

Indonesian Snapper Fisheries Catch and Effort by Home District of The Fleet

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Abstract

This document provides an overview of the Indonesia deepwater demersal fishery targeting snappers. It presents the composition of the fishing fleet and catch by the district where the vessels are registered (home district), further summarized by major island and province. Especially for larger vessels (over 30 GT), the actual fishing grounds may be hundreds of kilometers away from the home district of the vessel, and therefore catch estimates presented here are not representative for the catch from waters near the home district.

This document is a companion to a series of reports that provide stock assessments and fleet and catch characteristics by Fisheries Management Area (Wilayah Pengelolaan Perikanan, WPP). Whereas Fisheries Management Areas are meaningful as an ecological unit, they are less meaningful for analysis of supply lines. Especially for buyers who source fish directly from vessels, an overview by home district is more useful, as the home district gives some indication where raw material can be sourced. Government officials, on the other hand, may be interested in overviews by province. Findings presented in this document are based on YKAN's Crew-Operated Data Recording System, an initiative that involves fishers in data collection using digital imagery

Based on data collected in 2020, the annual catch of Indonesia's snapper fisheries amounted to nearly 120,000 metric tons. The top five home districts were Kepulauan Aru (Arafura Sea), Bintan (South China Sea), Sumenep (north of East Java), Biak (northern Papua), and Banyuwangi (east coast of East Java), which together represented close to 30% of the total catch. Fleet characteristics vary widely between home districts: Biak and Banyuwangi districts feature a large fleet of very small ("nano") units, from which fishers manually operate handlines. Aru, on the other hand is the base for a fleet of larger vessels that mainly operate bottom long lines, while Bintan is characterized by medium-sized vessels that operate traps. The Sumenep fleet is dominated by small drop line boats, many of them based on the islands east of Madura, together producing 5% of Indonesian snapper landings.

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1 Introduction

Deep demersal fisheries in Indonesia yielded close to 120,000 Metric Tons of fish in 2020, landed by a fleet of just over 11,500 fishing boats, together comprising almost 63,000 Hull Gross Tons (GT-hull) of vessel volume (Mous et al., 2021). Fishing boat sizes in these fisheries range from “nano” sized canoes of less than 1 GT, up to the larger vessels measuring close to 100 GT. The deep demersal fisheries target mainly snappers, groupers, trevallies, emperors, grunts and croakers, while also catching a large variety of co-occurring species, at depths ranging between 30 and 350 meters.

The most common gear types in these fisheries are drop lines, bottom long lines and traps, but some fleet segments also use bottom gillnets - set either deep or vertical along outer reef walls. Fishing grounds are spread out over the entire Indonesian archipelago, from Sumatra in the West to Papua in the East, and are administratively divided into 11 Fisheries Management Areas (FMAs). Fishing grounds include flat bottom areas of medium depth, deep slopes, and seamounts, with specific gear types applied at different habitats.

Before the start of this study, information on the dispersed small- to medium-scale deep demersal fisheries was scarce, and reliable data on geographic distribution of effort and species-specific catch was non-existent. This data deficiency made stock assessments impossible, while harvest control rules could not be developed. A Crew-Operated Data Recording System (CODRS) was therefore implemented, with the aim to efficiently collect species- and length-composition data from catches across all segments of the fleet.

The CODRS approach involves fishers taking photographs of all fish in the catch, displayed on measuring boards, while a low-cost GPS tracking system records fishing positions. This approach enabled calculation of species-specific catch per unit of effort (CpUE) by boat size and gear type category, for each of the 11 FMAs (Figure 1.1).

Total extraction could be calculated by combining CpUE for each fleet segment in each FMA with information on the fleet size engaged in the deep demersal fisheries there. The total fleet was described and mapped during a frame survey that covered the entire Indonesian archipelago, and CODRS contracts were allocated to around 440 fishing boats. CODRS contracts were allocated over the full range of boat sizes and gear types, with at least one and where possible multiple repetitions within the same segment.

Onboard GPS trackers provided data on fishing grounds, effort and fleet dynamics, while measuring boards and cameras were supplied to photograph the catches with a reference for the size of the fish. With over 4 million CODRS images available by 2020, length-based assessment methods were applied to evaluate total production, status and trends in the stocks for the most important species.

Assessment results showed that the Indonesian deep demersal fisheries are of national and local importance in terms of jobs, economic output and food security. A global end value of close to US\$ 1.3 Billion has been estimated for the trade in the top 100 target species in these fisheries, based on catch volumes, percentages local retail and export by species, and local as well as international retail prices.

While there are over 100 species of fish regularly caught in these fisheries (Mous et al., 2019), the top 12 snapper species account for close to 60% of the total catch volume (Mous et al., 2021) and all snappers combined represent close to 70% of the total production.

Groupers represent only about 12% of the catch but with a high price per kilogram they do represent an important part of the total value. All other species combined make up about 20% of the total production but a smaller percentage of the end value of the trade.

While the actual fishing grounds (or target FMA) used by the various fleet segments are of major importance in stock assessments, it is essential for fisheries administrators and fish traders to have a detailed overview of where those fleet segments are based, and what the catch volume and species composition looks like in relation to home bases of the fleet. During the frame survey, a data base with all vessels was therefore developed that included information on the home district (Kabupaten) for every vessel in the fleet.

The current report provides a geographic overview of fleet distribution, by home district, with details on fleet size by segment based in each Kabupaten, as well as on the production that each home district represents. We expect that this information will be useful for traders planning the development of supply lines as well as for fisheries administrators planning to gather additional information on the deep demersal fisheries in Indonesia. When using this information though, we note that target fishing grounds for some fleet segments may be far away from their home districts (Mous et al., 2021) especially for the larger boat sizes in the fleet.

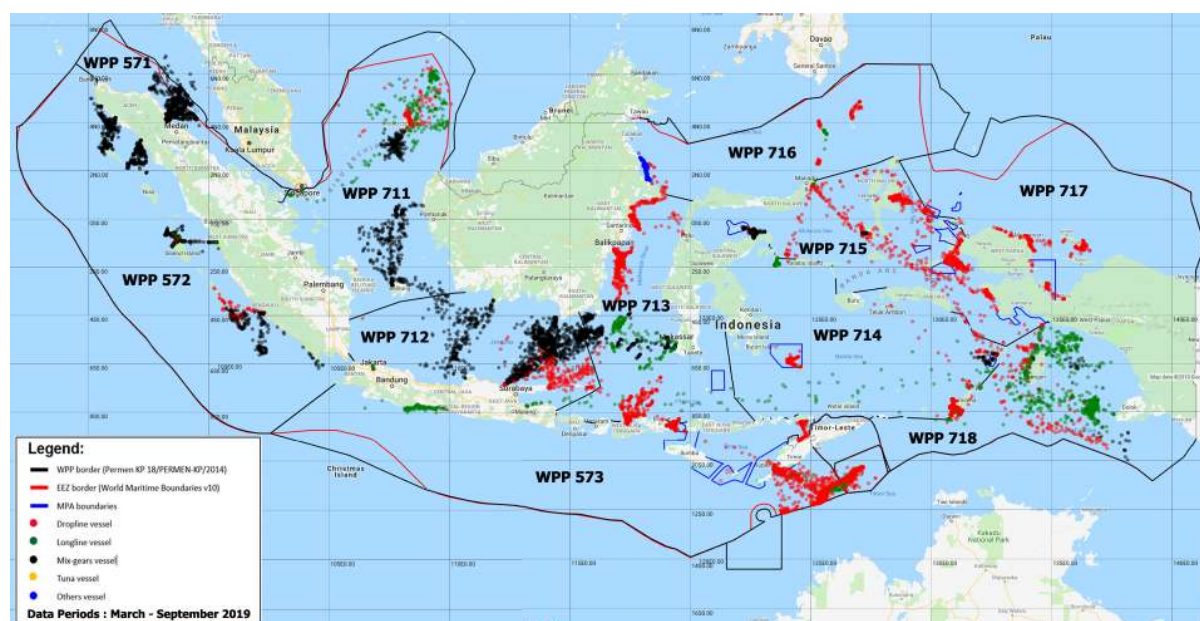


Figure 1.1: Map of 11 Fishery Management Areas (FMA) within Indonesia. Black lines denote FMA boundaries and coloured dots indicate vessel positions for various segments of the fleet.

