high. Catching small and immature fish needs to be actively avoided and a limit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

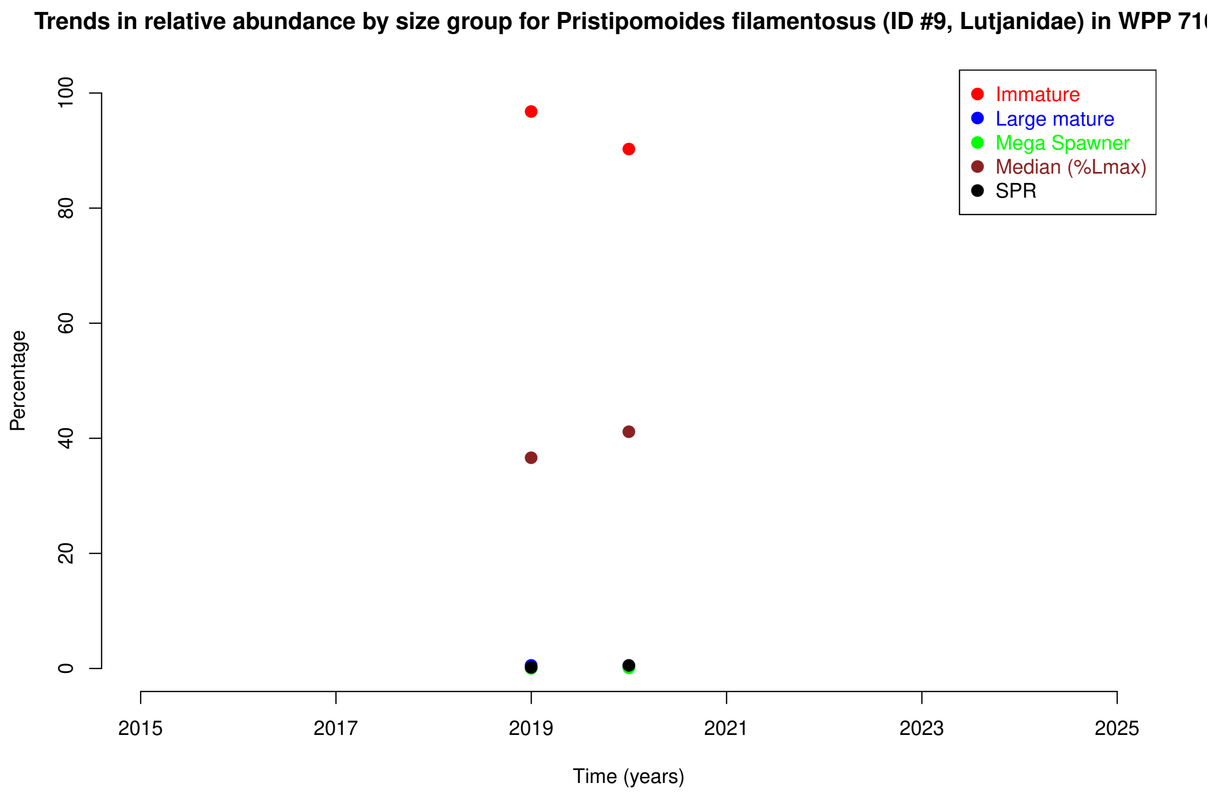
The vast majority of the fish in the catch have not yet achieved their growth potential. The harvest of small fish promotes growth overfishing and the size distribution for this species indicates that over exploitation through growth overfishing may already be happening. Risk level is high.

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 gibbus (ID #20, 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.


Catch length frequency for Pristipomoides filamentosus (ID #9, Lutjanidae) in WPP 716 in 2020.
N (Catch) = 150,177, n (Sample) = 1,426.
90 %
9 %
0 %
Trade Limit
L−maturity
L−optimum
L−max
L−median
L−infinity
Trade Limit 33 cm
L−maturity 48 cm
L−optimum 64 cm
L−infinity 81 cm
L−max 90 cm
L−median 37 cm
Lx−codrs 90 cm
SPR 1 %
Frequency
Total Length (cm)


Trends in relative abundance by size group for Pristipomoides filamentosus (ID #9, Lutjanidae) in WPP 71
Immature
Large mature
Mega Spawner
Median (%Lmax)
SPR
Percentage
Time (years)

The percentages of Pristipomoides filamentosus (ID #9, Lutjanidae) in 2020.
N (Catch) =150,177, n (Sample) = 1,426
Immature (< 48cm): 90%
Small mature (>= 48cm, < 64cm): 9%
Large mature (>= 64cm): 0%
Mega spawner (>= 70.4cm): 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.

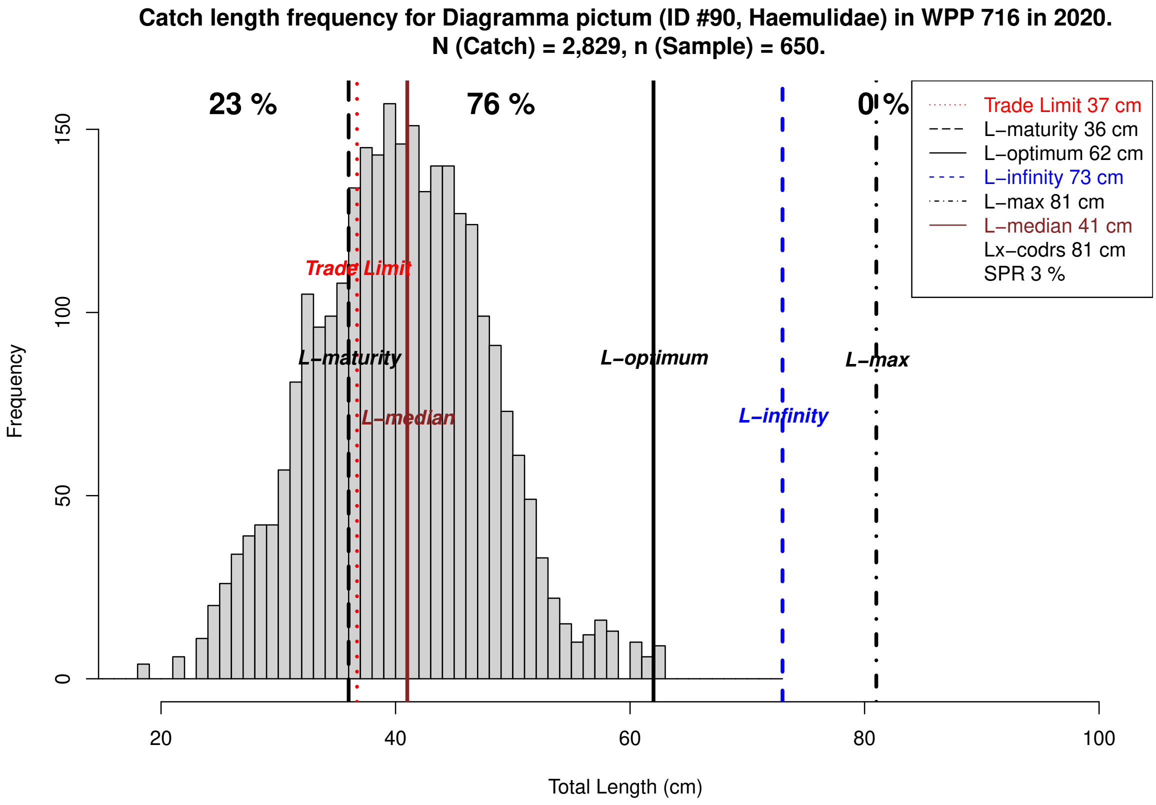
The majority of the fish in the catch have not had a chance to reproduce before capture. This fishery is most likely overfished already if fishing mortality is high for all size classes in the population. An immediate shift away from targeting juvenile fish and a reduction in overall fishing pressure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

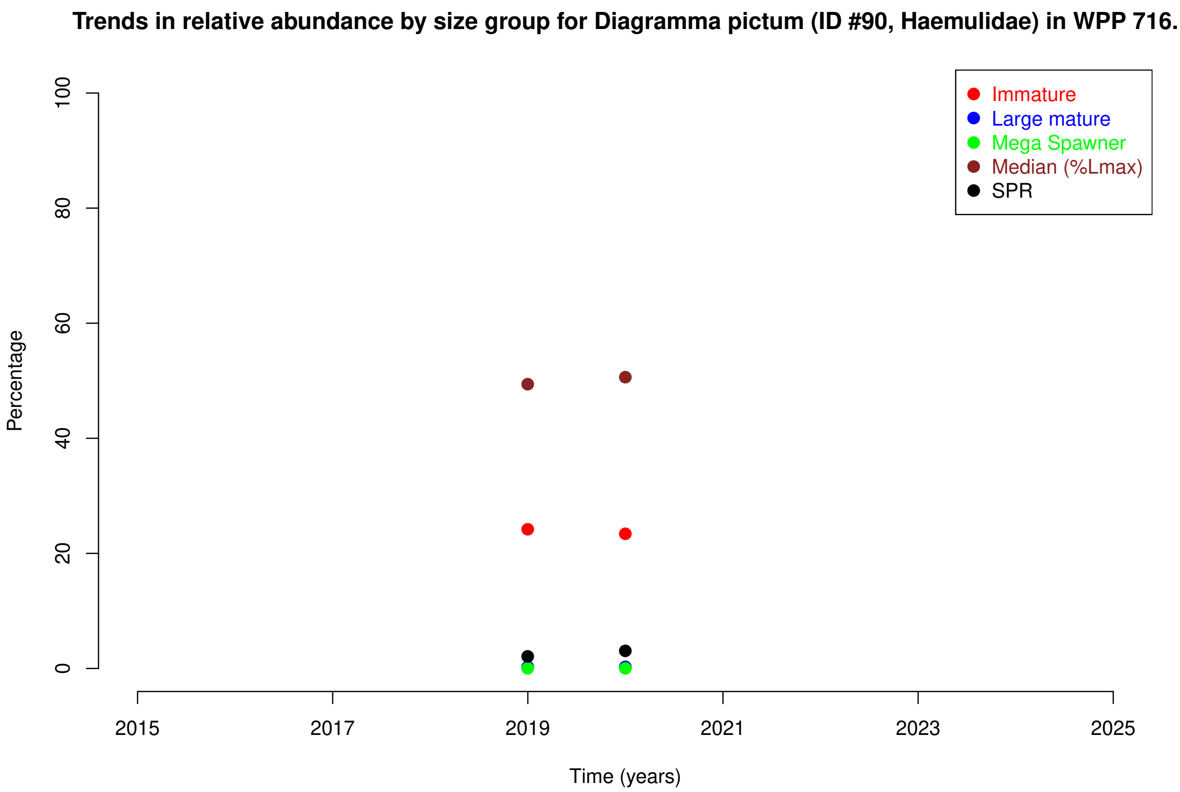
The vast majority of the fish in the catch have not yet achieved their growth potential. The harvest of small fish promotes growth overfishing and the size distribution for this species indicates that over exploitation through growth overfishing may already be happening. Risk level is high.

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 Pristipomoides filamentosus (ID #9, 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.


Catch length frequency for Diagramma pictum (ID #90, Haemulidae) in WPP 716 in 2020.
N (Catch) = 2,829, n (Sample) = 650.
23 %
76 %
0 %
Trade Limit 37 cm
L−maturity 36 cm
L−optimum 62 cm
L−infinity 73 cm
L−max 81 cm
L−median 41 cm
Lx−codrs 81 cm
SPR 3 %
Trade Limit
L−maturity
L−median
L−optimum
L−infinity
L−max
Frequency
0
50
100
150
20
40
60
80
100
Total Length (cm)


Trends in relative abundance by size group for Diagramma pictum (ID #90, Haemulidae) in WPP 716.
Immature
Large mature
Mega Spawner
Median (%Lmax)
SPR
Percentage
0
20
40
60
80
100
2015
2017
2019
2021
2023
2025
Time (years)

The percentages of Diagramma pictum (ID #90, Haemulidae) in 2020.
N (Catch) =2,829, n (Sample) = 650
Immature (< 36cm): 23%
Small mature (>= 36cm, < 62cm): 76%
Large mature (>= 62cm): 0%
Mega spawner (>= 68.2cm): 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.

