

Fishing ground distribution of deep sea demersal fish in South Coast of Ambon, Indonesia

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Abstract. Deep sea demersal fish resource is one of the most potential fisheries resources in South Coast of Ambon, Indonesia. The utilization of those resources is limited due to the lack of ability of fishermen to detect the precise fishing ground. This research aim to spatially map the fishing ground of demersal fish and the species distribution based on ocean depth. Survey, interview and experimental fishing was done to collect data of fishing location, fish species, measurement, and the depth of fishing gear operation, then analyzed descriptive-qualitatively. The result found 29 fishing grounds of deep sea demersal fish spread along the South Coast of Ambon Island. There were distributed 16 fish species from 10 families. All the demersal fish distributed in depth 50-300 m. *Etelis carbunculus*, *E. coruscans*, *E. radiosus* and *Aphareus rutilans* are fish species that can be found up to 300 m depth, with length size varying between 70-110 cm total length (TL). However, all of the demersal fish species can be found in the depth of 90-150 m.

Key Words: demersal species, distribution, fishing ground, South Coast of Ambon island.

Introduction. The resource of deep sea demersal fish has not been optimally utilized by fishermen in Ambon. This problem exists because of the unique and specific fishing ground, located in certain areas that are difficult to be detected by traditional fishermen. Matrutty et al (2013) reported that fishing ground of demersal fish is distributed in area with hilly bottoms, formed as deep valley with high slope. Species of fish that are found in these specific areas are described as important high economic valued species and categorized as export commodity of Indonesia, for instance Family Lutjanidae and Serranidae.

Ocean area on the South Coast of Ambon Island has a similar characteristic with Lease Archipelago, because of the same isodepth, with deep and steep bottoms topography. These characters showed that the South Coast of Ambon can be a potential fishing ground for various types of economically important demersal fishes. Matrutty (2014) mentioned that demersal fishes from family Lutjanidae are a high potential fishes that have not been optimally utilized in Maluku, for instance red snapper from species *Etelis coruscans* and *E. carbunculus*. However, those species were reported as world's endangered fish species (Williams et al 2015). Fishing of red snapper fishes by fisherman in South Coast of Ambon was done only for daily consumption. One of the problems is limited knowledge of potential fishing ground for demersal fish. The estimation of fishing ground was done conventionally, based on the ground surface characters and inheritance experience and knowledge of the fishermen. However, conventional estimating fishing ground capability is limited only to several fishermen in Ambon, Maluku (Matrutty 2015).

The development of deep sea fishing in Ambon is very important due to the over exploitation of shallow sea fishing causing a big damage of coral ecosystem. However, acknowledgement of fishing ground distribution, fish species, and distribution of the fish is essential for optimization of demersal fish utilization in South Coast of Ambon. Previous research by Moosa & Suharsono (1995) in Haruddin et al (2011) classified the coral condition in East Indonesia (including Maluku) as very good, good, intermediate, and very bad with percentage of 9.80%, 29.55%, 29.55% and 32.74%, respectively. In the other side, coral ecosystems in East Indonesia consists of 300 coral species, 2000 fish

species, and dozens species of mollusc, crustacean, sponge, algae, and other biota (Dahuri 2003).

Optimization of demersal fish resource utilization through the mapping of fishing ground and fish species distribution will not only give an additional value for the fishing activity by fishermen, but also decrease the pressure of fishing activity on shallow sea, especially on coral ecosystem. Because of that, this research aimed to spatially map the distribution of fishing ground of deep sea demersal fish in the South Coast of Ambon Island and determine the distribution of fish species based on waters depth.

Material and Method. The research was conducted in South Coast of Ambon Island from March to October 2016. Survey, interview and experimental fishing was done to collect data about fishing activity, location, fish species, measurement, and the depth of fishing gear operation, then analyzed descriptive-qualitatively. Survey was conducted using *fish finder* and Global Positioning System (GPS) on a single long boat to collect the data of sea depth and fishing ground location. The survey was done twice. On survey step one the data were collected during the fishing activity. Second survey, data were collected in other fishing ground that have not been collected (first survey), assisted by local experts long-term fishermen. Experimental fishing was conducted using three different fishing gears, modified fish trap, bottom long line, and hand line to observe the distribution of fish species. The collected data were then tabulated, analyzed and mapped out using basic map of Ambon Island.