2 Production and Fleet Composition by Home District and Major Island

To enable fisheries managers, fish traders and other stakeholders in the deep demersal fisheries to focus on the most important home districts (kabupaten) in Indonesia, we organized the information from the 2020 CODRS sampling program in such a way that it shows where the various fleet segments are registered that are producing the bulk of the catch in these fisheries. We also listed and ranked home districts within major island regions, which are the same island regions by which the original frame surveys for the CODRS program were organized.

We distinguished seven major island regions including Sumatra, Jawa, Kalimantan, Sulawesi, Bali-NTB-NTT, Maluku and Papua. The home district is defined here as the district where fishing vessels are registered, not necessarily where they are fishing, so we do need to keep in mind here that in some cases the catches may originate from fishing grounds (FMA), which are far away from the home district. For production and effort allocation by FMA we refer to the IFish stock assessment reports by FMA.

We estimated annual catch volume by home district from the estimated CpUE for each vessel in its target WPP based on CODRS data from the fleet segment (boat size * gear type) that the vessel belongs to. For each vessel this estimated CpUE was multiplied with its effort in terms of vessel size (GT) and number of active fishing days per year, to estimate the catch for that vessel. Catches for all vessels registered in each home district were combined to estimate total catch by the fleet registered in that home district, and with that we could rank the home districts by the catch volume that their respective fleets produced in 2020.

The Top 50 home districts in Indonesia represent a registered fleet that together produced 90% of the total catch in that year (Table 2.1). Besides catch volume we also summarized the fleet size based in each home district in terms of numbers of vessels and in terms of total vessel size. Fleet characteristics were then further detailed in terms of gear type by vessel volume and number of boats per size category.

The Top 5 Home Districts for fleet segments in the deep demersal fisheries, including Kepulauan Aru in the island region of Maluku, Bintan in Sumatra, Sumenep in Jawa, Biak in Papua, and Banyuwangi also in Jawa, together represented close to 30% of the total catch in 2020. Fleet characteristics can be extremely different between home districts, even within the Top 5 districts in terms of fleet productivity (Table 2.1).

Biak and Banyuwangi districts, for example, are characterized by a very large fleet of very small (“nano”) units, from which fishers manually operate handlines that are dropped to fairly great depths. Aru on the other hand is the base for a fleet of larger vessels that mainly operate bottom long lines, while Bintan is characterized by medium sized vessels that operate traps. Bottom long lines and traps are usually confined to shallower fishing grounds, while drop lines are commonly used in deeper waters as well.

The Sumenep district, in the province of East Java, includes the eastern end of Madura island, and the string of islands extending from there to the east into the northern Bali Sea and the southern Makassar Strait. This relatively unknown district ranks number 1 in Jawa and number 3 overall in Indonesia for deep demersal fisheries production by the fleet which is registered here. This fleet is dominated by small drop line boats, many of them based on the islands east of Madura, together producing an estimated 6,375 MT of demersal fish, representing 5% of Indonesian landings in 2020.

Table 2.1: Catch Volume and Effort Details by Home District of the Fleet fishing for Snappers, Groupers and Emperors in Indonesia, for the Top 50 Home Districts ranked by production in 2020.

Rank	Home District Kabupaten	Catch MT	Catch %	Fleet GT	GT% by Gear				Fleet		N% by Size			
					drop	long	gill	trap	N	nano	small	medium	large	
1	Kepulauan Aru	8519	7	8538	20	64	15	NA	226	8	4	50	38	
2	Bintan	8055	7	6079	2	NA	NA	98	459	0	47	53	NA	
3	Sumenep	6375	5	3515	88	12	NA	NA	529	10	88	2	NA	
4	Biak	6236	5	1804	100	NA	NA	NA	1805	100	NA	NA	NA	
5	Banyuwangi	6210	5	3214	100	NA	NA	NA	902	69	30	0	NA	
6	Merauke	6196	5	5453	NA	5	95	NA	74	NA	NA	11	89	
7	Lamongan	4721	4	3242	94	6	NA	1	298	NA	39	61	NA	
8	Pati	4543	4	2122	NA	100	NA	NA	48	NA	NA	27	73	
9	Probolinggo	4406	4	4124	NA	97	3	NA	69	NA	NA	13	87	
10	Belitung	3694	3	1399	21	NA	NA	79	299	58	39	3	NA	
11	Jepara	3247	3	1039	NA	2	NA	98	121	15	57	28	NA	
12	Kupang	3145	3	851	88	12	NA	NA	144	67	15	18	NA	
13	Fakfak	2775	2	252	100	NA	NA	NA	255	100	NA	NA	NA	
14	Natuna	2642	2	2947	40	57	NA	3	452	73	13	11	3	
15	Sorong	2322	2	475	60	4	NA	37	35	17	14	69	NA	
16	Mimika	1847	2	1342	NA	13	87	NA	35	NA	9	60	31	
17	Belitung Timur	1843	2	558	6	NA	NA	94	98	6	91	3	NA	
18	Bima	1657	1	652	93	7	NA	NA	245	100	0	NA	NA	
19	Halmahera Selatan	1370	1	169	99	1	NA	NA	365	100	NA	NA	NA	
20	Berau	1368	1	532	94	NA	NA	6	171	99	1	1	NA	
21	Tarakan	1348	1	302	48	52	NA	NA	98	96	4	NA	NA	
22	Seram Bagian Timur	1336	1	194	90	10	NA	NA	158	100	NA	NA	NA	
23	Minahasa Utara	1302	1	480	100	NA	NA	NA	15	NA	NA	73	27	
24	Langkat	1265	1	392	6	NA	NA	94	90	86	10	4	NA	
25	Kaimana	1237	1	277	37	63	NA	NA	61	87	NA	10	3	
26	Denpasar	1160	1	290	91	9	NA	NA	13	NA	NA	100	NA	
27	Penajam Paser Utara	1120	1	345	27	NA	NA	73	69	3	97	NA	NA	
28	Nias Utara	1081	1	229	86	14	NA	NA	40	32	68	NA	NA	
29	Kutai Timur	1045	1	313	100	NA	NA	NA	101	79	17	4	NA	
30	Maluku Tengah	1006	1	204	100	NA	NA	NA	116	99	NA	NA	1	
31	Bulukumba	940	1	340	100	NA	NA	NA	340	100	NA	NA	NA	
32	Balikpapan	909	1	477	91	9	NA	NA	52	6	63	31	NA	
33	Kota Bengkulu	843	1	383	50	NA	42	8	33	12	39	45	3	
34	Dompu	827	1	394	96	4	NA	NA	109	40	60	NA	NA	
35	Kota Makassar	800	1	1119	32	68	NA	NA	91	1	4	95	NA	
36	Aceh Selatan	777	1	212	8	92	NA	NA	43	33	67	NA	NA	
37	Aceh Barat	773	1	205	58	21	NA	22	37	32	62	5	NA	
38	Seram Bagian Barat	723	1	230	81	19	NA	NA	169	100	NA	NA	NA	
39	Pandeglang	718	1	152	100	NA	NA	NA	29	NA	100	NA	NA	
40	Lombok Timur	702	1	310	12	88	NA	NA	72	75	4	21	NA	
41	Serang	630	1	125	100	NA	NA	NA	21	24	76	NA	NA	
42	Banda Aceh	608	1	129	90	10	NA	NA	21	14	86	NA	NA	
43	Bangka Tengah	590	0	159	NA	NA	NA	100	30	NA	100	NA	NA	
44	Banggai	584	0	58	93	7	NA	NA	68	100	NA	NA	NA	
45	Kutai Kartanegara	577	0	239	33	67	NA	NA	59	78	22	NA	NA	
46	Mamuju	564	0	113	100	NA	NA	NA	35	89	11	NA	NA	
47	Kepulauan Seribu	553	0	175	35	NA	NA	65	42	52	48	NA	NA	
48	Takalar	545	0	480	9	51	40	NA	36	NA	8	92	NA	
49	Kepulauan Anambas	515	0	572	96	NA	NA	4	306	96	4	NA	NA	
50	Bangka	510	0	149	4	NA	NA	96	19	NA	95	5	NA	
NA	Totals in Top 50 Districts	106758	90	57354	NA	NA	NA	NA	9003	NA	NA	NA	NA	
NA	Totals for Indonesia	118193	100	62445	NA	NA	NA	NA	11469	NA	NA	NA	NA	

The Top 3 major island regions in terms of production in the deep demersal fisheries are Jawa, Sumatra and Papua (Table 2.2), which all have direct access to extensive fishing grounds with water depths that are suitable for targeting snappers, groupers and emperors. Jawa and Sumatra together form the home base for a fleet that represents more than 50% of the total catch (close to 60,000 MT) by the Indonesian deep demersal fisheries. Maluku has an important long line fleet based in Dobu, in the Aru Islands, contributing 12% or more than 14,500 MT to the total Indonesian catch in 2020.