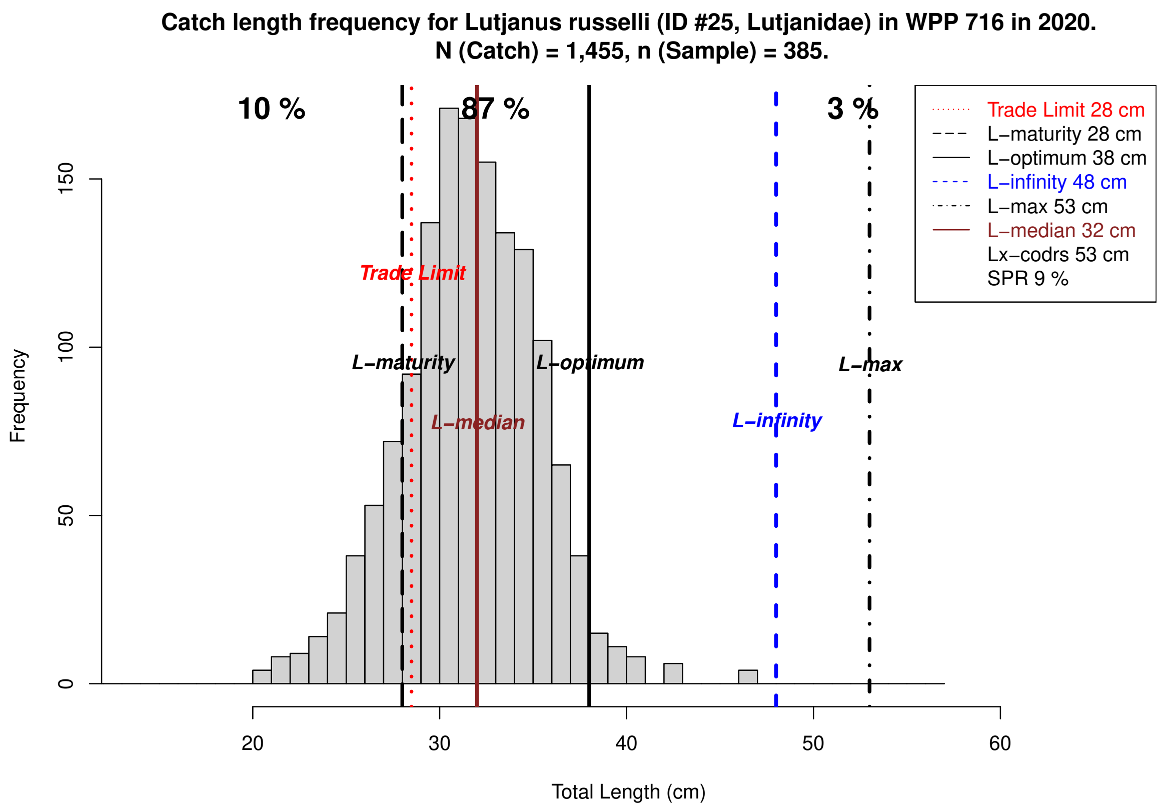
Between 20% and 30% of the fish in the catch are specimens that have not yet reproduced. This is reason for concern in terms of potential overfishing through overharvesting of juveniles, if fishing pressure is high and percentages immature fish would further rise. Targeting larger fish and avoiding small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

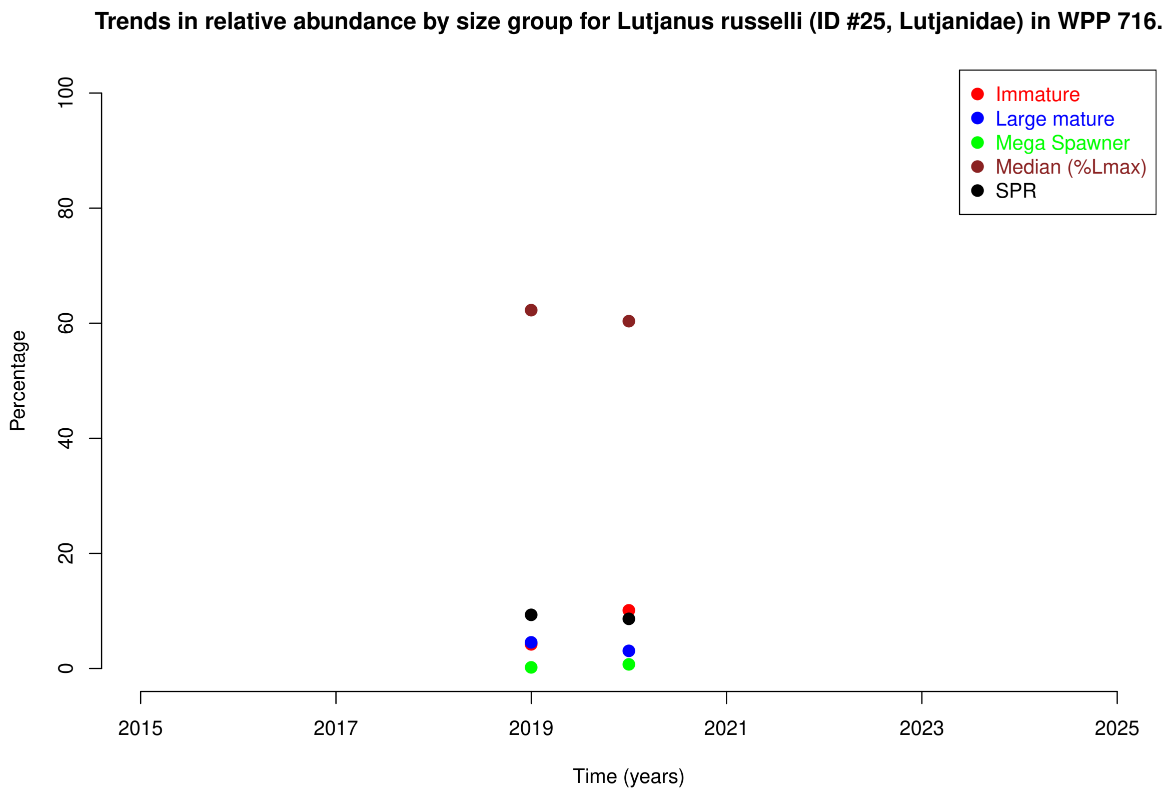
The vast majority of the fish in the catch have not yet achieved their growth potential. The harvest of small fish promotes growth overfishing and the size distribution for this species indicates that over exploitation through growth overfishing may already be happening. Risk level is high.

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 Diagramma pictum (ID #90, 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.


Catch length frequency for Lutjanus russelli (ID #25, Lutjanidae) in WPP 716 in 2020.
N (Catch) = 1,455, n (Sample) = 385.
10 %
87 %
3 %
Trade Limit 28 cm
L−maturity 28 cm
L−optimum 38 cm
L−infinity 48 cm
L−max 53 cm
L−median 32 cm
Lx−codrs 53 cm
SPR 9 %
Trade Limit
L−maturity
L−optimum
L−max
L−median
L−infinity
Frequency
Total Length (cm)


Trends in relative abundance by size group for Lutjanus russelli (ID #25, Lutjanidae) in WPP 716.
Immature
Large mature
Mega Spawner
Median (%Lmax)
SPR
Percentage
Time (years)

The percentages of Lutjanus russelli (ID #25, Lutjanidae) in 2020.
N (Catch) =1,455, n (Sample) = 385
Immature (< 28cm): 10%
Small mature (>= 28cm, < 38cm): 87%
Large mature (>= 38cm): 3%
Mega spawner (>= 41.8cm): 1% (subset of large mature fish)
Spawning Potential Ratio: 9 %

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.

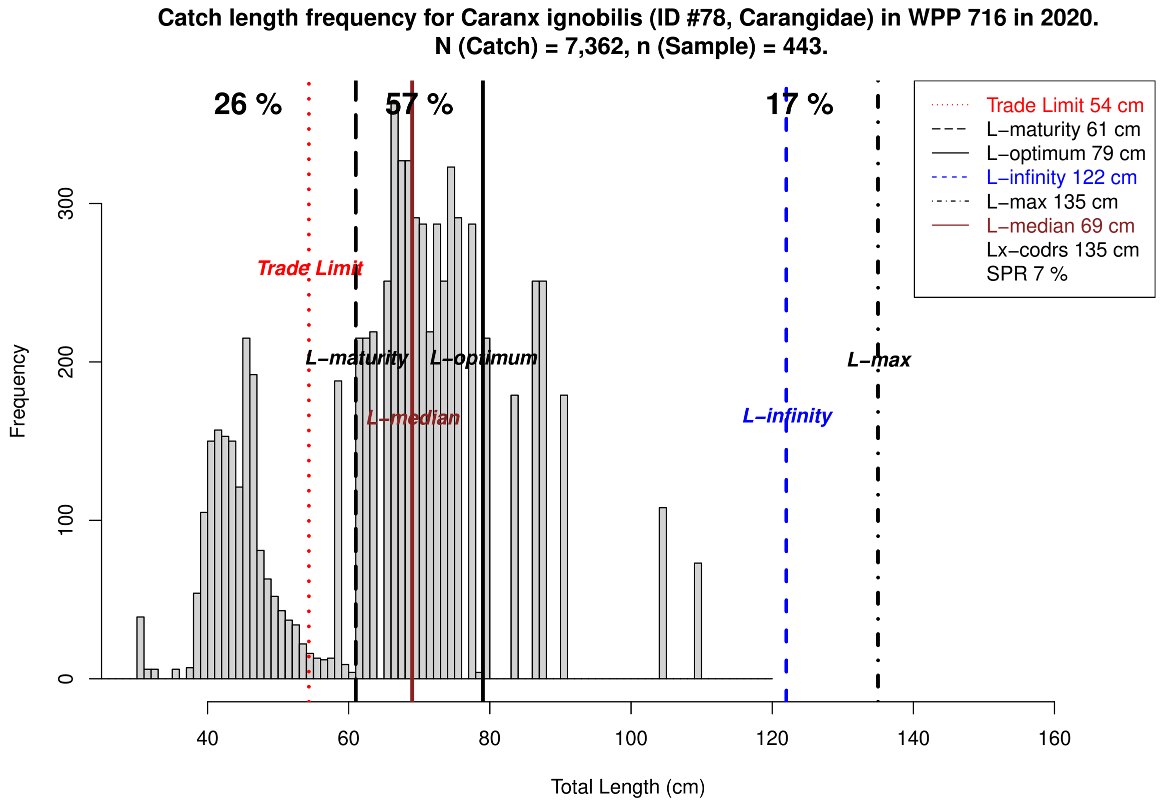
Between 10% and 20% of the fish in the catch are juveniles that have not yet reproduced. There is no immediate concern in terms of overfishing through over harvesting of juveniles, but the fishery needs to be monitored closely for any further increase in this indicator and incentives need to be geared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

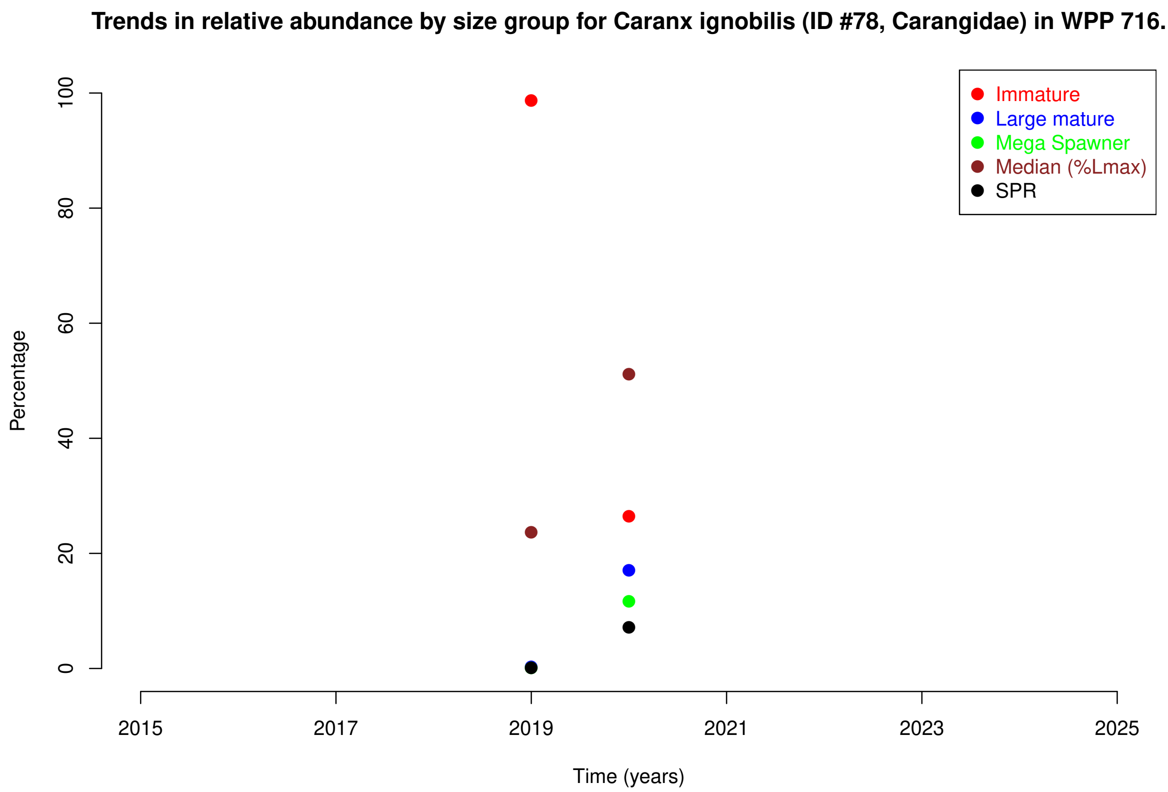
The vast majority of the fish in the catch have not yet achieved their growth potential. The harvest of small fish promotes growth overfishing and the size distribution for this species indicates that over exploitation through growth overfishing may already be happening. Risk level is high.

