

**Annex 6: Japan-Indonesia Deep Sea Fishery Resources Joint Exploration Project  
and experiences on commercial deep sea trawl**

By Dr. Fayakun Satria

The Japan-Indonesia *Deep-Sea* Fisheries  
Resources Joint Exploration Project  
AMFR-OFCE



FAYAKUN SATRIA  
Research Center For Capture Fisheries  
JAKARTA-INDONESIA

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SEAFDEC Samutprakarn Thailand 18-23 January 2010

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## 1 BACK GROUND

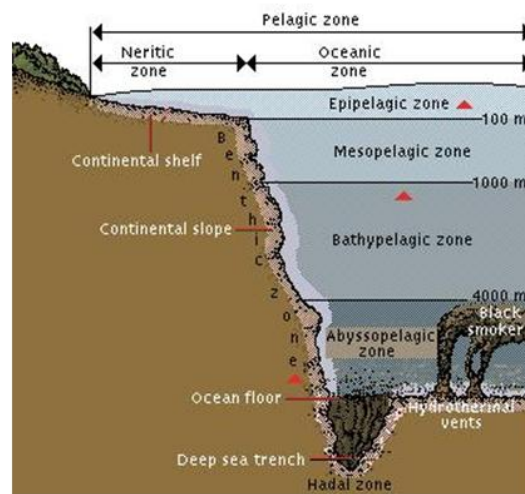
- Human consume on fish → Increase
- Conventional fish resources (shallow water) → decrease
- New fish resources → *untapped resources* → *Deep sea and High seas*
- Over capital of Deep-sea fishing vessel → *JDSTA, JOFA*
- Indonesia → increase production → *deep –sea* and high sea consider as a low level of exploitation

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# DEEP-SEA

Deep- sea is considered as the biggest habitat on the earth.

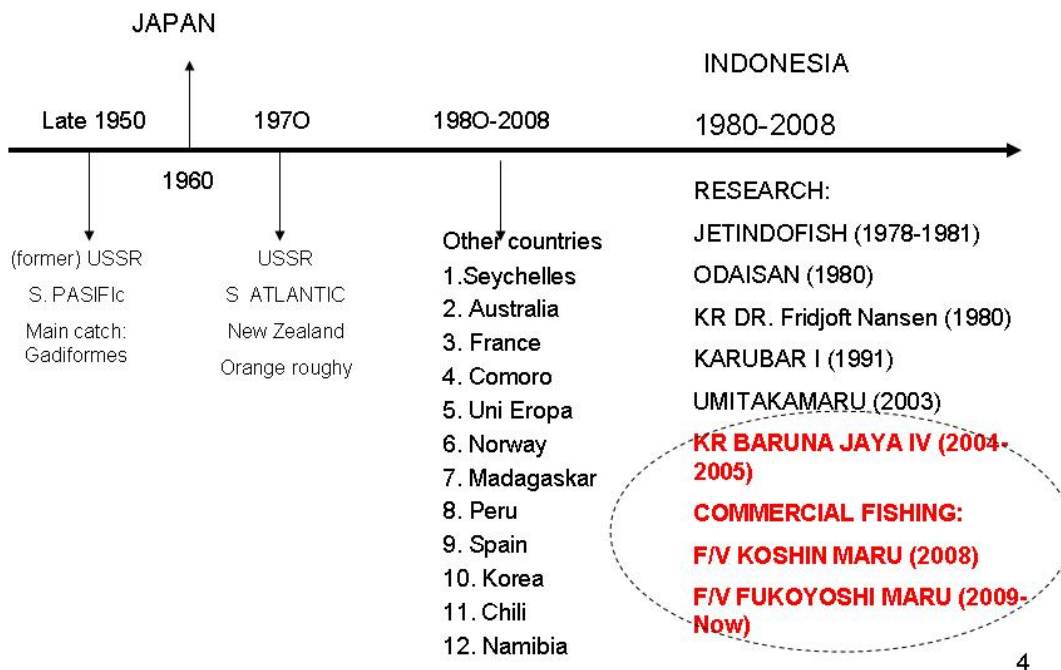
About 53 % area of the sea is more than 4000 m deep (FAO 2008)



sumber : FAO 2008

Deep sea is defined as marine area that more than 200 m (Thistle 2003; Jab dan Wilkinson 2008)