Results and Discussion

Characteristics of South Coast Ambon island area. Ocean in South Coast of Ambon Island is located at the coordinates $128^{\circ}10'25''$ - $128^{\circ}17'30''$ E and $03^{\circ}45'071''$ - $03^{\circ}44'176''$ S. This area located against the Banda Ocean, Maluku, caused a big influence from Banca Ocean condition. The coastline dominated by big rock, hilly, and relatively high with elevation between 10 to 100 m asl. This phenomenon described that topography of the South Coast of Ambon is very steep and deep. The ocean is a part of the Island Group VII. The Bathymetry of Island Group VII showed variative and complex depth profile by Banda Ocean with very deep ocean (Lembaran LPI 2612, 2712). Coast condition and bathymetry illustration of South Coast of Ambon are shown in the Figure 1.

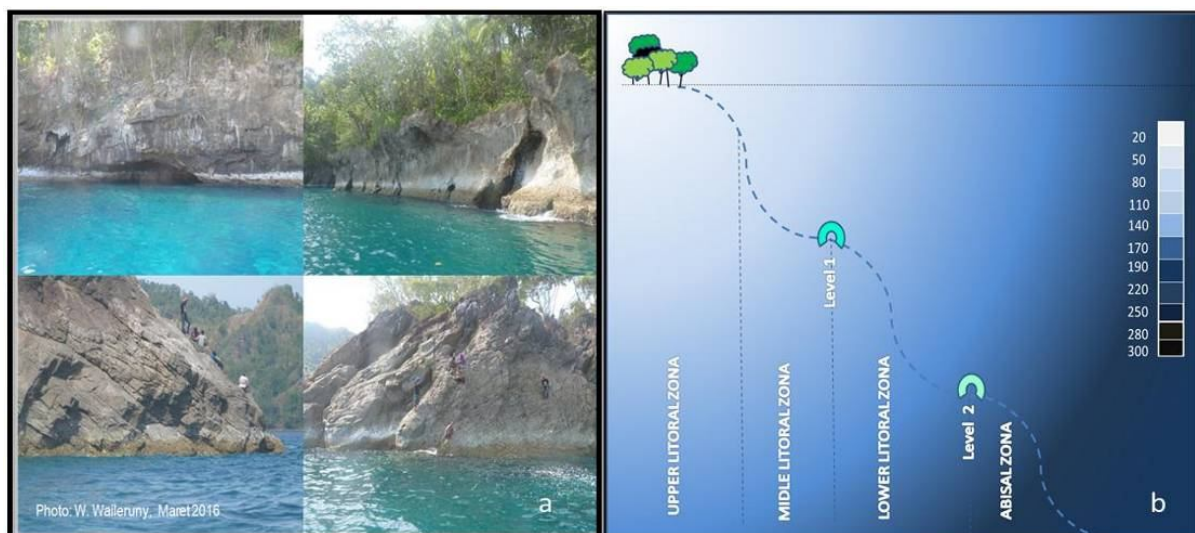


Figure 1. Hilly rock picture (a) and depth profile (b) at South Coast of Ambon Island.

Monitoring from *fish finder* showed that bottom of this fishing area is relatively hard, indicated that substrate of the bottom is dominantly rock. The bottom is covered by coral ecosystem with various biota living within (Ayal et al 2007). In Spatial Planning of Ambon Island 2005, regional government specifies South Coast of Ambon Island as marine

tourism, especially for diving and fishing spot. The ocean around South Coast of Ambon is on a great pressure because of the big waves during the east monsoon from June to August. Data from Indonesian Agency for Meteorology, Climatology, and Geophysics mention that average wind velocity can reach up to 35 knot with the wave height more than 3.5 m. Within the transition period from September to November the wind velocity is lower and maximum wave height is 1 m. Because of the extreme climate during east monsoon, fishing activity is usually restricted. Fishing activity by local fishermen usually happened in west monsoon (November-February), first transition period (March-April), and second transition period (September-October).

Distribution of fishing ground. The survey resulted 29 fishing ground spread along the coast line of South Coast of Ambon Island. The fishing grounds were named after the local terms, based on the name of location, mountain, and cape. The analysis showed that all the fishing grounds have a different depth and characteristics, as shown in Table 1.