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 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 russelli (ID #25, 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.


Catch length frequency for Caranx ignobilis (ID #78, Carangidae) in WPP 716 in 2020.
N (Catch) = 7,362, n (Sample) = 443.
26 %
57 %
17 %
Trade Limit
L−maturity
L−optimum
L−median
L−infinity
L−max
Trade Limit 54 cm
L−maturity 61 cm
L−optimum 79 cm
L−infinity 122 cm
L−max 135 cm
L−median 69 cm
Lx−codrs 135 cm
SPR 7 %
Frequency
Total Length (cm)


Trends in relative abundance by size group for Caranx ignobilis (ID #78, Carangidae) in WPP 716.
Immature
Large mature
Mega Spawner
Median (%Lmax)
SPR
Percentage
Time (years)

The percentages of Caranx ignobilis (ID #78, Carangidae) in 2020.
N (Catch) =7,362, n (Sample) = 443
Immature (< 61cm): 26%
Small mature (>= 61cm, < 79cm): 57%
Large mature (>= 79cm): 17%
Mega spawner (>= 86.9cm): 12% (subset of large mature fish)
Spawning Potential Ratio: 7 %

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.

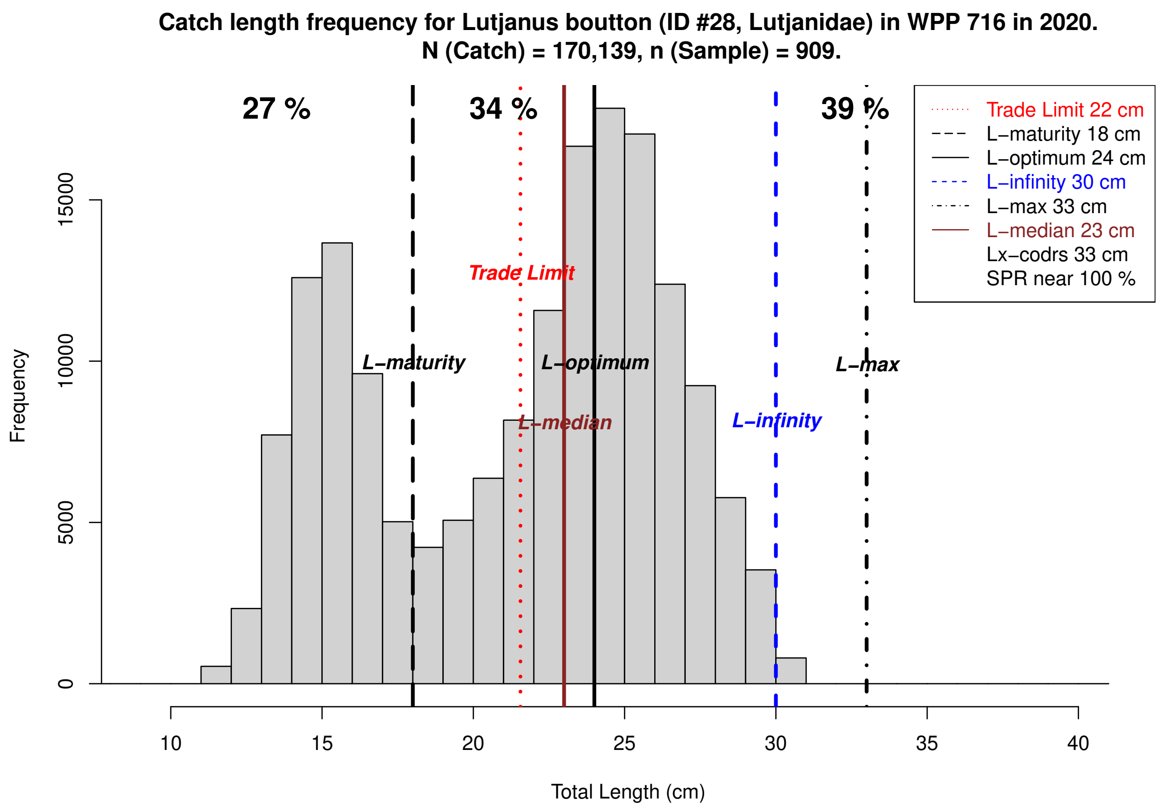
Between 20% and 30% of the fish in the catch are specimens that have not yet reproduced. This is reason for concern in terms of potential overfishing through overharvesting of juveniles, if fishing pressure is high and percentages immature fish would further rise. Targeting larger fish and avoiding small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

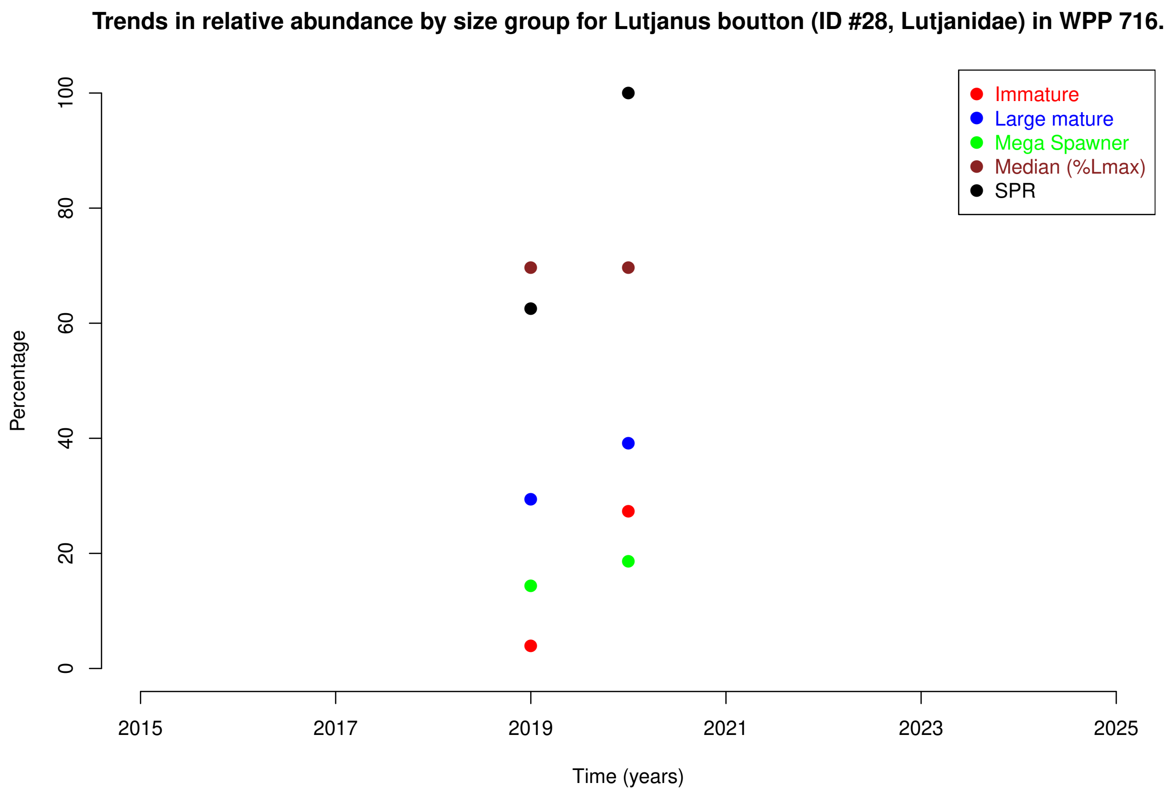
The vast majority of the fish in the catch have not yet achieved their growth potential. The harvest of small fish promotes growth overfishing and the size distribution for this species indicates that over exploitation through growth overfishing may already be happening. Risk level is high.

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 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.


Catch length frequency for Lutjanus boutton (ID #28, Lutjanidae) in WPP 716 in 2020.
N (Catch) = 170,139, n (Sample) = 909.
27 %
34 %
39 %
Trade Limit 22 cm
L−maturity 18 cm
L−optimum 24 cm
L−infinity 30 cm
L−max 33 cm
L−median 23 cm
Lx−codrs 33 cm
SPR near 100 %
Trade Limit
L−maturity
L−optimum
L−median
L−infinity
L−max
Frequency
0
5000
10000
15000
10
15
20
25
30
35
40
Total Length (cm)


Trends in relative abundance by size group for Lutjanus boutton (ID #28, Lutjanidae) in WPP 716.
Immature
Large mature
Mega Spawner
Median (%Lmax)
SPR
Percentage
0
20
40
60
80
100
2015
2017
2019
2021
2023
2025
Time (years)

The percentages of Lutjanus boutton (ID #28, Lutjanidae) in 2020.
N (Catch) =170,139, n (Sample) = 909
Immature (< 18cm): 27%
Small mature (>= 18cm, < 24cm): 34%
Large mature (>= 24cm): 39%
Mega spawner (>= 26.4cm): 19% (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.

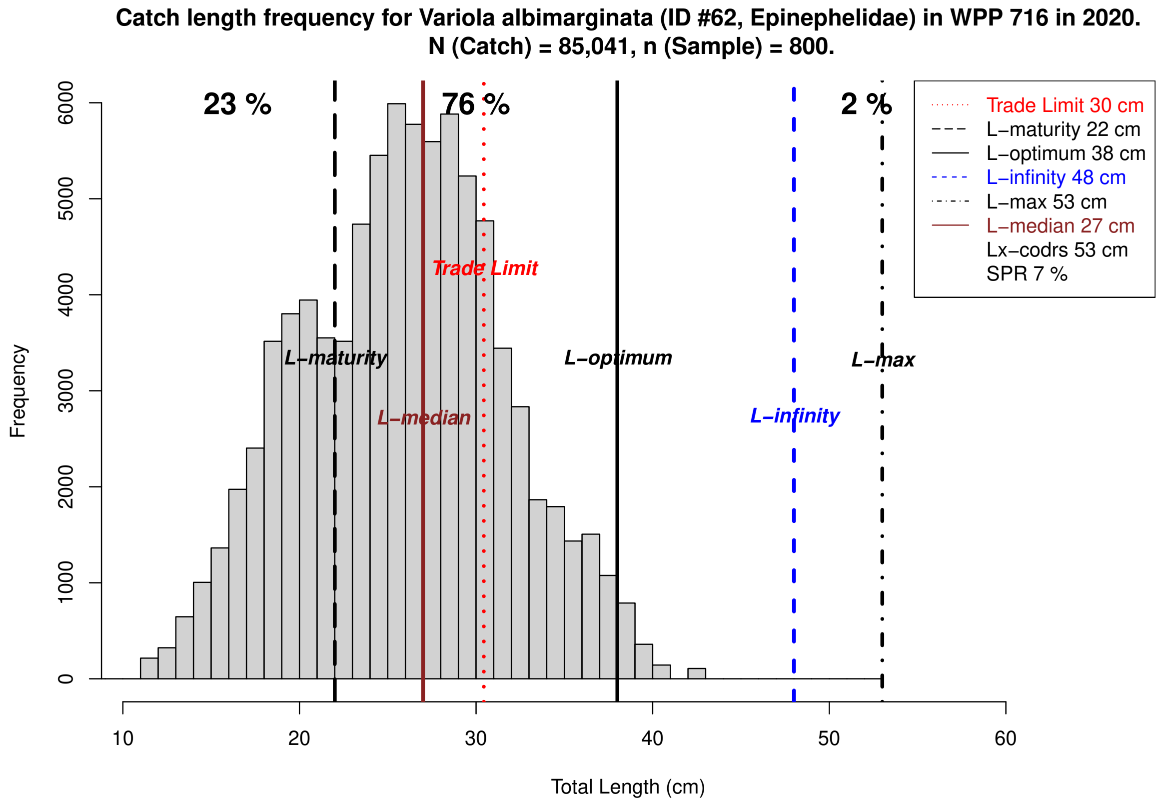
Between 20% and 30% of the fish in the catch are specimens that have not yet reproduced. This is reason for concern in terms of potential overfishing through overharvesting of juveniles, if fishing pressure is high and percentages immature fish would further rise. Targeting larger fish and avoiding small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