The Top 5 Home districts in Jawa (Table 2.3) include Sumenep, Banyuwangi, Lamongan, Pati and Probolinggo. Nano and small sized drop line boats are dominant in Sumenep and Banyuwangi, small to medium sized drop line boats most common in Lamongan, and medium to large long line vessels characteristic for Pati and Probolinggo home districts. Especially the larger long line boats from Probolinggo are known to fish in distant waters, throughout Indonesia where suitable habitat is available. Many of the larger bottom long line vessels operating in the Arafura Sea near Papua originate from Probolinggo, where a major fish processing industry is situated.

Table 2.2: Catch Volume and Effort Details by Major Island Regions of the Fleet fishing for Snappers, Groupers and Emperors in Indonesia, ranked by production in 2020.

Rank	Major Island	Catch MT	Catch %	Fleet GT	GT% by Gear				Fleet N	N% by Size			
					drop	long	gill	trap		nano	small	medium	large
1	Jawa	32776	28	18745	52	41	1	6	2436	44	42	10	4
2	Sumatra	27037	23	14866	21	17	1	61	2183	48	35	17	1
3	Papua	21016	18	9743	26	7	65	2	2342	94	0	3	3
4	Maluku	14108	12	9643	28	59	13	NA	1148	81	2	10	8
5	Bali_NTB_NTT	9766	8	3402	79	21	NA	NA	1483	90	6	4	NA
6	Sulawesi	6903	6	3759	55	37	5	2	1301	86	2	11	0
7	Kalimantan	6587	6	2288	71	17	NA	12	576	72	24	4	NA
NA	Totals for Indonesia	118193	100	62445	NA	NA	NA	NA	11469	NA	NA	NA	NA

Table 2.3: Catch Volume and Effort Details by Home District of the Fleet fishing for Snappers, Groupers and Emperors in Jawa, ranked by production in 2020

Rank	Home District Kabupaten	Catch MT	Catch %	Fleet GT	GT% by Gear				Fleet N	N% by Size			
					drop	long	gill	trap		nano	small	medium	large
1	Sumenep	6375	5	3515	88	12	NA	NA	529	10	88	2	NA
2	Banyuwangi	6210	5	3214	100	NA	NA	NA	902	69	30	0	NA
3	Lamongan	4721	4	3242	94	6	NA	1	298	NA	39	61	NA
4	Pati	4543	4	2122	NA	100	NA	NA	48	NA	NA	27	73
5	Probolinggo	4406	4	4124	NA	97	3	NA	69	NA	NA	13	87
6	Jepara	3247	3	1039	NA	2	NA	98	121	15	57	28	NA
7	Pandeglang	718	1	152	100	NA	NA	NA	29	NA	100	NA	NA
8	Serang	630	1	125	100	NA	NA	NA	21	24	76	NA	NA
9	Kepulauan Seribu	553	0	175	35	NA	NA	65	42	52	48	NA	NA
10	Tangerang	355	0	64	NA	NA	NA	100	7	NA	100	NA	NA
11	Situbondo	276	0	156	NA	100	NA	NA	100	100	NA	NA	NA
12	Jakarta Utara	200	0	205	NA	100	NA	NA	4	NA	NA	NA	100
13	Pangandaran	144	0	59	NA	NA	100	NA	10	20	80	NA	NA
14	Pacitan	139	0	222	NA	100	NA	NA	100	100	NA	NA	NA
15	Jember	100	0	160	NA	100	NA	NA	50	100	NA	NA	NA
16	Pemalang	80	0	57	100	NA	NA	NA	10	NA	100	NA	NA
17	Blitar	31	0	36	NA	100	NA	NA	16	94	6	NA	NA
18	Sukabumi	31	0	50	NA	100	NA	NA	50	100	NA	NA	NA
19	Cilacap	17	0	26	NA	100	NA	NA	30	100	NA	NA	NA
NA	Totals in Jawa	32776	28	18745	NA	NA	NA	NA	2436	NA	NA	NA	NA
NA	Totals for Indonesia	118193	100	62445	NA	NA	NA	NA	11469	NA	NA	NA	NA

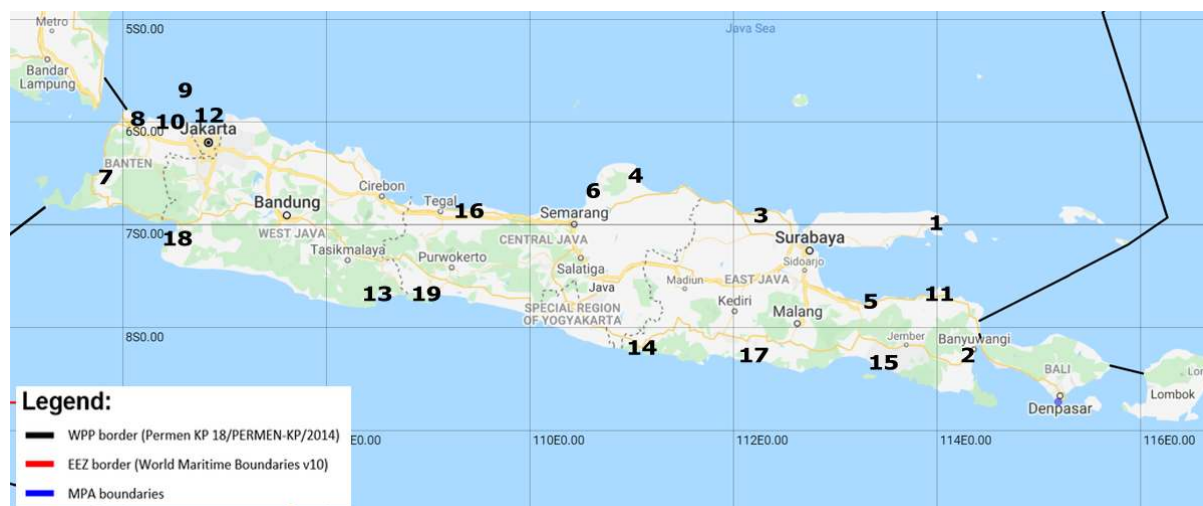


Figure 2.1: Map of major island region including Jawa and surrounding. The numbers in the map refer to Home Districts as ranked in Table 2.3

The Top 5 home districts in Sumatra are Bintan, Belitung, Natuna, Belitung Timur, and Langkat (Table 2.4). Except for the district of Natuna in the South China Sea, trap fishing is dominant in the most important home districts along the coast lines of Sumatra, with the Bintan fleet mostly comprising small to medium sized vessels and the other districts more characterized by nano to small sized boats. Drop line and bottom long line fishing with nano to small sized boats is most common in Natuna.

The Top 5 home districts in Papua are Biak, Merauke, Fak Fak, Sorong and Mimika (Table 2.5), with both Biak and Fak Fak characterized by large fleets of nano drop line boats. Merauke and Mimika are characterized by medium to large sized gillnet boats, which catch many different species, especially croakers with a smaller percentage of snappers also occurring in their catches. Medium sized drop line and trap boats are dominant in the Sorong fleet, which operates in and around the Raja Ampat islands.