Table 1

Location, name and depth of fishing ground

No	Longitude	Latitude	Name of location	Depth (m)
1	128° 10' 427"	03° 45' 071"	Labuang Namang	104
2	128° 10' 410"	03° 45' 033"	Batu Ator	115.8
3	128° 10' 611"	03° 45' 013"	Liang Karbou	131.5
4	128° 10' 753"	03° 44' 950"	Lau Lamo	112.4
5	128° 12' 113"	03° 45' 162"	Liang Moa	151.6
6	128° 12' 774"	03° 45' 033"	Batu seram	147.1
7	128° 13' 221"	03° 45' 159"	Batu kuda	315.7
8	128° 13' 404"	03° 45' 034"	Labuang Kilang	51.7
9	128° 08' 851"	03° 46' 518"	Labuang Haturesi	177.7
10	128° 08' 042"	03° 46' 690"	Lapangan Air Lou	142.9
11	128° 09' 389"	03° 45' 954"	Jiku Air	148.8
12	128° 09' 473"	03° 45' 809"	Gunung Putus	163.2
13	128° 09' 733"	03° 45' 205"	Silapa	195.9
14	128° 13' 741"	03° 45' 094"	Kilang	112.3
15	128° 13' 387"	03° 44' 902"	Batu kuda-2	326.2
16	128° 14' 167"	03° 44' 902"	Batu Tongka-2	126.3
17	128° 14' 304"	03° 14' 758"	Suhang	161.3
18	128° 14' 501"	03° 44' 706"	Haor	161.6
19	128° 14' 987"	03° 44' 349"	Batu Ayam	131.5
20	128° 15' 036"	03° 44' 341"	Batu A	156
21	128° 15' 214"	03° 44' 327"	Waelary	232.3
22	128° 15' 330"	03° 44' 327"	Batu babunyi-1	296.5
23	128° 15' 445"	03° 44' 176"	Batu babunyi-2	228.4
24	128° 15' 398"	03° 44' 114"	Hapia ma'a	151.5
25	128° 15' 549"	03° 43' 985"	Eri	96
26	128° 15' 971"	03° 43' 891"	Tanjung	253.7
27	128° 16' 012"	03° 43' 802"	Batu Hitam	201.1
28	128° 17' 263"	03° 42' 147"	Depan Gereja Hutumury	231.4
29	128° 17' 263"	03° 42' 130"	Depan talid	182.4

Depth of each fishing ground relatively varies from the lowest (51 m) found only in Batu Kuda 2 (128°13'221" E and 03°45'159"S), and the deepest (> 300 m) fishing ground are Batu Kuda 1 (128° 13' 221"E and 03° 45' 159"S) and Kilang (128°13'741" E and 03° 45'094" S). The depth of other 27 fishing grounds varies from 51 to 300 m. Map of the distribution of demersal fish in South Coast of Ambon Island is shown in the Figure 2.

The fishing grounds are located at various distances from the coastline. Most of the fishing grounds located 200 m from the coast line, some others located at the border of coastline against the hilly rock, which is popular as the fishing ground for local community.