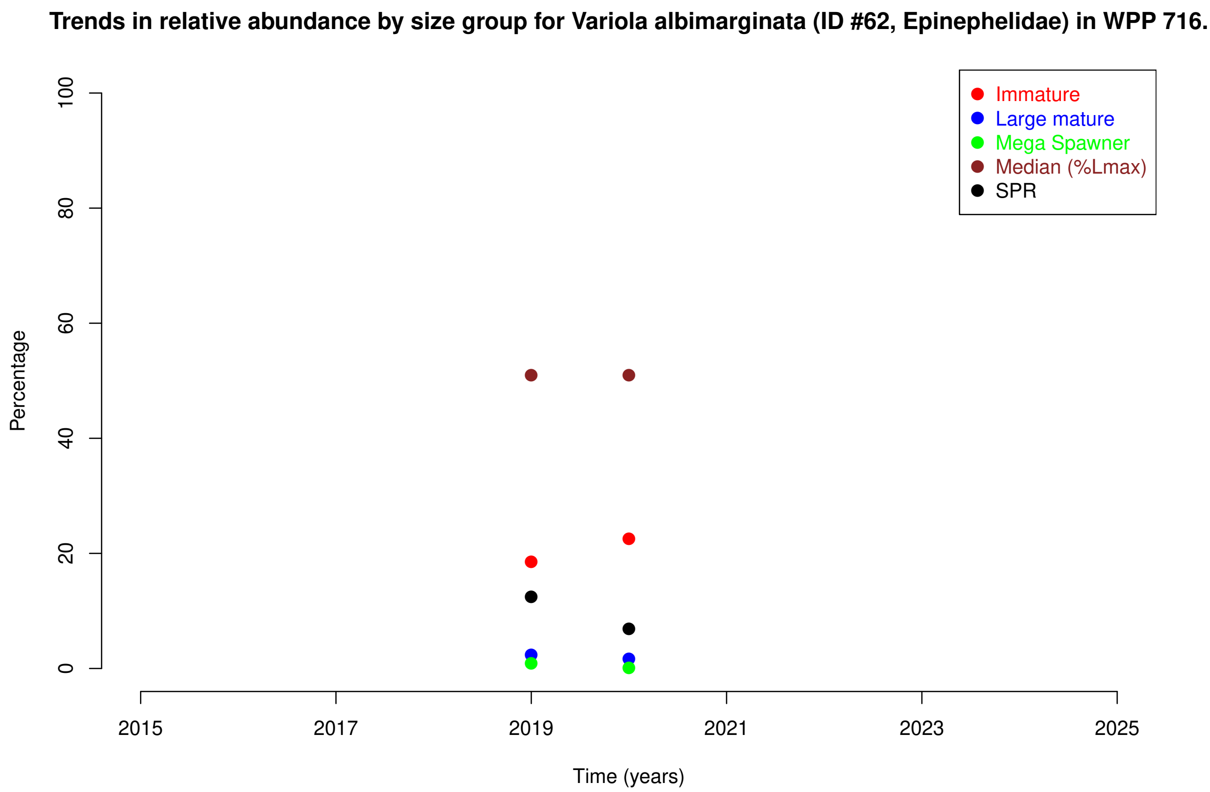
The bulk of the catch includes age groups that have just matured and are about to achieve their full growth potential. This indicates that the fishery is probably at least being fully exploited. Risk level is medium.

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 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 Lutjanus boutton (ID #28, 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.


Catch length frequency for Variola albimarginata (ID #62, Epinephelidae) in WPP 716 in 2020.
N (Catch) = 85,041, n (Sample) = 800.
23 %
76 %
2 %
Trade Limit 30 cm
L−maturity 22 cm
L−optimum 38 cm
L−infinity 48 cm
L−max 53 cm
L−median 27 cm
Lx−codrs 53 cm
SPR 7 %
Trade Limit
L−maturity
L−optimum
L−max
L−median
L−infinity
Frequency
Total Length (cm)
0
1000
2000
3000
4000
5000
6000
10
20
30
40
50
60


Trends in relative abundance by size group for Variola albimarginata (ID #62, Epinephelidae) in WPP 716.
Immature
Large mature
Mega Spawner
Median (%Lmax)
SPR
Percentage
Time (years)
0
20
40
60
80
100
2015
2017
2019
2021
2023
2025

The percentages of Variola albimarginata (ID #62, Epinephelidae) in 2020.
N (Catch) =85,041, n (Sample) = 800
Immature (< 22cm): 23%
Small mature (>= 22cm, < 38cm): 76%
Large mature (>= 38cm): 2%
Mega spawner (>= 41.8cm): 0% (subset of large mature fish)
Spawning Potential Ratio: 7 %

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.

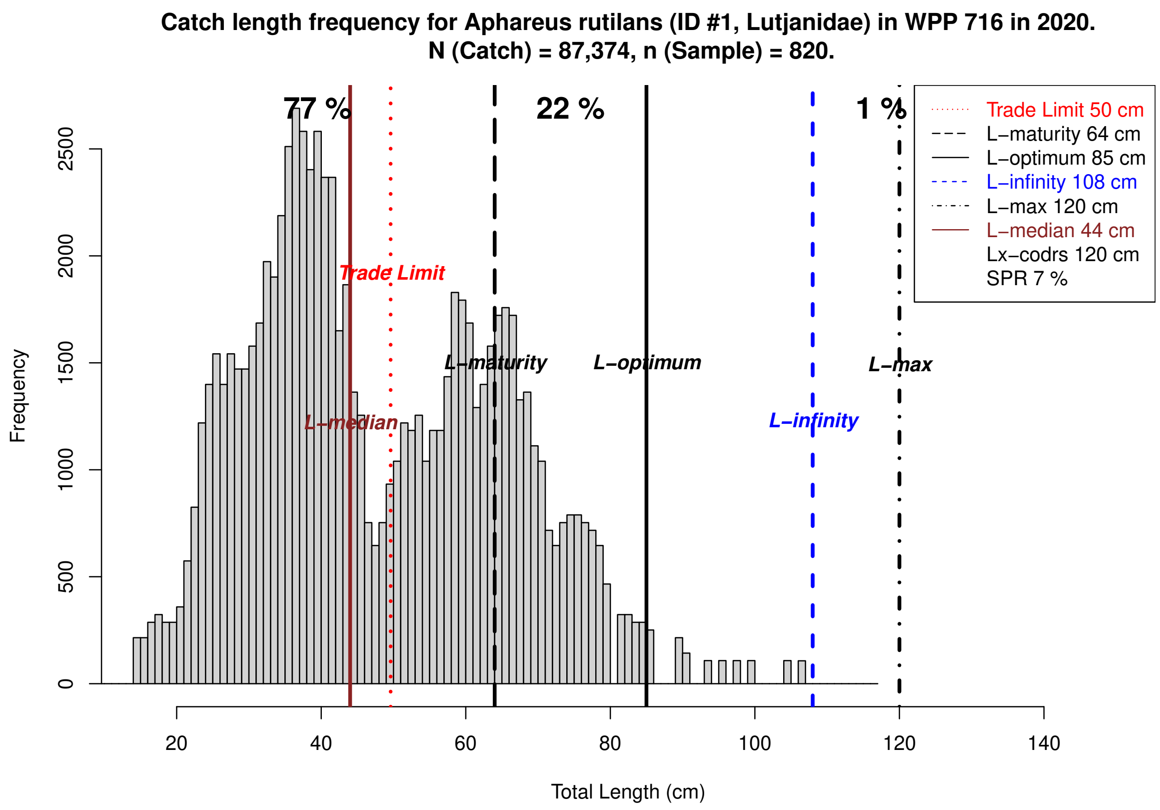
Between 20% and 30% of the fish in the catch are specimens that have not yet reproduced. This is reason for concern in terms of potential overfishing through overharvesting of juveniles, if fishing pressure is high and percentages immature fish would further rise. Targeting larger fish and avoiding small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

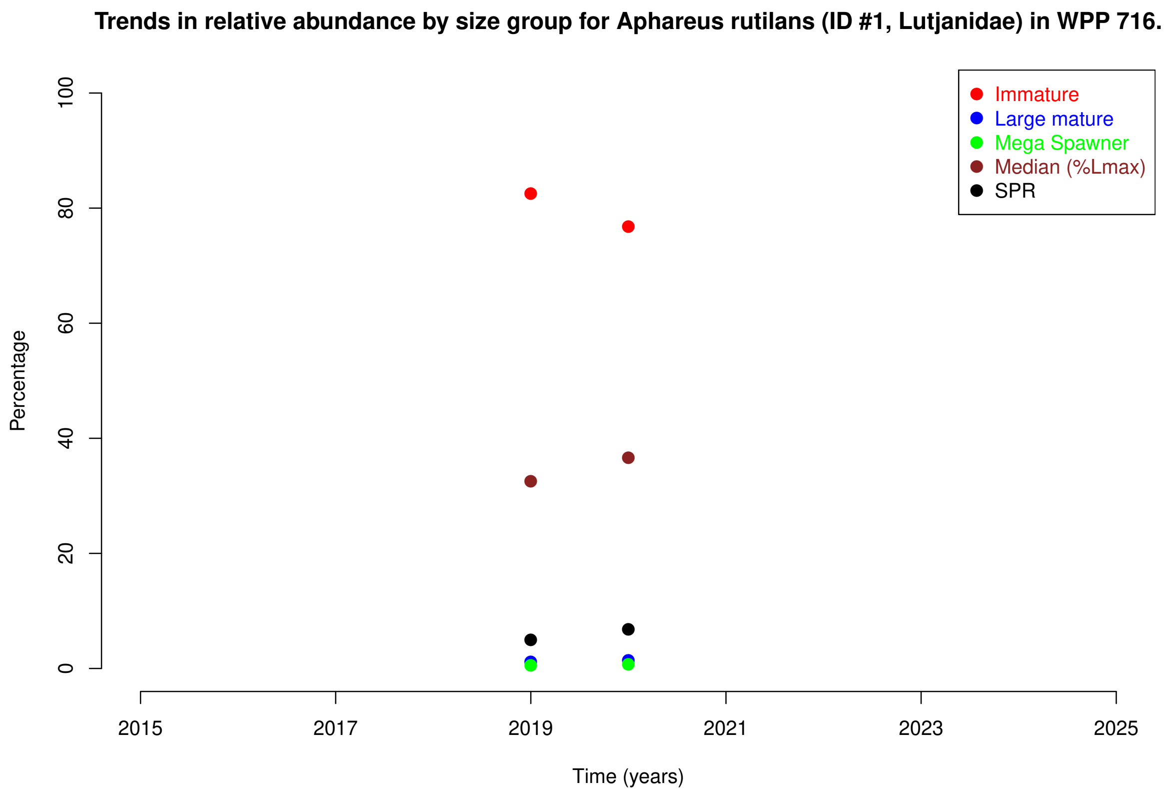
The vast majority of the fish in the catch have not yet achieved their growth potential. The harvest of small fish promotes growth overfishing and the size distribution for this species indicates that over exploitation through growth overfishing may already be happening. Risk level is high.

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 Variola albimarginata (ID #62, 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 Aphareus rutilans (ID #1, Lutjanidae) in WPP 716 in 2020.
N (Catch) = 87,374, n (Sample) = 820.
77 %
22 %
1 %
Trade Limit 50 cm
L−maturity 64 cm
L−optimum 85 cm
L−infinity 108 cm
L−max 120 cm
L−median 44 cm
Lx−codrs 120 cm
SPR 7 %
Trade Limit
L−maturity
L−optimum
L−max
L−median
L−infinity
Frequency
0
500
1000
1500
2000
2500
20
40
60
80
100
120
140
Total Length (cm)


Trends in relative abundance by size group for Aphareus rutilans (ID #1, Lutjanidae) in WPP 716.
Immature
Large mature
Mega Spawner
Median (%Lmax)
SPR
Percentage
0
20
40
60
80
100
2015
2017
2019
2021
2023
2025
Time (years)

The percentages of Aphareus rutilans (ID #1, Lutjanidae) in 2020.
N (Catch) =87,374, n (Sample) = 820
Immature (< 64cm): 77%
Small mature (>= 64cm, < 85cm): 22%
Large mature (>= 85cm): 1%
Mega spawner (>= 93.5cm): 1% (subset of large mature fish)
Spawning Potential Ratio: 7 %

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.