## Brief History of deep sea demersal fishes exploration

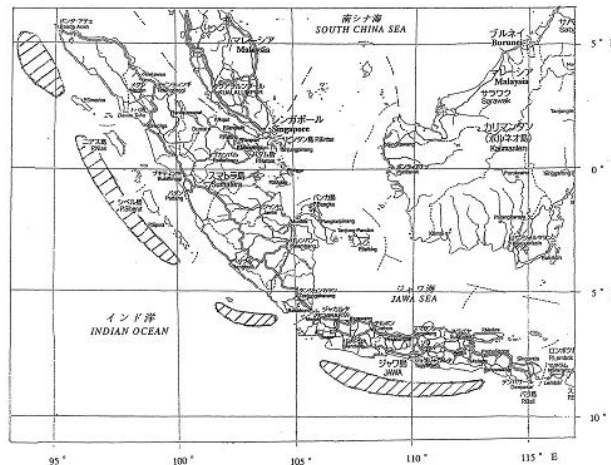


QUESTION AND ISSUE ARISE FOR DEEP SEA FISHERIES

- FISH RESOURCES (WHAT) → IDENTIFICATION (diversity) AND HOW MANY → BIOMASS/DENSITY → Promisable to be commercially exploited ? → BIOLOGY (Risk of exploitation) → How many the fish resources allowable to catch? Etc.
- ENVIRONMENT (WHERE, HOW, WHEN) → Topography of the Sea Bed, Oceanography, Substrate (Ecological Issue)
- FISHING TECHNOLOGY (Enviromentally friendly CCRF VS Efficient and high productivity gears?)
- Exploitation Vs Conservation (MPA other regulation?)

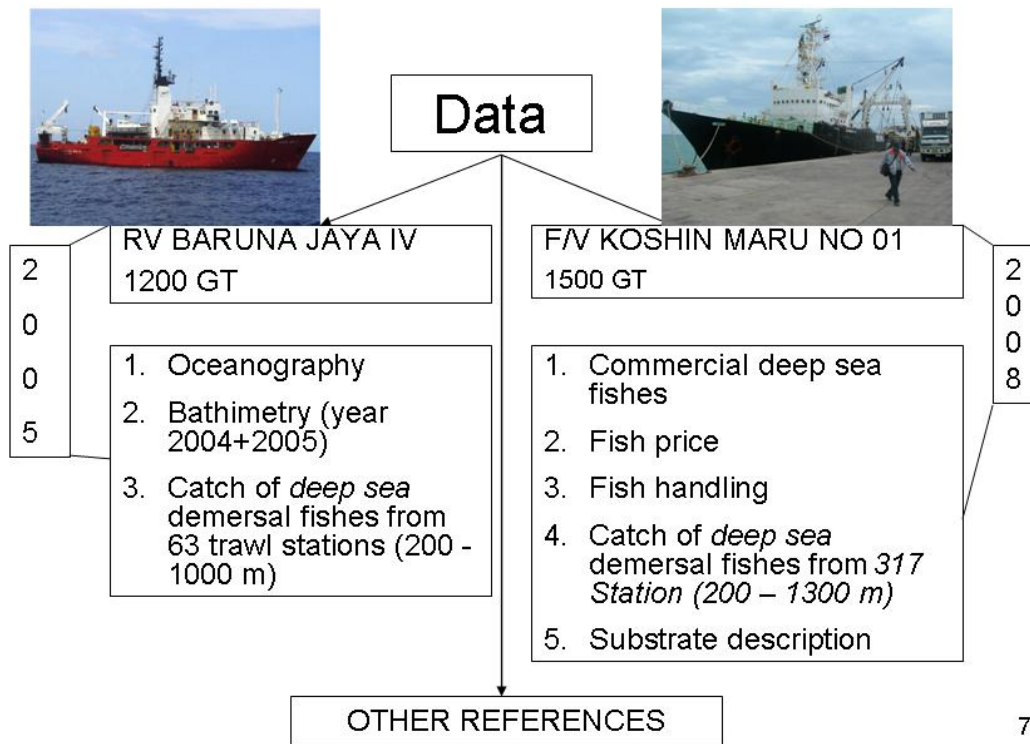
**EBM, EAF, EAFM?  
OFTEN OUR KNOWLEDGE, DATA AND INFORMATION IS NOT ENOUGH TO ANSWER THE MANAGEMENT NEED WHILE THE EXPLOITATION (FISHING ACTIVITY) ALREADY RUN**