Table 2.4: Catch Volume and Effort Details by Home District of the Fleet fishing for Snappers, Groupers and Emperors in Sumatra, ranked by production in 2020

Rank	Home District Kabupaten	Catch MT	Catch %	Fleet GT	GT% by Gear				Fleet N	N% by Size			
					drop	long	gill	trap		nano	small	medium	large
1	Bintan	8055	7	6079	2	NA	NA	98	459	0	47	53	NA
2	Belitung	3694	3	1399	21	NA	NA	79	299	58	39	3	NA
3	Natuna	2642	2	2947	40	57	NA	3	452	73	13	11	3
4	Belitung Timur	1843	2	558	6	NA	NA	94	98	6	91	3	NA
5	Langkat	1265	1	392	6	NA	NA	94	90	86	10	4	NA
6	Nias Utara	1081	1	229	86	14	NA	NA	40	32	68	NA	NA
7	Kota Bengkulu	843	1	383	50	NA	42	8	33	12	39	45	3
8	Aceh Selatan	777	1	212	8	92	NA	NA	43	33	67	NA	NA
9	Aceh Barat	773	1	205	58	21	NA	22	37	32	62	5	NA
10	Banda Aceh	608	1	129	90	10	NA	NA	21	14	86	NA	NA
11	Bangka Tengah	590	0	159	NA	NA	NA	100	30	NA	100	NA	NA
12	Kepulauan Anambas	515	0	572	96	NA	NA	4	306	96	4	NA	NA
13	Bangka	510	0	149	4	NA	NA	96	19	NA	95	5	NA
14	Padang	499	0	199	40	60	NA	NA	21	NA	52	48	NA
15	Kota Pangkalpinang	466	0	141	5	NA	NA	95	27	22	78	NA	NA
16	Kota Sibolga	463	0	220	14	NA	NA	86	34	47	35	18	NA
17	Serdang Bedagai	446	0	165	NA	100	NA	NA	26	50	46	4	NA
18	Lampung	252	0	48	NA	100	NA	NA	17	94	6	NA	NA
19	Mukomuko	237	0	100	100	NA	NA	NA	20	NA	100	NA	NA

Table 2.4: Catch Volume and Effort Details by Home District of the Fleet fishing for Snappers, Groupers and Emperors in Sumatra, ranked by production in 2020

Rank	Home District Kabupaten	Catch MT	Catch %	Fleet GT	GT% by Gear				Fleet N	N% by Size			
					drop	long	gill	trap		nano	small	medium	large
20	Kepulauan Mentawai	154	0	45	100	NA	NA	NA	5	20	40	40	NA
21	Aceh Besar	142	0	22	100	NA	NA	NA	15	100	NA	NA	NA
22	Kota Medan	132	0	50	NA	NA	NA	100	10	NA	100	NA	NA
23	Nias Selatan	116	0	18	100	NA	NA	NA	5	100	NA	NA	NA
24	Aceh Tamiang	113	0	41	NA	NA	NA	100	8	25	75	NA	NA
25	Karimun	112	0	118	NA	94	NA	6	6	NA	17	83	NA
26	Pesisir Selatan	111	0	70	NA	100	NA	NA	7	NA	NA	100	NA
27	Batam	104	0	81	15	NA	NA	85	6	NA	67	33	NA
28	Aceh Singkil	94	0	39	NA	NA	27	73	7	86	NA	14	NA
29	Padang Pariaman	93	0	17	NA	100	NA	NA	10	100	NA	NA	NA
30	Kota Pariaman	88	0	16	NA	100	NA	NA	10	100	NA	NA	NA
31	Aceh Barat Daya	81	0	23	100	NA	NA	NA	3	NA	67	33	NA
32	Kota Sabang	58	0	17	100	NA	NA	NA	6	83	17	NA	NA
33	Aceh Utara	42	0	12	13	NA	NA	87	6	100	NA	NA	NA
34	Lhokseumawe	35	0	11	NA	100	NA	NA	7	100	NA	NA	NA
NA	Totals in Sumatra	27037	23	14866	NA	NA	NA	NA	2183	NA	NA	NA	NA
NA	Totals for Indonesia	118193	100	62445	NA	NA	NA	NA	11469	NA	NA	NA	NA

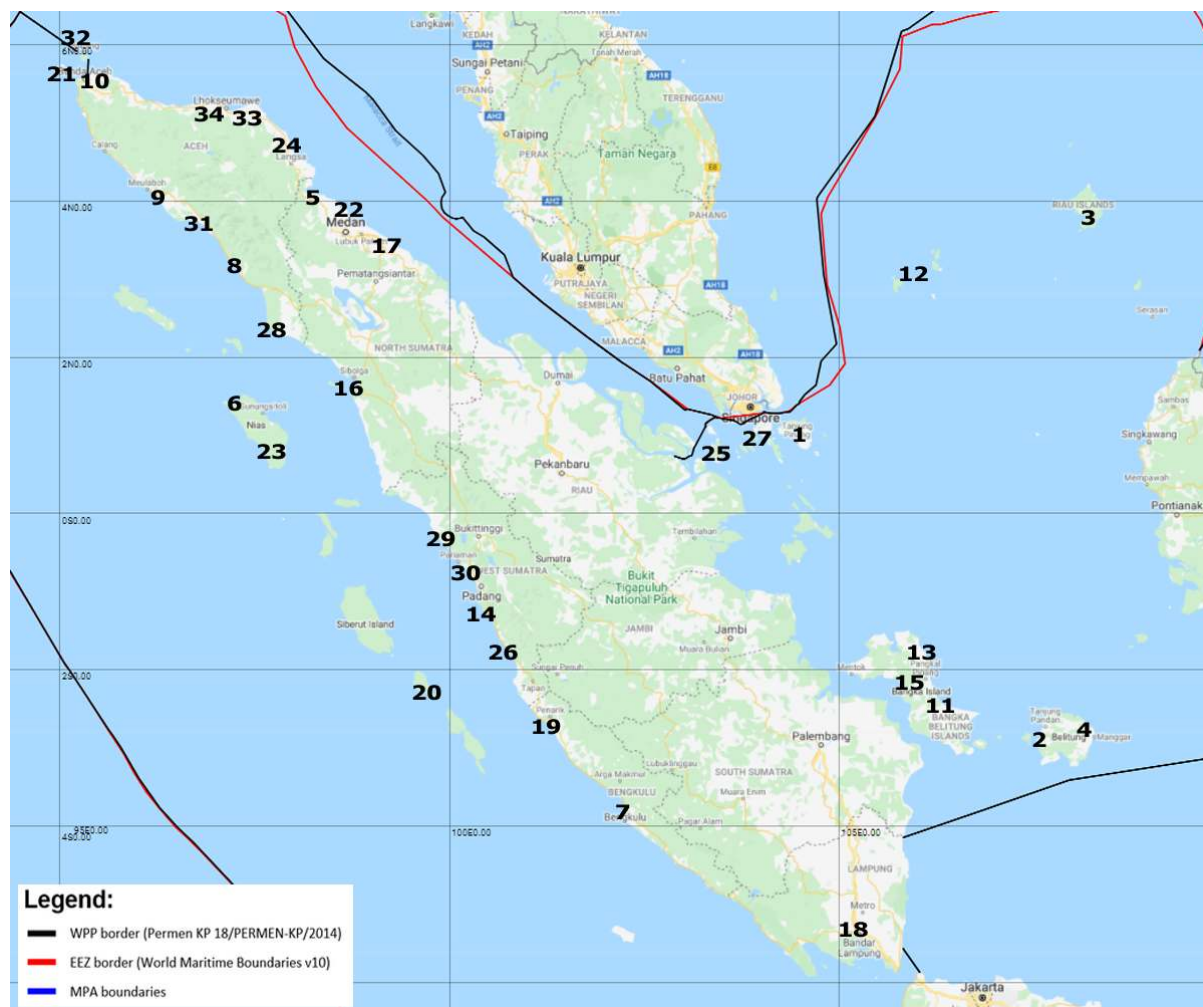


Figure 2.2: Map of major island region including Sumatra and surrounding. The numbers in the map refer to Home Districts as ranked in Table 2.4

Table 2.5: Catch Volume and Effort Details by Home District of the Fleet fishing for Snappers, Groupers and Emperors in Papua, ranked by production in 2020

Rank	Home District Kabupaten	Catch MT	Catch %	Fleet GT	GT% by Gear				Fleet N	N% by Size			
					drop	long	gill	trap		nano	small	medium	large
1	Biak	6236	5	1804	100	NA	NA	NA	1805	100	NA	NA	NA
2	Merauke	6196	5	5453	NA	5	95	NA	74	NA	NA	11	89
3	Fakfak	2775	2	252	100	NA	NA	NA	255	100	NA	NA	NA
4	Sorong	2322	2	475	60	4	NA	37	35	17	14	69	NA
5	Mimika	1847	2	1342	NA	13	87	NA	35	NA	9	60	31
6	Kaimana	1237	1	277	37	63	NA	NA	61	87	NA	10	3
7	Manokwari	266	0	87	100	NA	NA	NA	46	100	NA	NA	NA
8	Nabire	85	0	30	100	NA	NA	NA	12	100	NA	NA	NA
9	Teluk Wondama	52	0	23	100	NA	NA	NA	19	100	NA	NA	NA
NA	Totals in Papua	21016	18	9743	NA	NA	NA	NA	2342	NA	NA	NA	NA
NA	Totals for Indonesia	118193	100	62445	NA	NA	NA	NA	11469	NA	NA	NA	NA