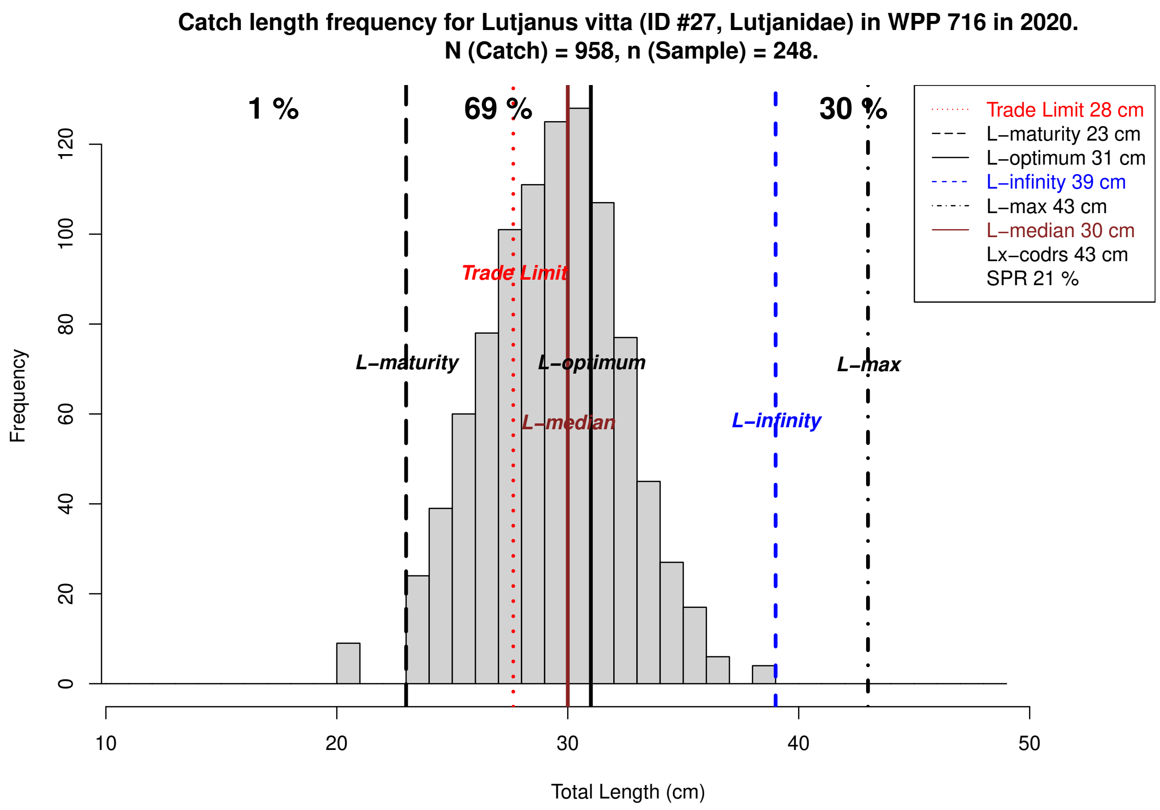
The majority of the fish in the catch have not had a chance to reproduce before capture. This fishery is most likely overfished already if fishing mortality is high for all size classes in the population. An immediate shift away from targeting juvenile fish and a reduction in overall fishing pressure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

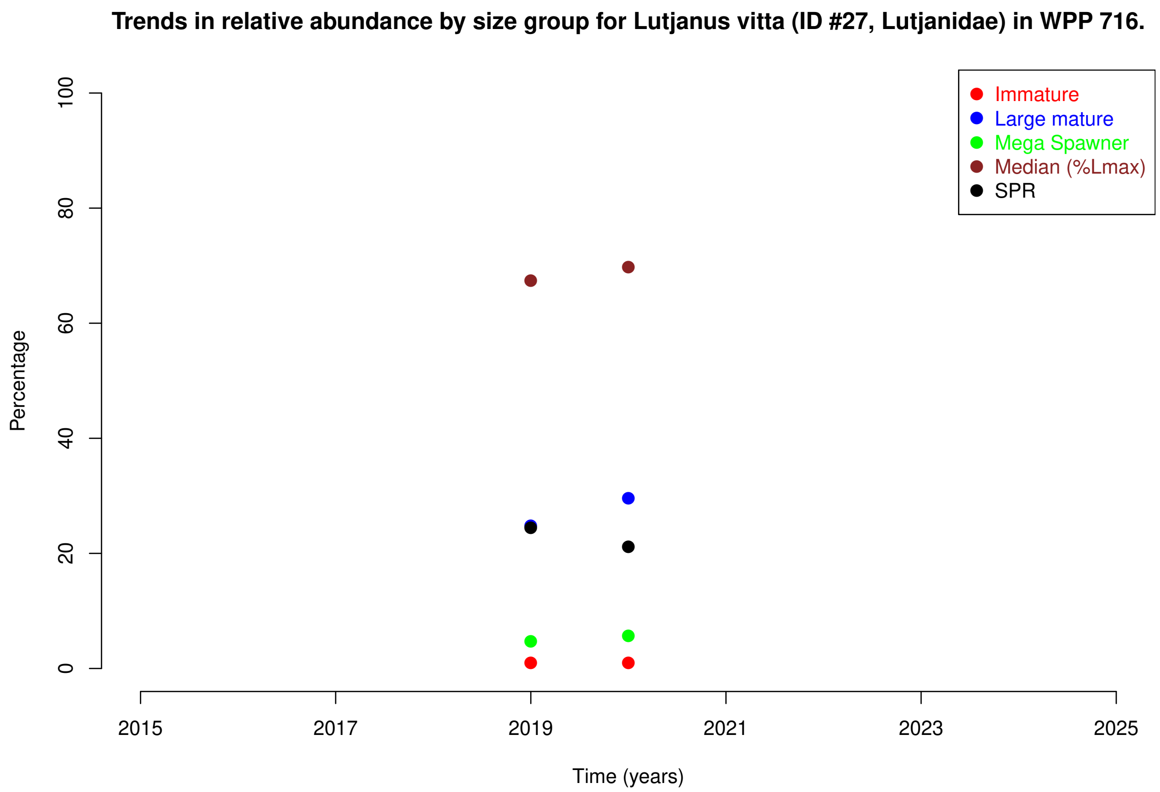
The vast majority of the fish in the catch have not yet achieved their growth potential. The harvest of small fish promotes growth overfishing and the size distribution for this species indicates that over exploitation through growth overfishing may already be happening. Risk level is high.

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 Aphareus rutilans (ID #1, 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.


Catch length frequency for Lutjanus vitta (ID #27, Lutjanidae) in WPP 716 in 2020.
N (Catch) = 958, n (Sample) = 248.
1 %
69 %
30 %
Trade Limit 28 cm
L−maturity 23 cm
L−optimum 31 cm
L−infinity 39 cm
L−max 43 cm
L−median 30 cm
Lx−codrs 43 cm
SPR 21 %
Trade Limit
L−maturity
L−optimum
L−median
L−infinity
L−max
Frequency
Total Length (cm)


Trends in relative abundance by size group for Lutjanus vitta (ID #27, Lutjanidae) in WPP 716.
Immature
Large mature
Mega Spawner
Median (%Lmax)
SPR
Percentage
Time (years)

The percentages of Lutjanus vitta (ID #27, Lutjanidae) in 2020.
N (Catch) =958, n (Sample) = 248
Immature (< 23cm): 1%
Small mature (>= 23cm, < 31cm): 69%
Large mature (>= 31cm): 30%
Mega spawner (>= 34.1cm): 6% (subset of large mature fish)
Spawning Potential Ratio: 21 %

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.

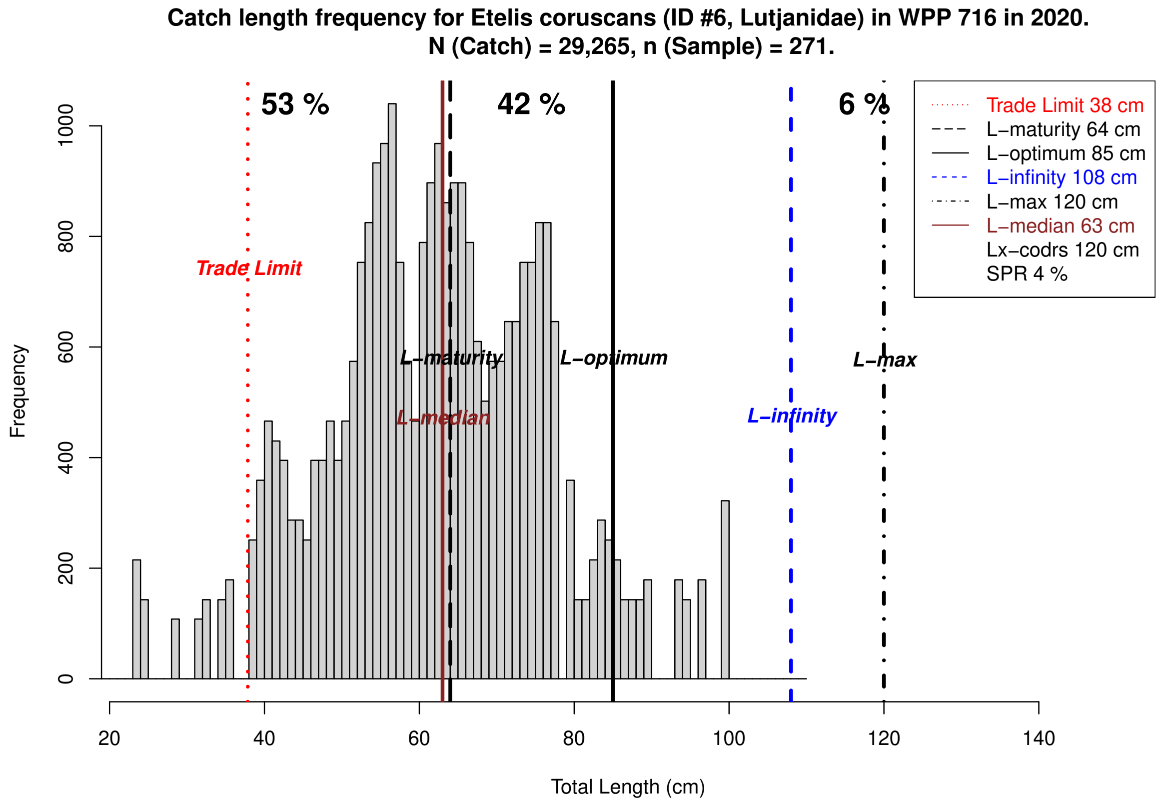
At least 90% of the fish in the catch are mature specimens that have spawned at least once before they were caught. The fishery does not depend on immature size classes for this species and is considered safe for this indicator. This fishery will not be causing overfishing through over harvesting of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

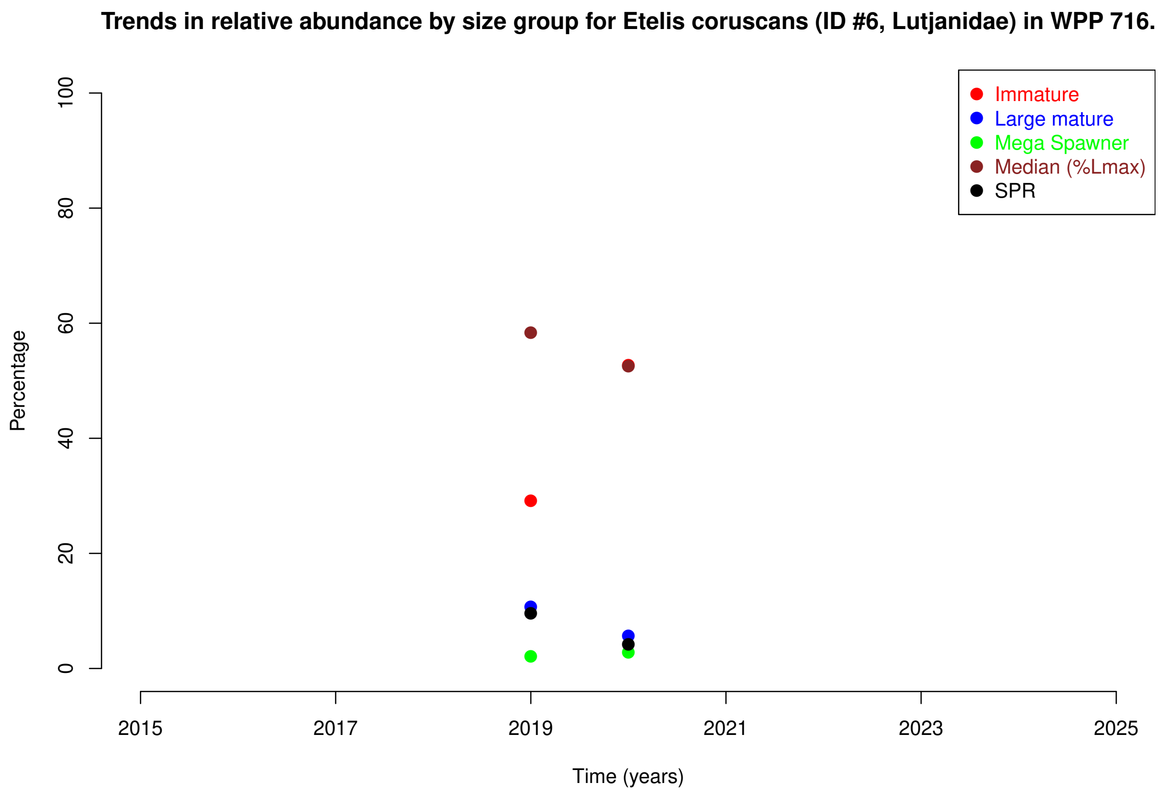
The vast majority of the fish in the catch have not yet achieved their growth potential. The harvest of small fish promotes growth overfishing and the size distribution for this species indicates that over exploitation through growth overfishing may already be happening. Risk level is high.

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.