## Survey period and area

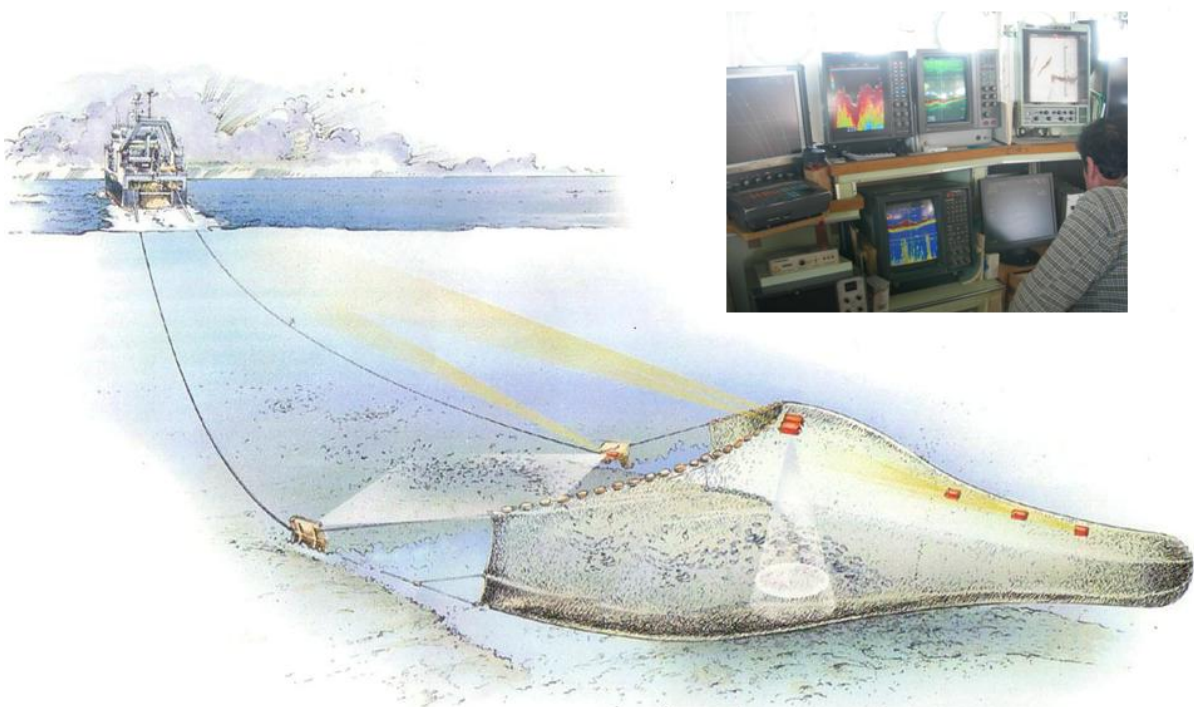


Field surveys of R/v Baruna Jaya IV were carried out in the years of 2004 and 2005, and five cruises were held during the period. The research area was in the Indian Ocean west to 115 degrees east longitude, outside of the territorial line and inside of the Indonesian EEZ. The depth range to be covered was set to be between 200m and 1,000m.

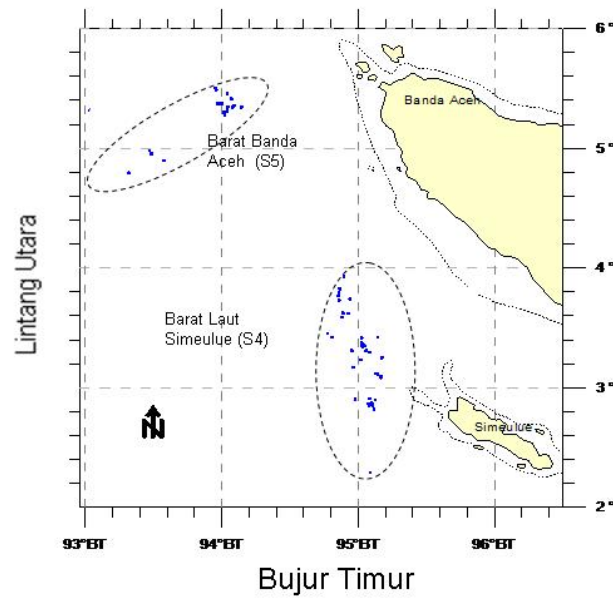
Field Surveys of M/V Koshiun Maro No 01 were carried out During January to May 2008 in the west of Aceh Waters



## FISHING VESSEL AND DEEP SEA BOTTOM TRAWL



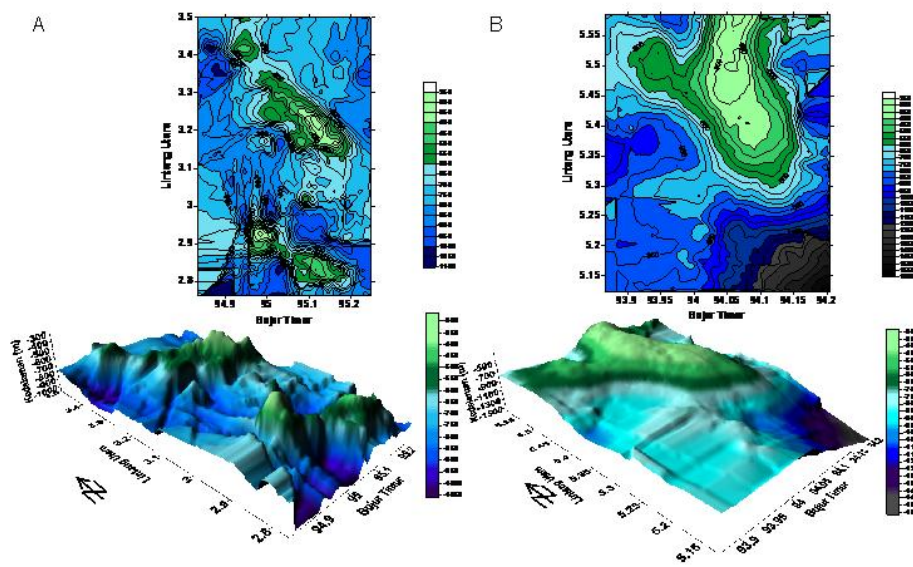
### Trawled Station (Focused on the West of Aceh)