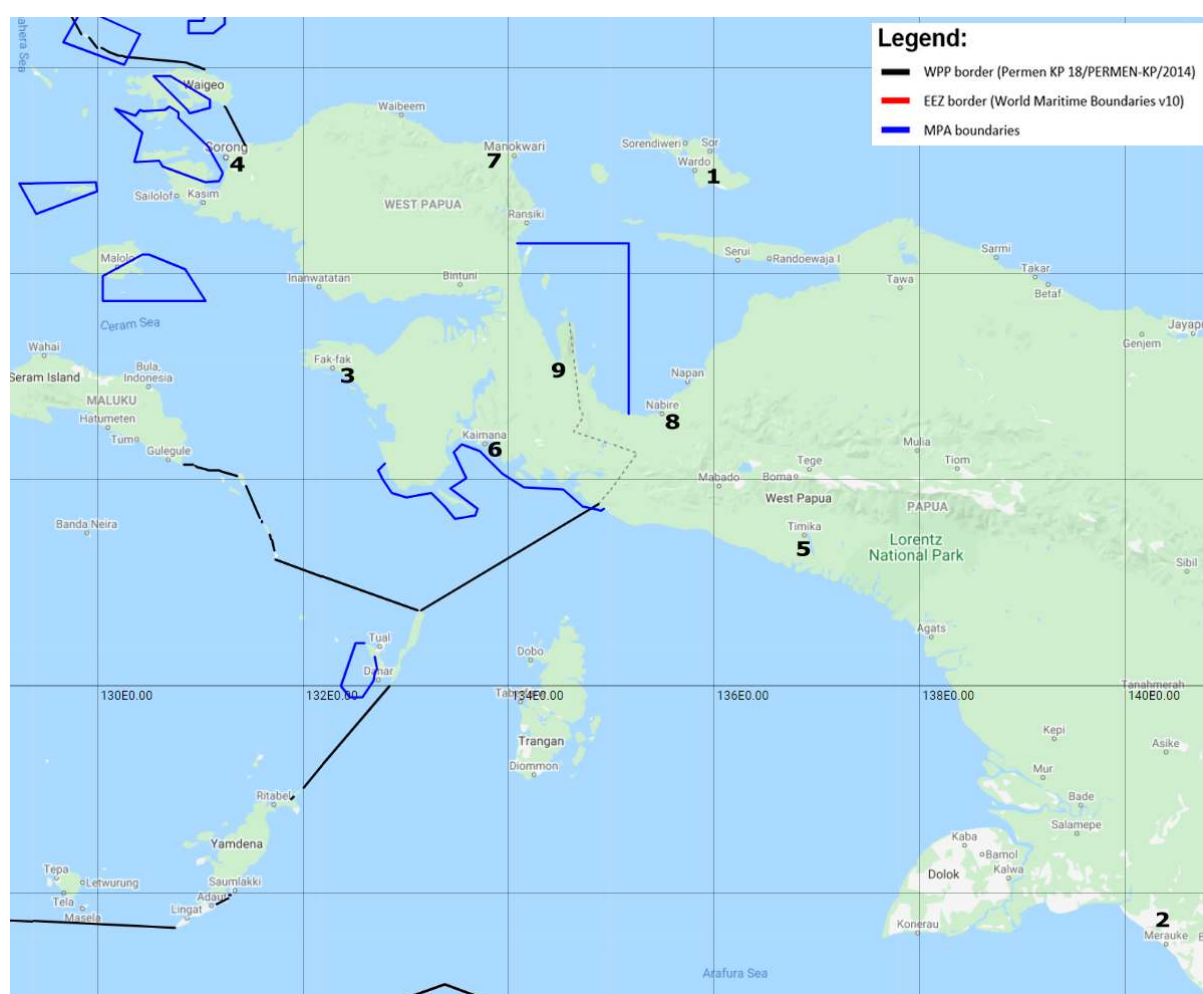


Figure 2.3: Map of major island region including Papua and surrounding. The numbers in the map refer to Home Districts as ranked in Table 2.5

Kepulauan Aru is a major home district for deep demersal fisheries in the Maluku region (Table 2.6), with a large fleet of medium to large sized bottom long line vessels operating in the nearby Arafura Sea, near the coast of Papua. Other districts in Central Maluku like Halmahera Selatan, Seram Timur and Barat, and Maluku Tengah, also represent a significant total catch, produced by a large fleet of nano sized boats that operate drop lines targeting deep water snappers.

Table 2.6: Catch Volume and Effort Details by Home District of the Fleet fishing for Snappers, Groupers and Emperors in Maluku, ranked by production in 2020

Rank	Home District Kabupaten	Catch MT	Catch %	Fleet GT	GT% by Gear				Fleet N	N% by Size			
					drop	long	gill	trap		nano	small	medium	large
1	Kepulauan Aru	8519	7	8538	20	64	15	NA	226	8	4	50	38
2	Halmahera Selatan	1370	1	169	99	1	NA	NA	365	100	NA	NA	NA
3	Seram Bagian Timur	1336	1	194	90	10	NA	NA	158	100	NA	NA	NA
4	Maluku Tengah	1006	1	204	100	NA	NA	NA	116	99	NA	NA	1
5	Seram Bagian Barat	723	1	230	81	19	NA	NA	169	100	NA	NA	NA
6	Halmahera Timur	503	0	85	100	NA	NA	NA	55	100	NA	NA	NA
7	Tual	386	0	148	42	58	NA	NA	8	12	62	12	12
8	Maluku Tenggara	172	0	48	100	NA	NA	NA	11	45	55	NA	NA
9	Kota Tidore Kepulauan	55	0	10	100	NA	NA	NA	10	100	NA	NA	NA
10	Pulau Taliabu	39	0	18	NA	100	NA	NA	30	100	NA	NA	NA
NA	Totals in Maluku	14108	12	9643	NA	NA	NA	NA	1148	NA	NA	NA	NA
NA	Totals for Indonesia	118193	100	62445	NA	NA	NA	NA	11469	NA	NA	NA	NA