Catch length frequency for Etelis coruscans (ID #6, Lutjanidae) in WPP 716 in 2020.
N (Catch) = 29,265, n (Sample) = 271.
53 %
42 %
6 %
Trade Limit 38 cm
L–maturity 64 cm
L–optimum 85 cm
L–infinity 108 cm
L–max 120 cm
L–median 63 cm
Lx–codrs 120 cm
SPR 4 %
Trade Limit
L–maturity
L–optimum
L–median
L–infinity
L–max
Frequency
Total Length (cm)


Trends in relative abundance by size group for Etelis coruscans (ID #6, Lutjanidae) in WPP 716.
Immature
Large mature
Mega Spawner
Median (%Lmax)
SPR
Percentage
Time (years)

The percentages of Etelis coruscans (ID #6, Lutjanidae) in 2020.
N (Catch) =29,265, n (Sample) = 271
Immature (< 64cm): 53%
Small mature (>= 64cm, < 85cm): 42%
Large mature (>= 85cm): 6%
Mega spawner (>= 93.5cm): 3% (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.

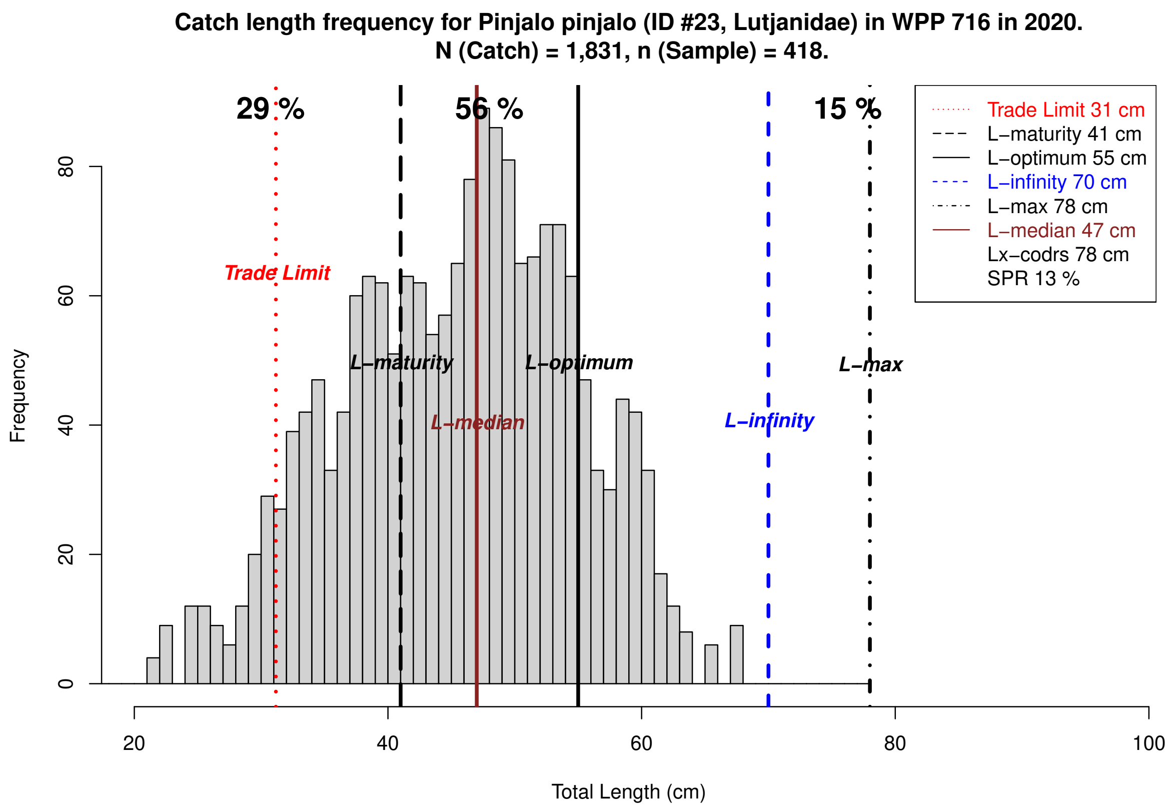
The majority of the fish in the catch have not had a chance to reproduce before capture. This fishery is most likely overfished already if fishing mortality is high for all size classes in the population. An immediate shift away from targeting juvenile fish and a reduction in overall fishing pressure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

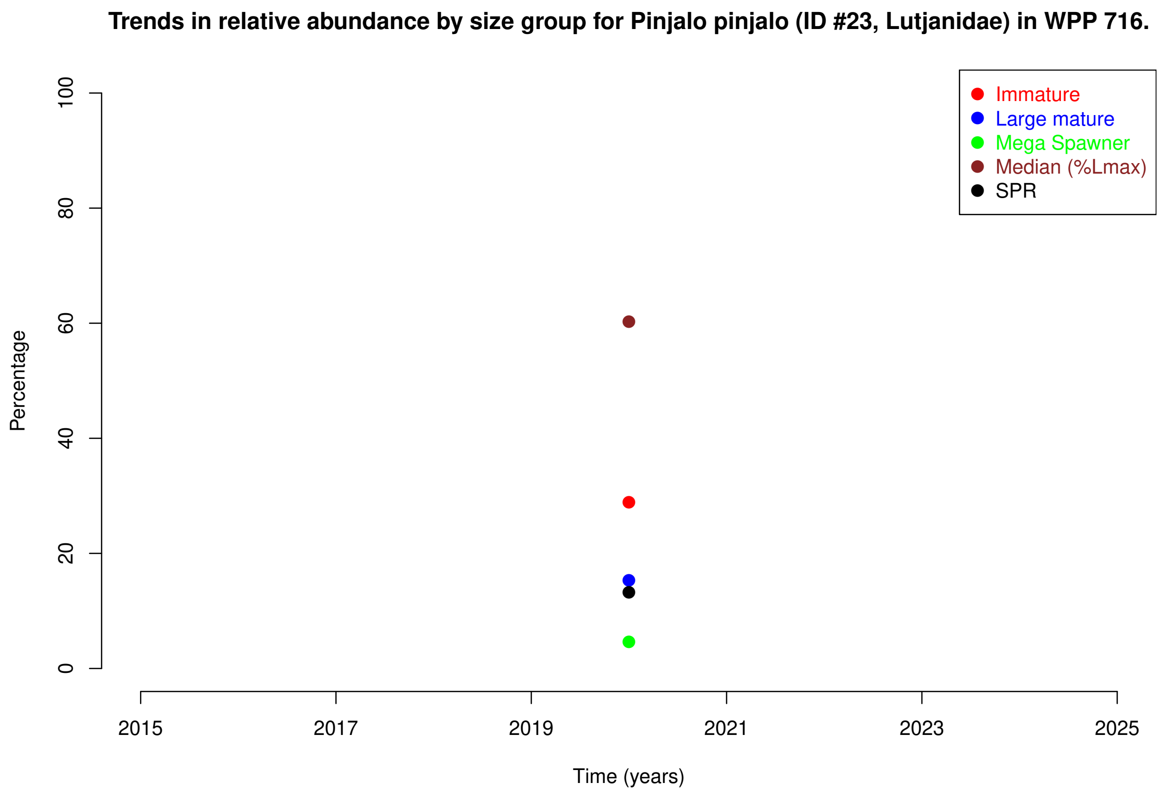
The vast majority of the fish in the catch have not yet achieved their growth potential. The harvest of small fish promotes growth overfishing and the size distribution for this species indicates that over exploitation through growth overfishing may already be happening. Risk level is high.

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 Etelis coruscans (ID #6, 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.


Catch length frequency for Pinjalo pinjalo (ID #23, Lutjanidae) in WPP 716 in 2020.
N (Catch) = 1,831, n (Sample) = 418.
29 %
56 %
15 %
Trade Limit 31 cm
L–maturity 41 cm
L–optimum 55 cm
L–infinity 70 cm
L–max 78 cm
L–median 47 cm
Lx–codrs 78 cm
SPR 13 %
Trade Limit
L–maturity
L–optimum
L–max
L–median
L–infinity
Frequency
Total Length (cm)
0
20
40
60
80
100


Trends in relative abundance by size group for Pinjalo pinjalo (ID #23, Lutjanidae) in WPP 716.
Immature
Large mature
Mega Spawner
Median (%Lmax)
SPR
Percentage
Time (years)
2015
2017
2019
2021
2023
2025

The percentages of Pinjalo pinjalo (ID #23, Lutjanidae) in 2020.
N (Catch) =1,831, n (Sample) = 418
Immature (< 41cm): 29%
Small mature (>= 41cm, < 55cm): 56%
Large mature (>= 55cm): 15%
Mega spawner (>= 60.5cm): 5% (subset of large mature fish)
Spawning Potential Ratio: 13 %

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.

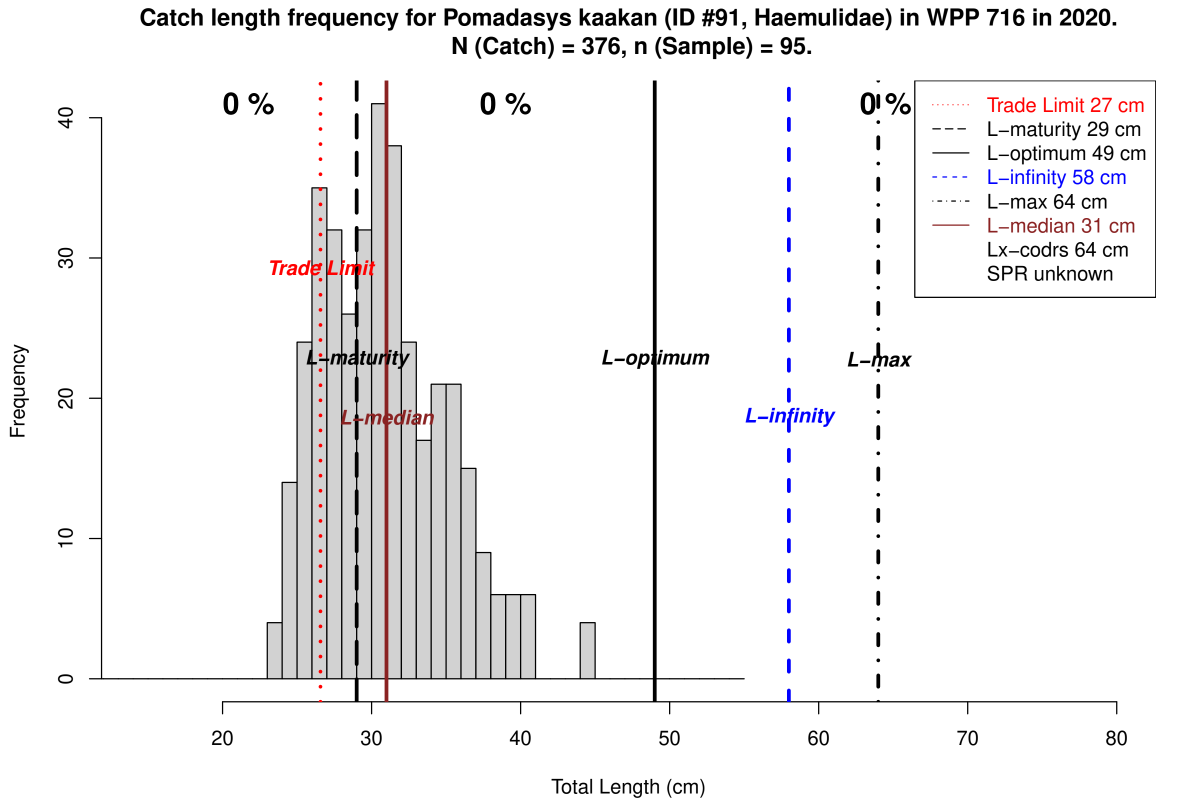
Between 20% and 30% of the fish in the catch are specimens that have not yet reproduced. This is reason for concern in terms of potential overfishing through overharvesting of juveniles, if fishing pressure is high and percentages immature fish would further rise. Targeting larger fish and avoiding small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