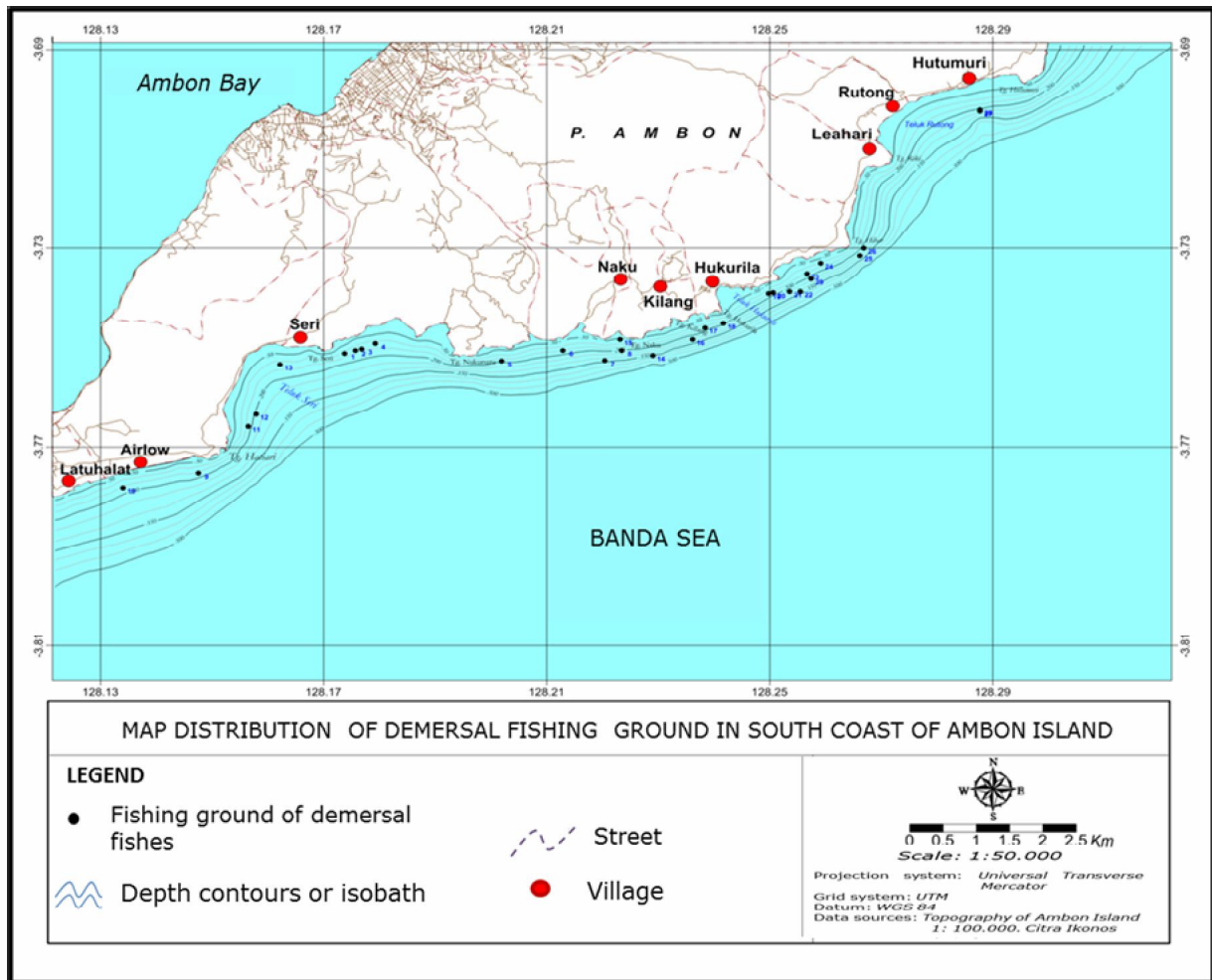


Figure 2. Map of Distribution of demersal fishing ground in South Coast of Ambon

Fish species and measurement. Sixteen (16) fish species were identified as deep sea demersal fish in South Coast of Ambon, including 'sidat' (*Anguilla* sp.) with measurement varies between 44-110 cm total length (TL) (Table 2). These fish species are categorized as important species with high economic value. Some of the species is an Indonesian export commodity for European market. Martinez-Andrade (2003) described that one of the important component of deep sea fisheries in Hawaii and other area of Pacific, Atlantic, and Indian Ocean is deep sea demersal fish from family Lutjanidae and Serranidae. Commercial exploitation in Hawaii have been done over 100 years for export purpose.

Demersal fish have a high economic value in local market in Ambon and other parts of Indonesia. Based on the interview with fisherman in Ambon Island, currently this type of fish is a target for big restaurant bussiness in Ambon, Surabaya, and Makasar. The mapping of fishing ground for deep sea demersal fish is expected to increase the effectivity and efficiency of fishing activity of demersal fish, in order to increase the welfare of local fishermen.

Table 2

Species and measurement of deep sea demersal fish caught in South Coast of Ambon Island

No	Local name	Scientific name		Size (cm) - TL
		Family	Species	
1	Sikuda	Lethrinidae	<i>Lethrinus</i> sp.	65-70
2	Garopa	Serranidae	<i>Epinephelus</i> sp.	60-70
3	Bae ekor bendera	Lutjanidae	<i>Etelis coruscans</i>	70-110
4	Bae perempuan	Lutjanidae	<i>Etelis carbunculus</i>	70-80
5	Bae laki-laki	Lutjanidae	<i>Etelis radiosus</i>	65-77
6	Silapa	Lutjanidae	<i>Pristopomoides</i> sp.	60-70
7	Bae Gamuru	Lutjanidae	<i>Aphareus rutilans</i>	70-90
8	Ikan merah	Lutjanidae	<i>Lutjanus</i> sp.	44-60
9	Kakap	Latidae	<i>Lates calcalifer</i>	60-70
10	Ikan Layur	Trichiuridae	<i>Trichiurus</i> sp.	60-70
11	Gulamah	Sciaenidae	<i>Johnius dussumieri</i>	50-60
12	Bawal hitam	Carangidae	<i>Parastromateus niger</i>	55-70
13	Salmaneti karang	Mullidae	<i>Parapeneus</i> sp.	70-90
14	Mata bulan	Priachantidae	<i>Priacanthus tayenus</i>	50-60
15	Morea	Muraenidae	<i>Gymnothorax</i> sp.	60-70
16	Sidat	Anguillidae	<i>Anguilla</i> sp.	60-95

Fish distribution. Distribution of deep sea demersal fish species using bottom long line within 14 trips and collection from fishermen using hand line in the South Coast of Ambon Island is variative (Table 3).