### Topography of Sea bed BATHIMETRY

A. Northwest of SIMEULUE (S4)

B. West of BANDA ACEH (S5)

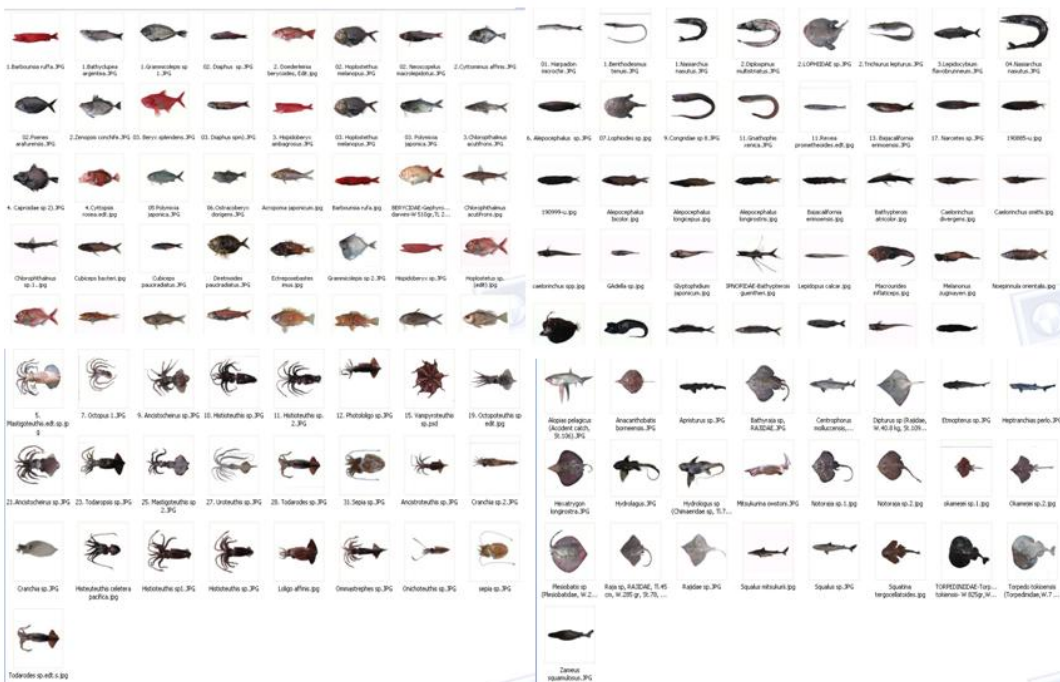


### Deep Sea demersal fishes

- 145 demersal species from 62 family
- Distribution aggregated/clumped

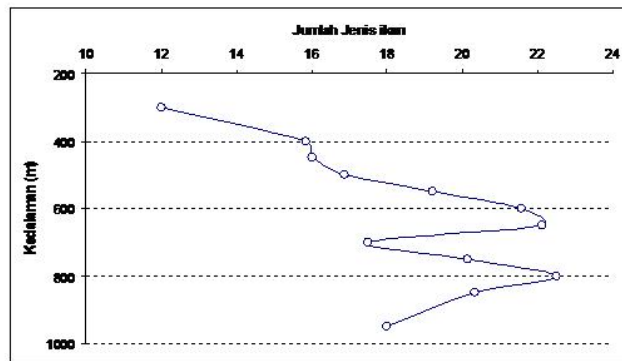
Family	species	Family	species
Acropomatidae	1	Melanonidae	1
Alepisauidae	1	Microstomatidae	2
Alepocephalidae	10	Moridae	5
Anoplogastridae	1	Muraenesocidae	2
Ateleopodidae	1	Nettastomatidae	1
Bathyclupeidae	1	Nomeidae	2
Berycidae	1	Notacanthidae	1
Bothidae	1	Notosuidae	1
Bregmacerotidae	1	Ogcocephalidae	3
Caproidae	2	Ophidiidae	12
Carapidae	1	Ostracoberycidae	1
Centrolophidae	1	Penstediidae	3
Chaunacidae	3	Poecilopsittidae	1
Chiasmodontidae	2	Polymixidae	1
Chimaeridae	2	Rajidae	4
Chlorophthalmidae	2	Rhinochimaeridae	2
Colocongidae	1	Scorobrolabracidae	1
Congridae	2	Scorpaenidae	4
Denchthyidae	1	Scybrothidae	2
Diretmidae	1	Serranidae	1
Epigonidae	2	Somniosidae	1
Etmopteridae	1	Squalidae	1
Gempylidae	7	Stomiidae	1
Grammicolepididae	3	Synphobranchidae	2
Hexanchidae	1	Torpedinidae	1
Hexatygonidae	1	Trachichthyidae	2
Hispidoberycidae	1	Triacanthodidae	7
Hoplichthyidae	2	Trichiuridae	1
Ipnopidae	2	Trogidae	1
Lophidae	1	Zenidae	3
Macrouridae	17	Zoaridae	1

### Example of deep sea fishes diversity in Indian Ocean Indonesia EEZ



Published in The Japan Indonesia DeepSea fishery Joint Exploration Project Photo album, Posters OCF-AMFR