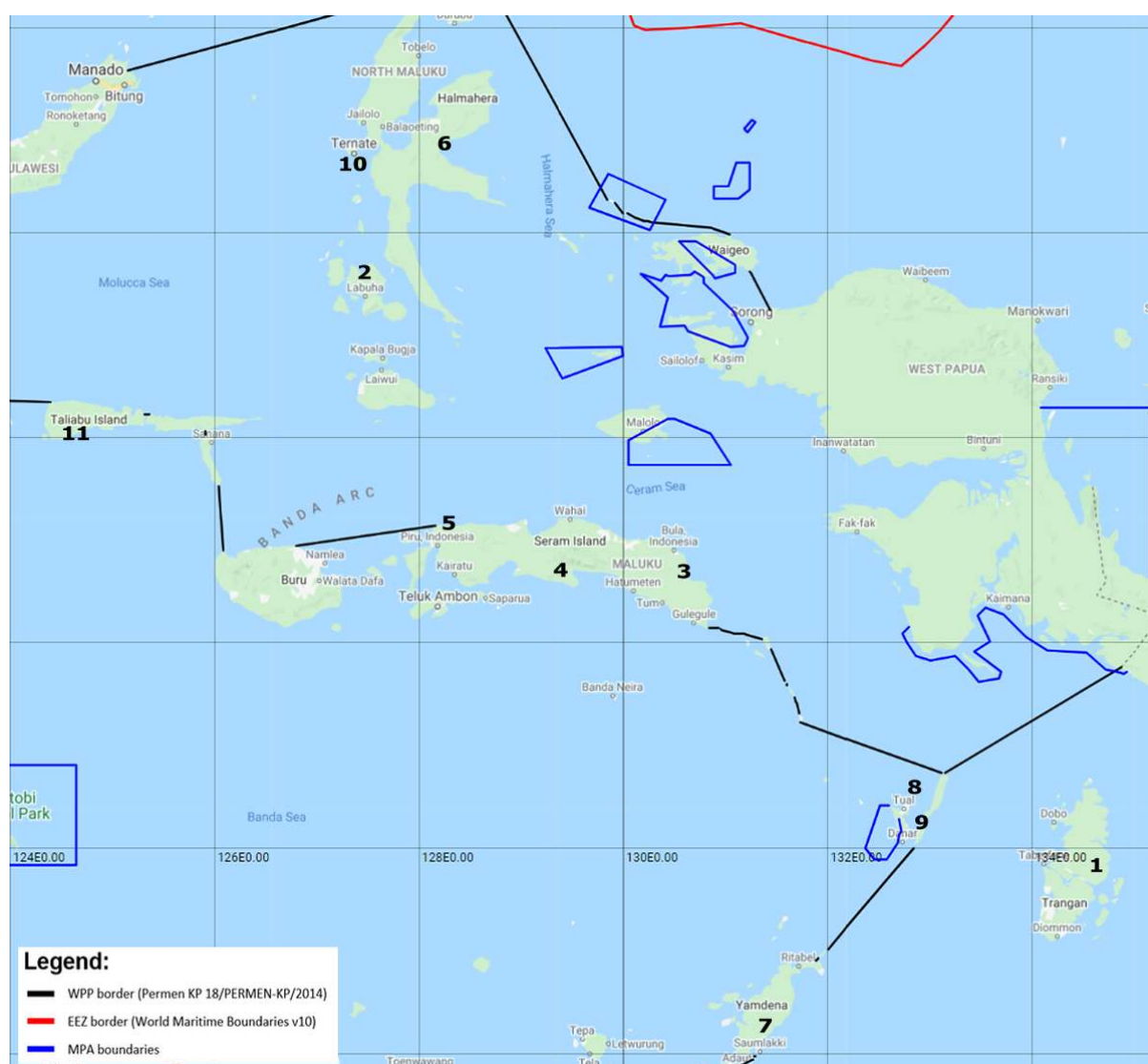


Figure 2.4: Map of major island region including Maluku and surrounding. The numbers in the map refer to Home Districts as ranked in Table 2.6

In the Bali-NTB-NTT region the main home districts are Kupang, Bima and Denpasar (Table 2.7) with medium sized drop line boats from Kupang and Denpasar operating at the Sahul Banks near the Australian bordered, while nano sized vessels from Bima and Kupang fish around Komodo and West Timor respectively. The most productive fleet in Sulawesi is based in Minahasa Utara (Table 2.8), from where medium to large sized drop line vessels operate and fish distant waters around the Raja Ampat Islands and into the eastern and western Banda Sea. Berau and Tarakan are the Top 2 home districts in Kalimantan (Table 2.9), with large fleets of nano sized drop line boats producing the bulk of the catch.

Table 2.7: Catch Volume and Effort Details by Home District of the Fleet fishing for Snappers, Groupers and Emperors in Bali-NTB-NTT, ranked by production in 2020

Rank	Home District Kabupaten	Catch MT	Catch %	Fleet GT	GT% by Gear				Fleet N	N% by Size			
					drop	long	gill	trap		nano	small	medium	large
1	Kupang	3145	3	851	88	12	NA	NA	144	67	15	18	NA
2	Bima	1657	1	652	93	7	NA	NA	245	100	0	NA	NA
3	Denpasar	1160	1	290	91	9	NA	NA	13	NA	NA	100	NA
4	Dompu	827	1	394	96	4	NA	NA	109	40	60	NA	NA
5	Lombok Timur	702	1	310	12	88	NA	NA	72	75	4	21	NA
6	Sumbawa	509	0	218	70	30	NA	NA	197	97	2	1	NA
7	Alor	484	0	115	100	NA	NA	NA	140	100	NA	NA	NA
8	Manggarai Barat	293	0	89	100	NA	NA	NA	100	100	NA	NA	NA
9	Sumba Barat	287	0	110	85	15	NA	NA	50	100	NA	NA	NA
10	Lembata	280	0	76	100	NA	NA	NA	90	100	NA	NA	NA
11	Jembrana	182	0	166	NA	100	NA	NA	170	100	NA	NA	NA
12	Badung	78	0	56	100	NA	NA	NA	30	100	NA	NA	NA
13	Rote Ndao	48	0	34	100	NA	NA	NA	31	100	NA	NA	NA
14	Buleleng	41	0	15	100	NA	NA	NA	50	100	NA	NA	NA
15	Timor Tengah Utara	34	0	12	100	NA	NA	NA	7	100	NA	NA	NA
16	Nagekeo	22	0	8	100	NA	NA	NA	30	100	NA	NA	NA
17	Belu	18	0	6	100	NA	NA	NA	5	100	NA	NA	NA
NA	Totals in Bali-NTB-NTT	9766	8	3402	NA	NA	NA	NA	1483	NA	NA	NA	NA
NA	Totals for Indonesia	118193	100	62445	NA	NA	NA	NA	11469	NA	NA	NA	NA

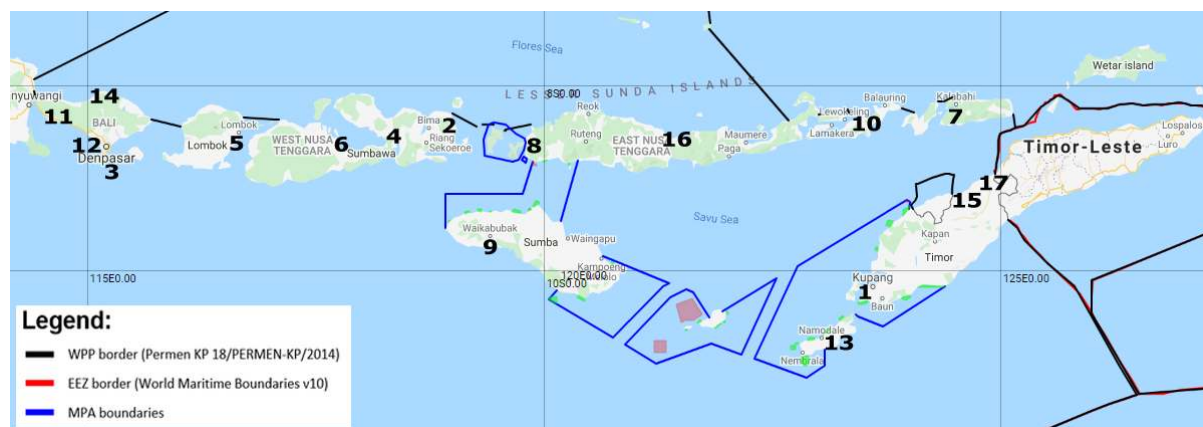


Figure 2.5: Map of major island region including Bali-Nusa Tenggara and surrounding. The numbers in the map refer to Home Districts as ranked in Table 2.7

Table 2.8: Catch Volume and Effort Details by Home District of the Fleet fishing for Snappers, Groupers and Emperors in Sulawesi, ranked by production in 2020

Rank	Home District Kabupaten	Catch MT	Catch %	Fleet GT	GT% by Gear				Fleet N	N% by Size			
					drop	long	gill	trap		nano	small	medium	large
1	Minahasa Utara	1302	1	480	100	NA	NA	NA	15	NA	NA	73	27
2	Bulukumba	940	1	340	100	NA	NA	NA	340	100	NA	NA	NA
3	Kota Makassar	800	1	1119	32	68	NA	NA	91	1	4	95	NA
4	Banggai	584	0	58	93	7	NA	NA	68	100	NA	NA	NA
5	Mamuju	564	0	113	100	NA	NA	NA	35	89	11	NA	NA
6	Takalar	545	0	480	9	51	40	NA	36	NA	8	92	NA
7	Majene	404	0	307	2	98	NA	NA	87	85	15	NA	NA
8	Kepulauan Sitaro	360	0	141	100	NA	NA	NA	206	100	NA	NA	NA
9	Banggai Laut	224	0	76	74	26	NA	NA	72	100	NA	NA	NA
10	Wakatobi	205	0	77	100	NA	NA	NA	41	93	5	2	NA
11	Kepulauan Talaud	153	0	32	100	NA	NA	NA	34	100	NA	NA	NA
12	Sinjai	148	0	270	100	NA	NA	NA	11	NA	NA	91	9
13	Donggala	132	0	24	100	NA	NA	NA	27	100	NA	NA	NA
14	Gorontalo Utara	101	0	30	100	NA	NA	NA	68	100	NA	NA	NA
15	Buton Tengah	69	0	17	NA	75	25	NA	17	100	NA	NA	NA
16	Kepulauan Sangihe	67	0	18	85	15	NA	NA	41	100	NA	NA	NA
17	Pangkep	66	0	50	NA	100	NA	NA	50	100	NA	NA	NA
18	Kolaka	56	0	64	NA	NA	NA	100	5	NA	NA	100	NA
19	Konawe Utara	48	0	11	91	9	NA	NA	10	100	NA	NA	NA
20	Morowali	39	0	13	36	64	NA	NA	9	100	NA	NA	NA
21	Toilitoli	32	0	6	100	NA	NA	NA	10	100	NA	NA	NA
22	Banggai Kepulauan	22	0	10	100	NA	NA	NA	10	100	NA	NA	NA
23	Konawe	16	0	13	NA	NA	NA	100	2	50	NA	50	NA
24	Buton	14	0	6	100	NA	NA	NA	5	100	NA	NA	NA
25	Bolaang Mongondow Utara	10	0	4	100	NA	NA	NA	11	100	NA	NA	NA
NA	Totals in Sulawesi	6903	6	3759	NA	NA	NA	NA	1301	NA	NA	NA	NA
NA	Totals for Indonesia	118193	100	62445	NA	NA	NA	NA	11469	NA	NA	NA	NA