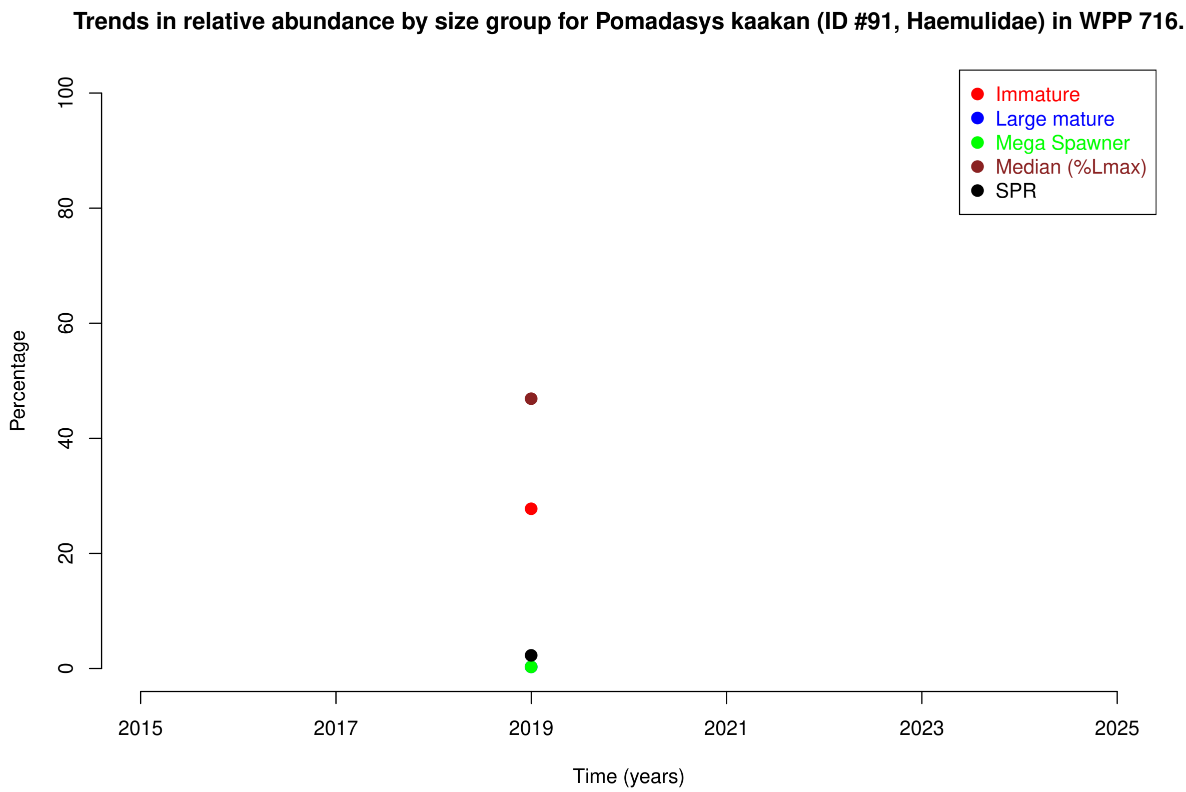
The vast majority of the fish in the catch have not yet achieved their growth potential. The harvest of small fish promotes growth overfishing and the size distribution for this species indicates that over exploitation through growth overfishing may already be happening. Risk level is high.

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 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.


Catch length frequency for Pomadasys kaakan (ID #91, Haemulidae) in WPP 716 in 2020.
N (Catch) = 376, n (Sample) = 95.
0 %
0 %
0 %
Trade Limit
L−maturity
L−median
L−optimum
L−infinity
L−max
Trade Limit 27 cm
L−maturity 29 cm
L−optimum 49 cm
L−infinity 58 cm
L−max 64 cm
L−median 31 cm
Lx−codrs 64 cm
SPR unknown
Frequency
Total Length (cm)


Trends in relative abundance by size group for Pomadasys kaakan (ID #91, Haemulidae) in WPP 716.
Immature
Large mature
Mega Spawner
Median (%Lmax)
SPR
Percentage
Time (years)

The percentages of Pomadasys kaakan (ID #91, Haemulidae) in 2020.
N (Catch) =376, n (Sample) = 95
Immature (< 29cm): 0%
Small mature (>= 29cm, < 49cm): 0%
Large mature (>= 49cm): 0%
Mega spawner (>= 53.9cm): 0% (subset of large mature fish)

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 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.

Table 4.1: Values of indicators in length-based assessments for the top 50 most abundant species by total CODRS samples in WPP 716 in 2020.

Rank	#ID	Species	Trade Limit Prop. Lmat	Immature %	Exploitation %	Mega Spawn %	SPR %
1	17	Lutjanus malabaricus	0.66	90	100	0	0
2	24	Lutjanus johnii	0.59	85	99	0	1
3	50	Epinephelus coioides	0.96	23	100	0	2
4	5	Etelis radiosus	0.71	37	69	9	18
5	10	Pristipomoides sieboldii	0.97	41	100	0	3
6	63	Lethrinus lentjan	1.05	3	95	1	12
7	21	Lutjanus erythropterus	0.86	62	99	0	6
8	33	Paracaesio xanthura	0.98	52	96	1	4
9	20	Lutjanus gibbus	1.07	45	91	4	10
10	9	Pristipomoides filamentosus	0.69	90	100	0	1
11	90	Diagramma pictum	1.02	23	100	0	3
12	25	Lutjanus russelli	1.02	10	97	1	9
13	78	Caranx ignobilis	0.89	26	83	12	7
14	28	Lutjanus boutton	1.20	27	61	19	near 100
15	62	Variola albimarginata	1.38	23	98	0	7
16	1	Aphareus rutilans	0.78	77	99	1	7
17	27	Lutjanus vitta	1.20	1	70	6	21
18	6	Etelis coruscans	0.59	53	94	3	4
19	23	Pinjalo pinjalo	0.76	29	85	5	13
20	91	Pomadasys kaakan		unknown	unknown	unknown	unknown
21	34	Paracaesio kusakarii	0.77	97	99	1	0
22	68	Lethrinus rubrioperculatus	1.40	2	70	9	46
23	19	Lutjanus timorensis	0.98	56	90	5	12
24	60	Plectropomus maculatus	0.91	2	93	1	18
25	71	Gymnocranius griseus		unknown	unknown	unknown	unknown
26	32	Paracaesio gonzalesi	0.86	3	91	0	15
27	93	Sphyraena barracuda		unknown	unknown	unknown	unknown
28	38	Cephalopholis sexmaculata		unknown	unknown	unknown	unknown
29	80	Caranx sexfasciatus		unknown	unknown	unknown	unknown
30	15	Lutjanus argentimaculatus		unknown	unknown	unknown	unknown
31	85	Erythrocles schlegelii		unknown	unknown	unknown	unknown
32	82	Elagatis bipinnulata		unknown	unknown	unknown	unknown
33	7	Pristipomoides multidens		unknown	unknown	unknown	unknown
34	46	Epinephelus bleekeri		unknown	unknown	unknown	unknown
35	70	Gymnocranius grandoculis		unknown	unknown	unknown	unknown
36	2	Aprion virescens		unknown	unknown	unknown	unknown
37	4	Etelis boweni		unknown	unknown	unknown	unknown
38	84	Seriola rivoliana		unknown	unknown	unknown	unknown
40	79	Caranx lugubris		unknown	unknown	unknown	unknown
41	81	Caranx tille		unknown	unknown	unknown	unknown
43	92	Cookeolus japonicus		unknown	unknown	unknown	unknown

Table 4.2: Risk levels in the fisheries for the top 50 most abundant species by total CODRS samples in WPP 716 in 2020.

Rank	#ID	Species	Trade Limit	Immature	Exploitation	Mega Spawn	SPR
1	17	Lutjanus malabaricus	**high**	**high**	**high**	**high**	**high**
2	24	Lutjanus johnii	**high**	**high**	**high**	**high**	**high**
3	50	Epinephelus coioides	**medium**	**medium**	**high**	**high**	**high**
4	5	Etelis radiosus	**high**	**high**	**high**	**high**	**high**
5	10	Pristipomoides sieboldii	**medium**	**high**	**high**	**high**	**high**
6	63	Lethrinus lentjan	**medium**	low	**high**	**high**	**high**
7	21	Lutjanus erythropterus	**high**	**high**	**high**	**high**	**high**
8	33	Paracaesio xanthura	**medium**	**high**	**high**	**high**	**high**
9	20	Lutjanus gibbus	**medium**	**high**	**high**	**high**	**high**
10	9	Pristipomoides filamentosus	**high**	**high**	**high**	**high**	**high**
11	90	Diagramma pictum	**medium**	**medium**	**high**	**high**	**high**
12	25	Lutjanus russelli	**medium**	**medium**	**high**	**high**	**high**
13	78	Caranx ignobilis	**high**	**medium**	**high**	**high**	**high**
14	28	Lutjanus boutton	low	**medium**	**medium**	**high**	low
15	62	Variola albimarginata	low	**medium**	**high**	**high**	**high**
16	1	Aphareus rutilans	**high**	**high**	**high**	**high**	**high**
17	27	Lutjanus vitta	low	low	**high**	**high**	**high**
18	6	Etelis coruscans	**high**	**high**	**high**	**high**	**high**
19	23	Pinjalo pinjalo	**high**	**medium**	**high**	**high**	**high**
20	91	Pomadasys kaakan	**unknown**	**unknown**	**unknown**	**unknown**	**unknown**
21	34	Paracaesio kusakarii	**high**	**high**	**high**	**high**	**high**
22	68	Lethrinus rubrioperculatus	low	low	**high**	**high**	low
23	19	Lutjanus timorensis	**medium**	**high**	**high**	**high**	**high**
24	60	Plectropomus maculatus	**medium**	low	**high**	**high**	**high**
25	71	Gymnocranius griseus	**unknown**	**unknown**	**unknown**	**unknown**	**unknown**
26	32	Paracaesio gonzalesi	**high**	low	**high**	**high**	**high**
27	93	Sphyraena barracuda	**unknown**	**unknown**	**unknown**	**unknown**	**unknown**
28	38	Cephalopholis sexmaculata	**unknown**	**unknown**	**unknown**	**unknown**	**unknown**
29	80	Caranx sexfasciatus	**unknown**	**unknown**	**unknown**	**unknown**	**unknown**
30	15	Lutjanus argentimaculatus	**unknown**	**unknown**	**unknown**	**unknown**	**unknown**
31	85	Erythrocles schlegelii	**unknown**	**unknown**	**unknown**	**unknown**	**unknown**
32	82	Elagatis bipinnulata	**unknown**	**unknown**	**unknown**	**unknown**	**unknown**
33	7	Pristipomoides multidens	**unknown**	**unknown**	**unknown**	**unknown**	**unknown**
34	46	Epinephelus bleekeri	**unknown**	**unknown**	**unknown**	**unknown**	**unknown**
35	70	Gymnocranius grandoculis	**unknown**	**unknown**	**unknown**	**unknown**	**unknown**
36	2	Aprion virescens	**unknown**	**unknown**	**unknown**	**unknown**	**unknown**
37	4	Etelis boweni	**unknown**	**unknown**	**unknown**	**unknown**	**unknown**
38	84	Seriola rivoliana	**unknown**	**unknown**	**unknown**	**unknown**	**unknown**
40	79	Caranx lugubris	**unknown**	**unknown**	**unknown**	**unknown**	**unknown**
41	81	Caranx tille	**unknown**	**unknown**	**unknown**	**unknown**	**unknown**
43	92	Cookeolus japonicus	**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 716.

Rank	#ID	Species	% Immature	% Large Mature	% Mega Spawner	% SPR
1	17	Lutjanus malabaricus	**unknown**	**unknown**	**unknown**	**unknown**
2	24	Lutjanus johnii	**unknown**	**unknown**	**unknown**	**unknown**
3	50	Epinephelus coioides	**unknown**	**unknown**	**unknown**	**unknown**
4	5	Etelis radiosus	**unknown**	**unknown**	**unknown**	**unknown**
5	10	Pristipomoides sieboldii	**unknown**	**unknown**	**unknown**	**unknown**
6	63	Lethrinus lentjan	**unknown**	**unknown**	**unknown**	**unknown**
7	21	Lutjanus erythropterus	**unknown**	**unknown**	**unknown**	**unknown**
8	33	Paracaesio xanthura	**unknown**	**unknown**	**unknown**	**unknown**
9	20	Lutjanus gibbus	**unknown**	**unknown**	**unknown**	**unknown**
10	9	Pristipomoides filamentosus	**unknown**	**unknown**	**unknown**	**unknown**
11	90	Diagramma pictum	**unknown**	**unknown**	**unknown**	**unknown**
12	25	Lutjanus russelli	**unknown**	**unknown**	**unknown**	**unknown**
13	78	Caranx ignobilis	**unknown**	**unknown**	**unknown**	**unknown**
14	28	Lutjanus boutton	**unknown**	**unknown**	**unknown**	**unknown**
15	62	Variola albimarginata	**unknown**	**unknown**	**unknown**	**unknown**
16	1	Aphareus rutilans	**unknown**	**unknown**	**unknown**	**unknown**
17	27	Lutjanus vitta	**unknown**	**unknown**	**unknown**	**unknown**
18	6	Etelis coruscans	**unknown**	**unknown**	**unknown**	**unknown**
19	23	Pinjalo pinjalo	**unknown**	**unknown**	**unknown**	**unknown**
20	91	Pomadasys kaakan	**unknown**	**unknown**	**unknown**	**unknown**
21	34	Paracaesio kusakarii	**unknown**	**unknown**	**unknown**	**unknown**
22	68	Lethrinus rubrioperculatus	**unknown**	**unknown**	**unknown**	**unknown**
23	19	Lutjanus timorensis	**unknown**	**unknown**	**unknown**	**unknown**
24	60	Plectropomus maculatus	**unknown**	**unknown**	**unknown**	**unknown**
25	71	Gymnocranius griseus	**unknown**	**unknown**	**unknown**	**unknown**
26	32	Paracaesio gonzalesi	**unknown**	**unknown**	**unknown**	**unknown**
27	93	Sphyraena barracuda	**unknown**	**unknown**	**unknown**	**unknown**
28	38	Cephalopholis sexmaculata	**unknown**	**unknown**	**unknown**	**unknown**
29	80	Caranx sexfasciatus	**unknown**	**unknown**	**unknown**	**unknown**
30	15	Lutjanus argentimaculatus	**unknown**	**unknown**	**unknown**	**unknown**
31	85	Erythrocles schlegelii	**unknown**	**unknown**	**unknown**	**unknown**
32	82	Elagatis bipinnulata	**unknown**	**unknown**	**unknown**	**unknown**
33	7	Pristipomoides multidens	**unknown**	**unknown**	**unknown**	**unknown**
34	46	Epinephelus bleekeri	**unknown**	**unknown**	**unknown**	**unknown**
35	70	Gymnocranius grandoculis	**unknown**	**unknown**	**unknown**	**unknown**
36	2	Aprion virescens	**unknown**	**unknown**	**unknown**	**unknown**
37	4	Etelis boweni	**unknown**	**unknown**	**unknown**	**unknown**
38	84	Seriola rivoliana	**unknown**	**unknown**	**unknown**	**unknown**
40	79	Caranx lugubris	**unknown**	**unknown**	**unknown**	**unknown**
41	81	Caranx tille	**unknown**	**unknown**	**unknown**	**unknown**
43	92	Cookeolus japonicus	**unknown**	**unknown**	**unknown**	**unknown**