**Fish diversity with respect to the depth range in west of Aceh Water**

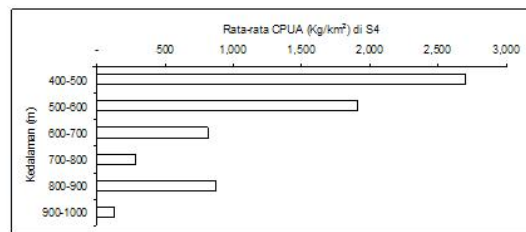
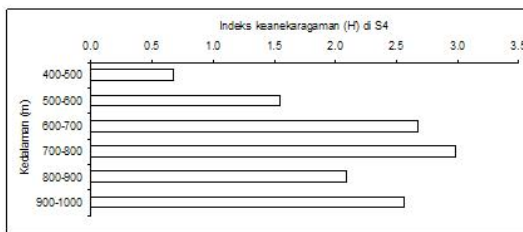


**Species richness) →Margalef Vs Depth**

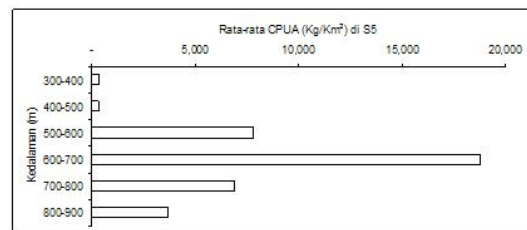
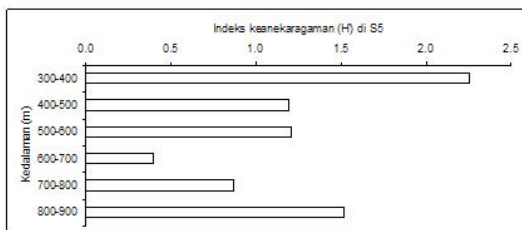
Lokasi	Kisaran kedalaman (m)							Total
	300-400	400-500	500-600	600-700	700-800	800-900	900-1000	
Barat laut Simeulue (S4)	—	4.11	7.21	8.18	8.06	7.18	4.24	13.11
Barat Banda Aceh (S5)	5.73	4.61	4.71	6.19	5.59	5.29	—	10.09