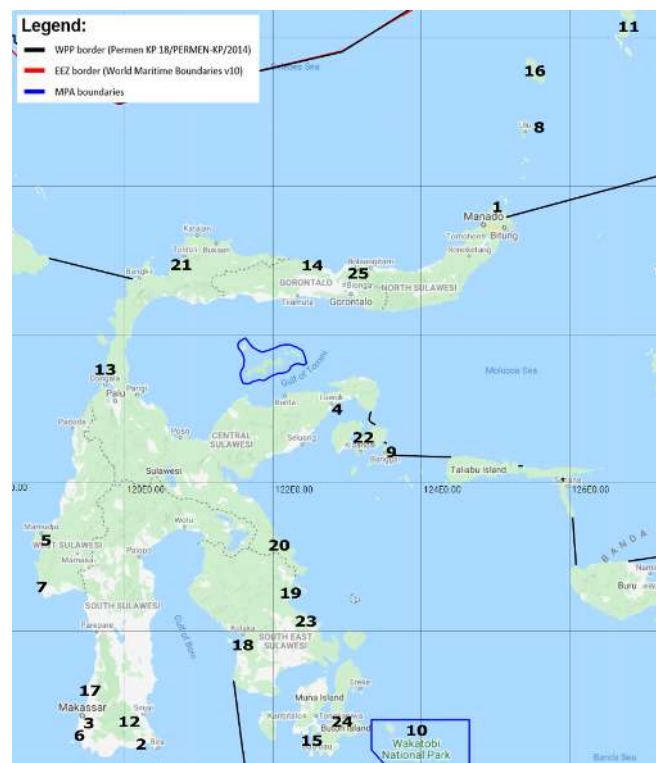


Figure 2.6: Map of major island region including Sulawesi and surrounding. The numbers in the map refer to Home Districts as ranked in Table 2.8

Table 2.9: Catch Volume and Effort Details by Home District of the Fleet fishing for Snappers, Groupers and Emperors in Kalimantan, ranked by production in 2020

Rank	Home District Kabupaten	Catch MT	Catch %	Fleet GT	GT% by Gear				Fleet N	N% by Size			
					drop	long	gill	trap		nano	small	medium	large
1	Berau	1368	1	532	94	NA	NA	6	171	99	1	1	NA
2	Tarakan	1348	1	302	48	52	NA	NA	98	96	4	NA	NA
3	Penajam Paser Utara	1120	1	345	27	NA	NA	73	69	3	97	NA	NA
4	Kutai Timur	1045	1	313	100	NA	NA	NA	101	79	17	4	NA
5	Balikpapan	909	1	477	91	9	NA	NA	52	6	63	31	NA
6	Kutai Kartanegara	577	0	239	33	67	NA	NA	59	78	22	NA	NA
7	Bontang	165	0	49	100	NA	NA	NA	14	71	29	NA	NA
8	Tanah Bumbu	28	0	10	100	NA	NA	NA	2	NA	100	NA	NA
9	Paser	26	0	20	NA	100	NA	NA	10	100	NA	NA	NA
NA	Totals in Kalimantan	6587	6	2288	NA	NA	NA	NA	576	NA	NA	NA	NA
NA	Totals for Indonesia	118193	100	62445	NA	NA	NA	NA	11469	NA	NA	NA	NA

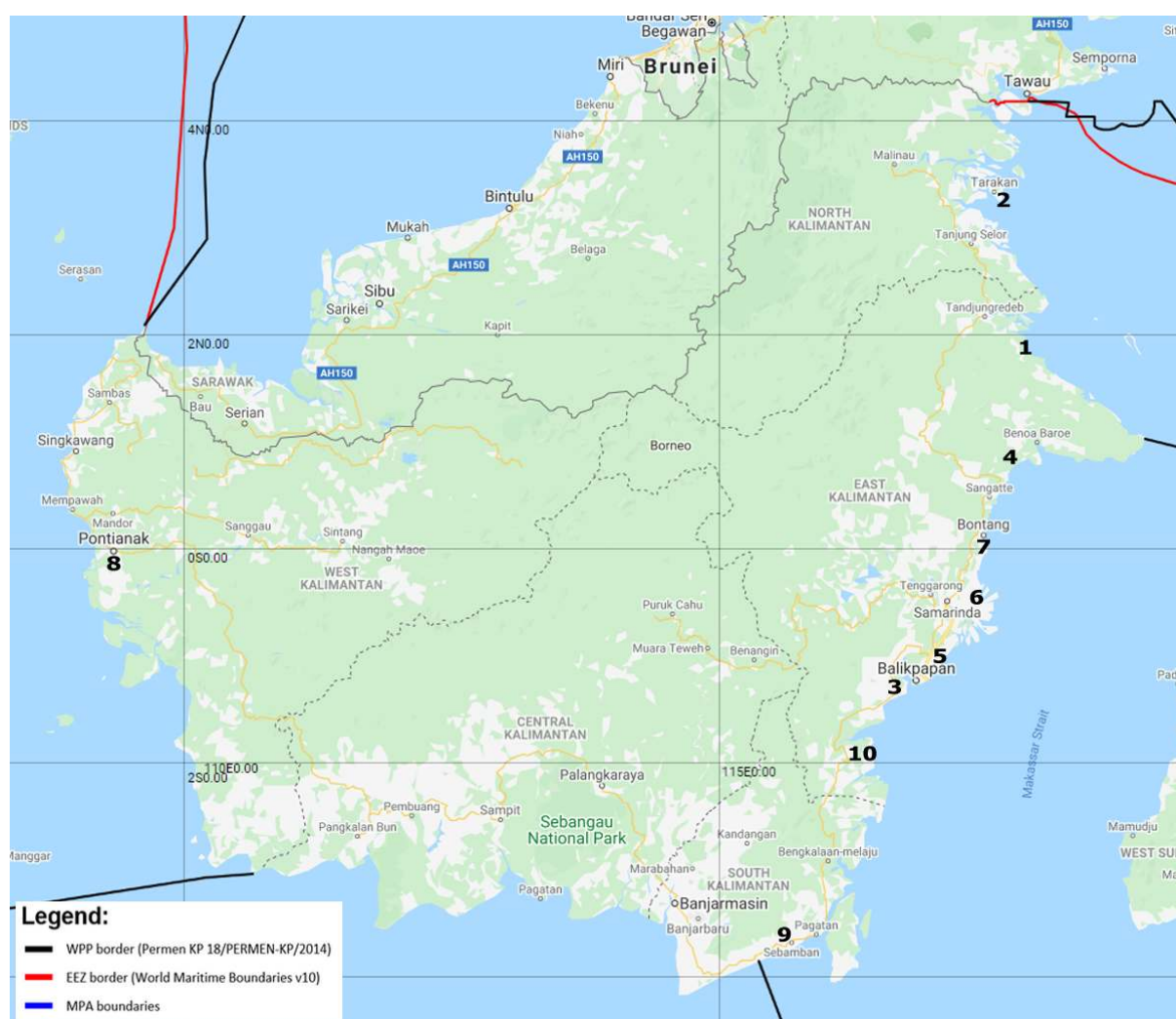


Figure 2.7: Map of major island region including Kalimantan and surrounding. The numbers in the map refer to Home Districts as ranked in Table 2.9

3 Production, Fleet and Species Composition by Province

To enable comparison between CODRS generated production estimates from the deep demersal fisheries with official statistics on fisheries by province, we have combined the CODRS catch volume estimates by home district for 2020 into catch estimates by province. Total catches produced by the fleets registered within each province, for those provinces that contain districts with fleets active in the deep demersal fisheries, were listed and ranked and fleet characteristics were detailed by province in terms of gear type by vessel volume and number of boats per size category (Table 3.1). This exercise it emerged that over 50% of the total Indonesian production in the deep demersal fisheries is realized by fleet from just 4 provinces, including Jawa Timur, Papua, Maluku and Kepulauan Riau.