Table 3

Dept distribution of demersal fish in South Coast of Ambon Island

No	Family	Species	Number of individuals	Depth (m)				
				> 50 -90	90 -150	150 -200	200 -250	250 -300
1	Lethrinidae	<i>Lethrinus</i> sp.	3		√	√		
2	Serranidae	<i>Epinephelus</i> sp.	6	√	√			
3	Lutjanidae	<i>Etelis coruscans</i>	4		√	√	√	√
4	Lutjanidae	<i>Etelis carbunculus</i>	7		√	√	√	√
5	Lutjanidae	<i>Etelis radiosus</i>	7		√	√		
6	Lutjanidae	<i>Pristopomoides</i> spp.	4	√	√	√	√	√
7	Lutjanidae	<i>Aphareus rutilans</i>	3	√	√	√	√	√
8	Lutjanidae	<i>Lutjanus</i> sp.	12	√	√			
9	Latidae	<i>Lates calcalifer</i>	3	√	√	√		
10	Trichiuridae	<i>Trichiurus</i> sp.	2		√	√		
11	Sciaenidae	<i>Johnius dussumieri</i>	7	√	√			
12	Carangidae	<i>Parastromateus niger</i>	3	√	√	√		
13	Mullidae	<i>Parapeneus</i> sp.	8		√			
14	Priachantidae	<i>Priacanthus tayenus</i>	4	√	√			
15	Muraenidae	<i>Gymnothorax</i> sp.	2	√	√			
16	Anguillidae	<i>Anguilla</i> sp.	2	√	√	√		

The distribution showed that within the depth of > 90-150 m, all species of fish can be found. In > 50-90 m depth, the following 6 species are not present: *Etelis coruscans*, *Etelis carbunculus*, *E. radiosus*, *Lethrinus* sp., *Trichiurus* sp. and *Parapeneus* sp. Extreme condition was shown at the depth ranged at 200-250 m and 250-300 m where only 4 out of 16 species were found, i.e. *Etelis coruscans*, *E. carbunculus*, *Pristopomoides* spp. and *Aphareus rutilans*. The difference of fish species distribution showed that some species have limited distribution, while others have wider distribution range. *Pristopomoides* spp.

and *Aphareus rutilans* are the examples of the widest distribution range of fish species. Both species were found at all depth range, >50-300 m. This is estimated to be caused by the biological condition of each deep sea fish species, deep sea being the habitat of the adult stage of these fishes (Martinez-Andrade 2003).

Previous research showed that deep sea fish species in family Lutjanidae distributed in 90-500 m depth. Matrutty et al (2013) found that *E. carbunculus*, *E. coruscans* and *A. rutilans* distributed in 90-140 m depth in specific location called "pasi" in Lease Archipelago, Maluku. Matrutty et al (2013) also mention that *A. rutilans* that caught in the < 90 m depth dominated by small size fish, 90.27% from total caught fish. In Pelabuhan Ratu, Indonesia, *E. carbunculus* distributed within 90-400 m depth within an extreme shelf break and upper slope (Hukom et al 2006). On the other hand, Carpenter & Niem (2001) mention that species from family Lutjanidae (i.e. *E. carbunculus* and *E. coruscans*) are species that inhabit the ocean with 100-500 m depth. These two species were caught in Pacific Ocean (Carpenter & Niem 2001; McCoy 2010).

The phenomenon explained above showed that in different regions, the demersal fish could be distributed in different depth. We assume that the depth of fish distribution is influenced by geographical location, water characteristics, and the fish behavior on feeding, spawn, and age. In Kanoeh Bay, Hawaii, young red snapper (*Etelis* spp.) from family Lutjanidae concentrated in 60-100 m depth (Moffitt 2003). Species of red snapper has been known to occupy certain location as their territory.

Conclusions. Fishing ground for deep sea demersal fish distributed in 29 location, along the South Coast of Ambon Island. We found 16 fish species within 11 families, which are Lutjanidae, Serranidae, Lethrinidae, Trichiuridae, Sciaenidae, Carangidae, Mullidae, Priachantidae, Stegostomatidae and Anguillidae. These species distributed in 51-326 m depth, with variative measurement in total length.

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