5 Discussion and conclusions

Fishing with bottom long lines and traps for snappers, groupers, emperors occurs in WPP 716 on shelf areas in the western Celebes Sea along the coast of East Kalimantan. Preferred bottom long line and trap 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 on the shelf, and on the slopes dropping into the Celebes Sea and western Pacific Ocean, mainly at depths between 50 and 350 meters. Snappers, groupers, emperors and grunts in WPP 716 are also targeted by "mixed gear" fisheries, which operate different types of hook and line gear sometimes simultaneously with traps.

The deep demersal 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 it is much more species-rich then is sometimes assumed, also within the snapper category. There is a relatively small amount of bycatch, consisting of various 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 bottom long lines and traps. 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 major target species in WPP 716 (Table 4.1 and Table 4.2), and SPR is dangerously low (Table 5.1), especially for those species which are easily caught with drop line and bottom long line gears. Snapper feeding aggregations occur at predictable and well known locations and the snappers are therefore among the most vulnerable species in these fisheries. Fishing mortality (from all gear types combined) for all major target 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 716 and the situation is currently not improving. Time trends for major target species (ranked by abundance in samples) show continuous 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 aggregation sites may be masking some of the direct effect on CpUE. We do see that for many fleet segments the CpUE is lower in WPP 716 than in some of the south eastern fisheries management areas, which may be part of the reason that many of the larger drop line vessels from North Sulawesi fish all the way in the south eastern Banda Sea.

We are currently looking at a high risk of overfishing for all major target species in WPP 716, combined with a worrisome trend of deterioration in most of the stocks, based on the size based stock assessments. The groupers seem to be somewhat less vulnerable to the deep demersal fisheries than the snappers. This may be because most groupers are staying closer to high rugosity bottom habitat, which is avoided by trap and 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 may be somewhat 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.

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 not in good 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 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 target species in the deep demersal fisheries 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 shows that habitat separation between size groups is evident for many species, while size selectivity of specific hook sizes is obvious. 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 species 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 demersal fisheries, judging from a number of indicators as presented in this report. At present these fisheries show clear signs of over-exploitation in WPP 716.

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 deep demersal 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 716, 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	Lutjanus malabaricus	NA	NA	NA	0	0	NA	NA	NA	NA
2	Lutjanus johnii	NA	NA	NA	2	1	NA	NA	NA	NA
3	Epinephelus coioides	NA	NA	NA	3	2	NA	NA	NA	NA
4	Etelis radiosus	NA	NA	NA	26	16	NA	NA	NA	NA
5	Pristipomoides sieboldii	NA	NA	NA	4	3	NA	NA	NA	NA
6	Lethrinus lentjan	NA	NA	NA	15	12	NA	NA	NA	NA
7	Lutjanus erythropterus	NA	NA	NA	5	6	NA	NA	NA	NA
8	Paracaesio xanthura	NA	NA	NA	5	4	NA	NA	NA	NA
9	Lutjanus gibbus	NA	NA	NA	6	10	NA	NA	NA	NA
10	Pristipomoides filamentosus	NA	NA	NA	0	1	NA	NA	NA	NA
11	Diagramma pictum	NA	NA	NA	2	3	NA	NA	NA	NA
12	Lutjanus russelli	NA	NA	NA	9	9	NA	NA	NA	NA
13	Caranx ignobilis	NA	NA	NA	0	7	NA	NA	NA	NA
14	Lutjanus boutton	NA	NA	NA	63	100	NA	NA	NA	NA
15	Variola albimarginata	NA	NA	NA	12	7	NA	NA	NA	NA
16	Aphareus rutilans	NA	NA	NA	5	7	NA	NA	NA	NA
17	Lutjanus vitta	NA	NA	NA	24	21	NA	NA	NA	NA
18	Etelis coruscans	NA	NA	NA	10	4	NA	NA	NA	NA
19	Pinjalo pinjalo	NA	NA	NA	NA	13	NA	NA	NA	NA
20	Pomadasys kaakan	NA	NA	NA	2	NA	NA	NA	NA	NA

Table 5.2: CpUE (kg/GT/day) trends by fleet segment for Etelis radiosus in WPP 716

CpUE	2016	2017	2018	2019	2020	2021	2022	2023	2024
Nano Dropline	NA	NA	NA	18.3	12.1	NA	NA	NA	NA
Nano Longline	NA	NA	NA	0.0	0.7	NA	NA	NA	NA
Small Dropline	NA	NA	NA	NA	NA	NA	NA	NA	NA
Small Longline	NA	NA	NA	12.2	8.5	NA	NA	NA	NA
Medium Dropline	NA	NA	NA	NA	8.5	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 Aphareus rutilans in WPP 716

CpUE	2016	2017	2018	2019	2020	2021	2022	2023	2024
Nano Dropline	NA	NA	NA	1.2	1.9	NA	NA	NA	NA
Nano Longline	NA	NA	NA	0.1	0.7	NA	NA	NA	NA
Small Dropline	NA	NA	NA	NA	NA	NA	NA	NA	NA
Small Longline	NA	NA	NA	0.8	1.5	NA	NA	NA	NA
Medium Dropline	NA	NA	NA	1.2	1.5	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 Caranx ignobilis in WPP 716

CpUE	2016	2017	2018	2019	2020	2021	2022	2023	2024
Nano Dropline	NA	NA	NA	0.7	0.5	NA	NA	NA	NA
Nano Longline	NA	NA	NA	4.1	3.4	NA	NA	NA	NA
Small Dropline	NA	NA	NA	NA	NA	NA	NA	NA	NA
Small Longline	NA	NA	NA	1.5	1.2	NA	NA	NA	NA
Medium Dropline	NA	NA	NA	1.4	1.2	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 Pristipomoides filamentosus in WPP 716

CpUE	2016	2017	2018	2019	2020	2021	2022	2023	2024
Nano Dropline	NA	NA	NA	0.5	1.5	NA	NA	NA	NA
Nano Longline	NA	NA	NA	0.2	0.3	NA	NA	NA	NA
Small Dropline	NA	NA	NA	NA	NA	NA	NA	NA	NA
Small Longline	NA	NA	NA	0.4	1.1	NA	NA	NA	NA
Medium Dropline	NA	NA	NA	NA	1.1	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 716

CpUE	2016	2017	2018	2019	2020	2021	2022	2023	2024
Nano Dropline	NA	NA	NA	35.6	24.7	NA	NA	NA	NA
Nano Longline	NA	NA	NA	19.7	26.3	NA	NA	NA	NA
Small Dropline	NA	NA	NA	NA	NA	NA	NA	NA	NA
Small Longline	NA	NA	NA	29.6	24.3	NA	NA	NA	NA
Medium Dropline	NA	NA	NA	10.6	24.3	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 716 Dropline

Family Name	2016	2017	2018	2019	2020	2021	2022	2023	2024	Total	%Sample
Acanthuridae	0	0	0	78	180	0	0	0	0	258	0.379
Ariidae	0	0	0	0	0	0	0	0	0	0	0.000
Ariommatidae	0	0	0	183	200	0	0	0	0	383	0.563
Balistidae	0	0	0	74	230	0	0	0	0	304	0.447
Bramidae	0	0	0	8	27	0	0	0	0	35	0.051
Caesionidae	0	0	0	9	0	0	0	0	0	9	0.013
Carangidae	0	0	0	68	217	0	0	0	0	285	0.419
Coryphaenidae	0	0	0	7	3	0	0	0	0	10	0.015
Ephippidae	0	0	0	3	4	0	0	0	0	7	0.010
Epinephelidae	0	0	0	593	828	0	0	0	0	1421	2.088
Gempylidae	0	0	0	10	0	0	0	0	0	10	0.015
Haemulidae	0	0	0	10	5	0	0	0	0	15	0.022
Hemiramphidae	0	0	0	5	0	0	0	0	0	5	0.007
Holocentridae	0	0	0	584	332	0	0	0	0	916	1.346
Istiophoridae	0	0	0	1	0	0	0	0	0	1	0.001
Labridae	0	0	0	6	0	0	0	0	0	6	0.009
Lethrinidae	0	0	0	783	1218	0	0	0	0	2001	2.940
Lutjanidae	0	0	0	304	857	0	0	0	0	1161	1.706
Mullidae	0	0	0	184	439	0	0	0	0	623	0.915
Muraenesocidae	0	0	0	0	0	0	0	0	0	0	0.000
Nemipteridae	0	0	0	31	182	0	0	0	0	213	0.313
Other	0	0	0	159	330	0	0	0	0	489	0.719
Priacanthidae	0	0	0	85	199	0	0	0	0	284	0.417
Rays	0	0	0	0	2	0	0	0	0	2	0.003
Scaridae	0	0	0	20	36	0	0	0	0	56	0.082
Scombridae	0	0	0	184	478	0	0	0	0	662	0.973
Serranidae	0	0	0	0	1	0	0	0	0	1	0.001
Sharks	0	0	0	6	17	0	0	0	0	23	0.034
Siganidae	0	0	0	3	1	0	0	0	0	4	0.006
Sphyraenidae	0	0	0	1	0	0	0	0	0	1	0.001
Trichiuridae	0	0	0	0	1	0	0	0	0	1	0.001
Total	0	0	0	3399	5787	0	0	0	0	9186	13.497

Table 5.8: Sample sizes over the period 2016 to 2024 for the others species in WPP 716 Longline

Family Name	2016	2017	2018	2019	2020	2021	2022	2023	2024	Total	%Sample
Acanthuridae	0	0	0	0	2	0	0	0	0	2	0.003
Ariidae	0	0	0	0	0	0	0	0	0	0	0.000
Ariommatidae	0	0	0	0	0	0	0	0	0	0	0.000
Balistidae	0	0	0	2	3	0	0	0	0	5	0.007
Bramidae	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	9	7	0	0	0	0	16	0.024
Coryphaenidae	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	91	71	0	0	0	0	162	0.238
Gempylidae	0	0	0	11	0	0	0	0	0	11	0.016
Haemulidae	0	0	0	8	8	0	0	0	0	16	0.024
Hemiramphidae	0	0	0	0	0	0	0	0	0	0	0.000
Holocentridae	0	0	0	65	75	0	0	0	0	140	0.206
Istiophoridae	0	0	0	0	0	0	0	0	0	0	0.000
Labridae	0	0	0	2	0	0	0	0	0	2	0.003
Lethrinidae	0	0	0	506	299	0	0	0	0	805	1.183
Lutjanidae	0	0	0	216	253	0	0	0	0	469	0.689
Mullidae	0	0	0	5	1	0	0	0	0	6	0.009
Muraenesocidae	0	0	0	2	0	0	0	0	0	2	0.003
Nemipteridae	0	0	0	28	2	0	0	0	0	30	0.044
Other	0	0	0	47	44	0	0	0	0	91	0.134
Priacanthidae	0	0	0	271	120	0	0	0	0	391	0.575
Rays	0	0	0	6	8	0	0	0	0	14	0.021
Scaridae	0	0	0	0	0	0	0	0	0	0	0.000
Scombridae	0	0	0	1	5	0	0	0	0	6	0.009
Serranidae	0	0	0	1	0	0	0	0	0	1	0.001
Sharks	0	0	0	15	3	0	0	0	0	18	0.026
Siganidae	0	0	0	0	0	0	0	0	0	0	0.000
Sphyraenidae	0	0	0	1	0	0	0	0	0	1	0.001
Trichiuridae	0	0	0	0	0	0	0	0	0	0	0.000
Total	0	0	0	1287	901	0	0	0	0	2188	3.215

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