Table 3.1: Catch Volume and Effort Details by Province of the Fleet fishing for Snappers, Groupers and Emperors in Indonesia, ranked by production in 2020.

Rank	Province	Catch MT	Catch %	Fleet GT	GT% by Gear				Fleet N	N% by Size			
					drop	long	gill	trap		nano	small	medium	large
1	Jawa Timur	22258	19	14670	64	35	1	0	2064	46	42	10	3
2	Papua	14364	12	8629	21	5	74	NA	1926	94	0	2	4
3	Maluku	12141	10	9362	26	60	14	NA	688	68	3	16	13
4	Kepulauan Riau	11429	10	9797	19	18	NA	63	1229	51	24	24	1
5	Jawa Tengah	7886	7	3244	2	67	NA	31	209	23	38	22	17
6	Kepulauan Bangka Belitung	7104	6	2407	14	NA	NA	86	473	39	58	3	NA
7	Papua Barat	6653	6	1114	67	17	NA	16	416	91	1	7	0
8	Kalimantan Timur	5211	4	1976	74	11	NA	14	476	67	28	4	NA
9	Nusa Tenggara Timur	4610	4	1301	91	9	NA	NA	597	92	4	4	NA
10	Sumatera Utara	4002	3	1273	27	25	NA	48	226	55	36	9	NA
11	Nusa Tenggara Barat	3695	3	1574	74	26	NA	NA	623	86	12	3	NA
12	Aceh	2724	2	710	44	37	1	17	153	46	52	3	NA
13	Sulawesi Selatan	2500	2	2259	45	47	9	NA	528	74	1	24	0
14	Maluku Utara	1967	2	281	93	7	NA	NA	460	100	NA	NA	NA
15	Sulawesi Utara	1892	2	675	100	0	NA	NA	307	95	NA	4	1
16	Banten	1702	1	342	81	NA	NA	19	57	9	91	NA	NA
17	Bali	1461	1	526	63	37	NA	NA	263	95	NA	5	NA
18	Kalimantan Utara	1348	1	302	48	52	NA	NA	98	96	4	NA	NA
19	Bengkulu	1080	1	483	61	NA	33	6	53	8	62	28	2
20	Sulawesi Tengah	1034	1	187	83	17	NA	NA	196	100	NA	NA	NA
21	Sulawesi Barat	968	1	420	29	71	NA	NA	122	86	14	NA	NA
22	DKI Jakarta	753	1	380	16	54	NA	30	46	48	43	NA	9
23	Sumatera Barat	447	0	148	30	70	NA	NA	32	66	6	28	NA
24	Sulawesi Tenggara	409	0	187	49	7	2	41	80	89	2	9	NA
25	Lampung	252	0	48	NA	100	NA	NA	17	94	6	NA	NA
26	Jawa Barat	176	0	109	NA	46	54	NA	60	87	13	NA	NA
27	Gorontalo	101	0	30	100	NA	NA	NA	68	100	NA	NA	NA
28	Kalimantan Selatan	28	0	10	100	NA	NA	NA	2	NA	100	NA	NA
NA	Totals for Indonesia	118193	100	62445	NA	NA	NA	NA	11469	NA	NA	NA	NA

By far the most productive fleet in the country is based in East Java, with almost 20% of the total landings, over 22,250 MT in 2020, landed by a fleet of more than 2,000 vessels registered there. This fleet represents almost 15,000 GT vessel (hull) volume, with two thirds of that engaged in the drop line fisheries and one third in the long line fisheries which often operates on remote fishing grounds. Papua, Maluku and Riau each represent somewhere between 9,000 and 10,000 MT of vessel volume, with production estimates between 11,000 and 15,000 MT for these provinces in 2020. The Papua fleet contains around 2,000 vessels, most of which are nano sized drop line operations. There are also some larger vessels, mainly based in Merauke, which represent a large percentage

of the Gross Tonnage in this province, and which mainly operates gillnets in relatively shallow waters. In terms of GT and total catch, the Maluku fleet is dominated by the long line vessels that are based in Kepulauan Aru, which is the single most productive home district in Indonesia. The fleet in Kepulauan Riau is dominated by medium sized trap fishing operations which produce the largest catch in that province.

Table 3.2: Catch Volume by Species Categories and Province of the Fleet fishing for Snappers, Groupers and Emperors in Indonesia, ranked by production in 2020.

Rank	Province	Catch MT	Catch MT by Species Categories						
			Snappers	Groupers	Trevallies	Emperors	Grunts	Croakers	Others
1	Jawa Timur	22258	16814	1696	1011	922	382	1128	306
2	Papua	14364	10349	561	1447	419	1028	367	192
3	Maluku	12141	7510	602	656	1033	478	1690	172
4	Kepulauan Riau	11429	6180	3048	275	667	1197	0	62
5	Jawa Tengah	7886	5283	1911	174	237	169	41	71
6	Kepulauan Bangka Belitung	7104	3939	2265	73	280	513	0	33
7	Papua Barat	6653	5527	146	664	163	13	21	118
8	Kalimantan Timur	5211	3503	405	829	290	68	0	117
9	Nusa Tenggara Timur	4610	3773	243	321	165	27	2	78
10	Sumatera Utara	4002	1923	1454	273	145	130	0	78
11	Nusa Tenggara Barat	3695	2708	245	435	163	52	1	91
12	Aceh	2724	1849	317	311	173	17	0	57
13	Sulawesi Selatan	2500	1685	119	329	193	134	7	33
14	Maluku Utara	1967	1669	42	174	47	5	0	29
15	Sulawesi Utara	1892	1544	35	179	39	2	0	94
16	Banten	1702	1363	187	73	36	10	0	33
17	Bali	1461	1230	73	91	37	19	1	11
18	Kalimantan Utara	1348	707	27	257	256	9	0	92
19	Bengkulu	1080	892	43	87	33	2	0	23
20	Sulawesi Tengah	1034	785	49	115	60	9	0	15
21	Sulawesi Barat	968	564	114	142	126	8	0	13
22	DKI Jakarta	753	466	174	10	22	18	59	3
23	Sumatera Barat	447	271	41	84	37	3	0	10
24	Sulawesi Tenggara	409	226	89	37	45	4	0	7
25	Lampung	252	124	39	72	7	3	0	8
26	Jawa Barat	176	126	13	22	8	4	0	3
27	Gorontalo	101	84	2	7	1	0	0	6
28	Kalimantan Selatan	28	24	2	1	0	0	0	0
NA	Totals for Indonesia	118193	81121	13940	8150	5605	4303	3317	1757
NA	Percentage of Total	100	69	12	7	5	4	3	1

In all four major provinces in terms of registered fleets, snappers formed the bulk of the catch, following the general trend in Indonesia where the deep demersal fisheries produces close to 81,400 MT of snappers, representing almost 70% of the total catch in 2020 (Table 3.2). The fleet registered in Kepulauan Riau produces the largest volume of groupers for all provinces in Indonesia, with over 3,000 MT of groupers accounting for one third of the total catch there. The nearby province of Kepulauan Bangka Belitung, ranked number 6 for total catch, is ranked second in Indonesia in terms of grouper production with more than 2,250 MT of groupers estimated for 2020. Papua ranks first for the production of trevallies (at least within the deep demersal fisheries), while Maluku is number 1 for emperors and Kepulauan Riau tops the list for Grunts. While croakers are exclusively produced in the Arafura Sea fisheries, between the Aru Islands in Maluku and the coast of Papua, these species are caught also in relatively large amounts by bottom long line vessels that are registered in East Java, reminding us again that production by province here means production by fleets registered in those provinces.