**Diversity Vs Density (CPUA)**

**Northwest of Simeulue**

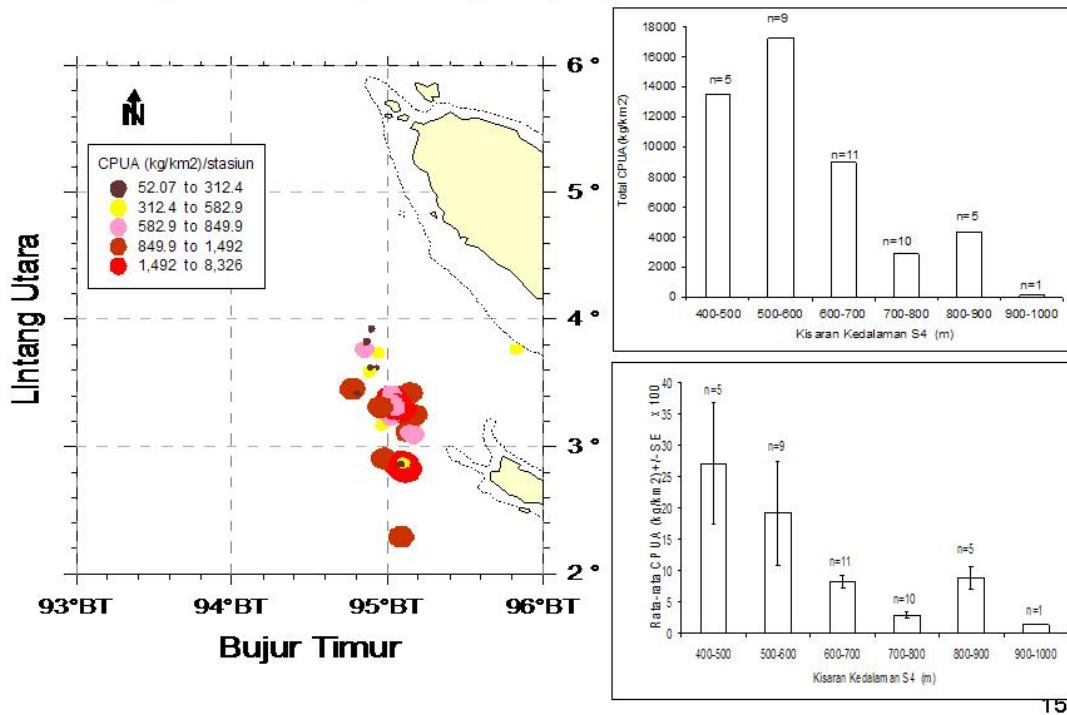


**West of Banda Aceh**

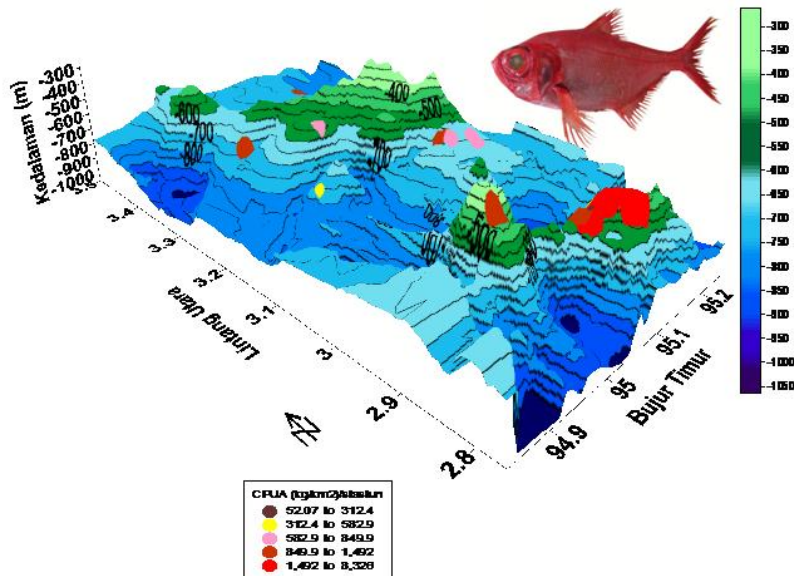




### Density variation (CPUA) in (S4) Northwest of Simeulue

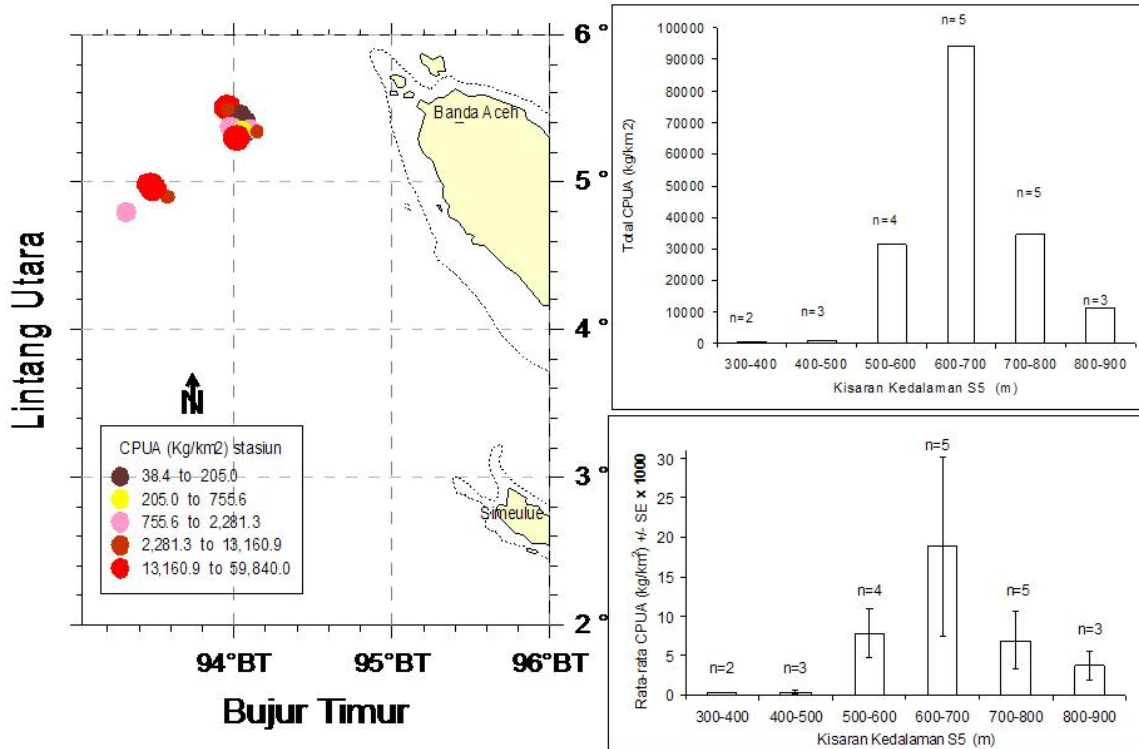


### CPUA (kg/km2) distribution on Northwest Simeulue

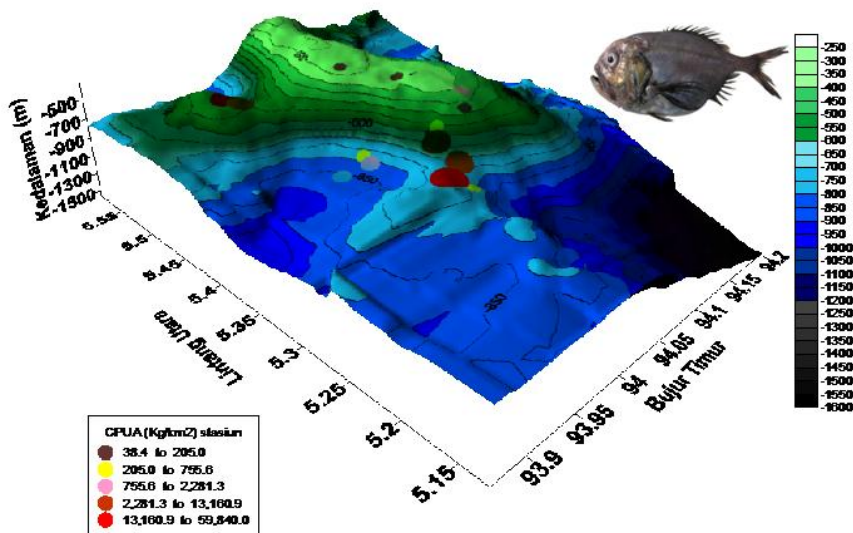


High densities → 400 – 600 m. Dominant fish *Beryx splendens* → Close to slope area

### Densities Variation (CPUA) in (S5) West of Banda Aceh



### CPUA (kg/km<sup>2</sup>) Distribution on West Banda Aceh (S5)



High densities → 600-800 m. Dominant fish *Hoplostethus rubellopterus*. Close to slope area → high

Index of importance value deep sea demersal fishes  
Both for S4 (Northwest Simeulue) and S5 (West Banda Aceh)

Rank	Area			
	S4	INP	S5	INP
1	<i>Ostracoberyx dorigenys</i>	141,42	<i>Hoplostethus rubellopterus</i>	249,88
2	<i>Beryx splendens</i>	36,55	<i>Ostracoberyx dorigenys</i>	19,12
3	<i>Diretmoides pauciradiatus</i>	35,09	<i>Diretmoides pauciradiatus</i>	18,94
4	<i>Hoplostethus rubellopterus</i>	23,19	<i>Caelorinchus divergens</i>	2,33
5	<i>Hoplostethus crassispinus</i>	12,67	<i>Beryx splendens</i>	1,15
6	<i>Caelorinchus divergens</i>	10,35	<i>Nettastoma solitarium</i>	1,13
7	<i>Lamprogrammus niger</i>	3,89	<i>Hoplostethus crassispinus</i>	0,85
8	<i>Glyptophtidium</i> sp.	3,88	<i>Chlorophthalmus</i> sp.1	0,84
9	<i>Hexatrygon longirostra</i>	2,59	<i>Benthodesmus tenuis</i>	0,37
10	<i>Grammicolepis</i> sp.1	2,40	<i>Muraenesox</i> sp.	0,28

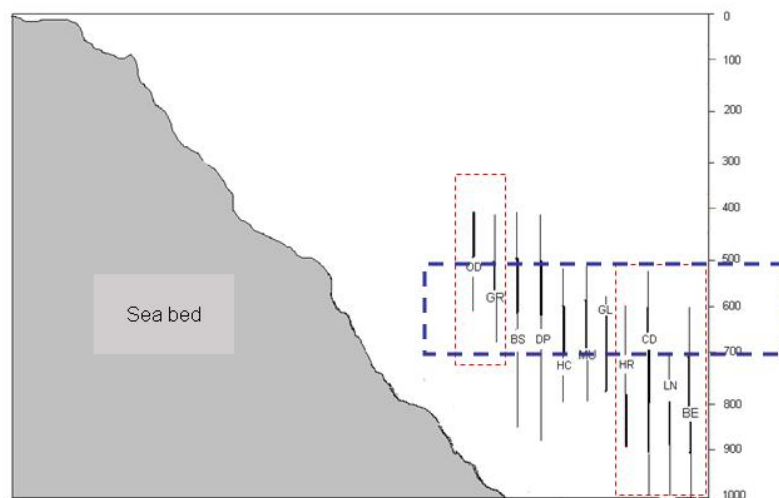
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Index of importance value deep sea demersal fishes

No	Barat laut Simeulue (S4)		Barat Banda Aceh (S5)	
	Nama ikan	INP	Nama ikan	INP
1	<i>Alepocephalidae</i> sp.2	0,0099	<i>Zoarcidae</i> sp.	0,0023
2	<i>Bregmaceros</i> sp.	0,0100	<i>Leptoderma retropinnum</i>	0,0023
3	<i>Malthopsis annulifera</i>	0,0101	<i>Hyperoglyphe japonica</i>	0,0025
4	<i>Congridae</i> sp.2	0,0105	<i>Triacanthodidae</i> sp.	0,0025
5	<i>Bathygadus</i> sp.	0,0107	<i>Halicmetus</i> sp.	0,0026
6	<i>Atrophacanthus japonicus</i>	0,0108	<i>Notacanthus abbotti</i>	0,0028
7	<i>Cubiceps pauciradiatus</i>	0,0109	<i>Narcetes</i> sp.	0,0029
8	<i>Poecilopsetta</i> sp.	0,0110	<i>Nessorhamphus ingolfianus</i>	0,0032
9	<i>Cyttomimus affinis</i>	0,0110	<i>Dipturus</i> sp.	0,0045
10	<i>Bathypylax bombiensis</i>	0,0112	<i>Physiculus</i> sp.	0,0046
11	<i>Ventrifossa</i> sp.3	0,0115	<i>Chascanopsetta</i> sp.	0,0047
12	<i>Scombrolabrax heterolepis</i>	0,0116	<i>Monomitopus</i> sp.2	0,0050
13	<i>Nessorhamphus ingolfianus</i>	0,0125	<i>Etmopterus</i> sp.	0,0052
14	<i>Anoplogaster cornuta</i>	0,0127	<i>Pyramodon</i> sp.1	0,0052
15	<i>Neobythites</i> sp.1	0,0138	<i>Pyramodon</i> ?	0,0052
16	<i>Pterygotrigla</i> sp.	0,0157	<i>Etmopterus</i> sp.	0,0052
17	<i>Bathyclupea argentea</i>	0,0157	<i>Chelidoperca</i> sp.	0,0053
18	<i>Ilyophis brunneus</i>	0,0158	<i>Scyliorhinus</i> sp.	0,0062
19	<i>Chlorophthalmus acutifrons</i>	0,0196	<i>Neobythites</i> sp.1	0,0187

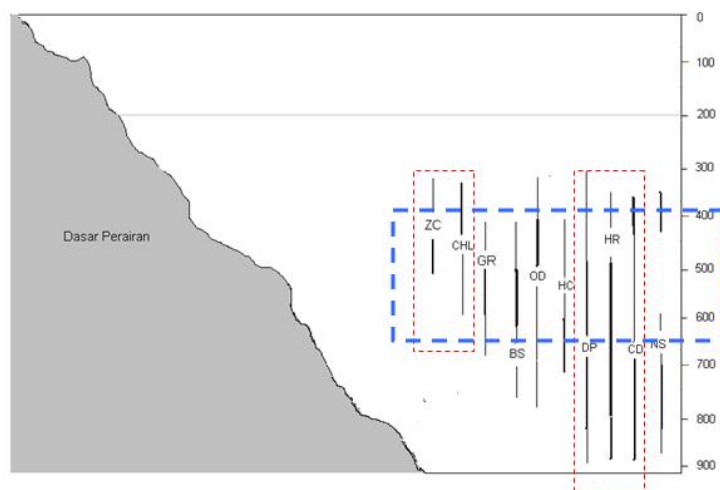
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Dept disribution (m) of deep sea demersal fishes  
Northwest of Simeulue (S4)



Depth Range 500 m – 700 m, Temp= 6.5 – 8.5 ° C, Sal= 35,2 – 34.8 PSU)

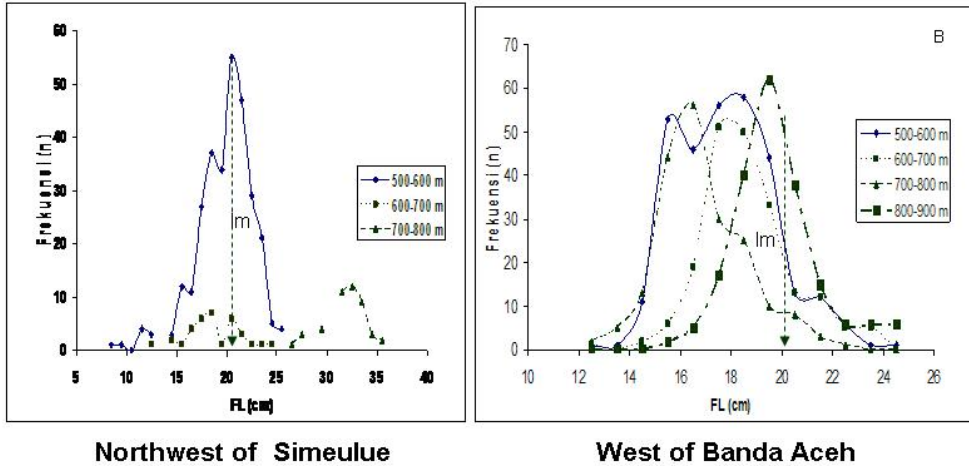
Depth distribution (m) deep sea demersal fishes  
West of Banda Aceh (S5)



Depth range 350 m – 600 m, Temp= 12.5 – 8.5 ° C, Sal= 35,3 – 35 PSU)

In general : Depth range 500-700 m might be the most productive area, high diversity, indicate has a high predation and competition.

### Size distribution of deep sea demersal fishes with respect to the depth range

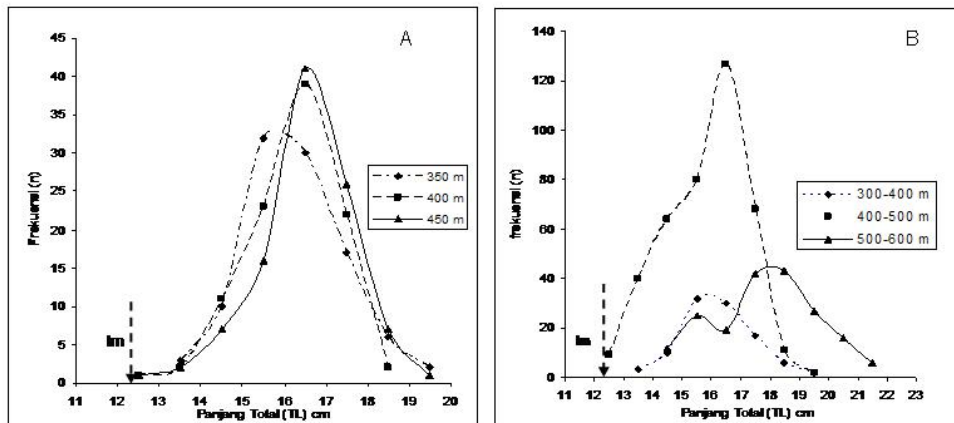


Northwest of Simeulue

West of Banda Aceh

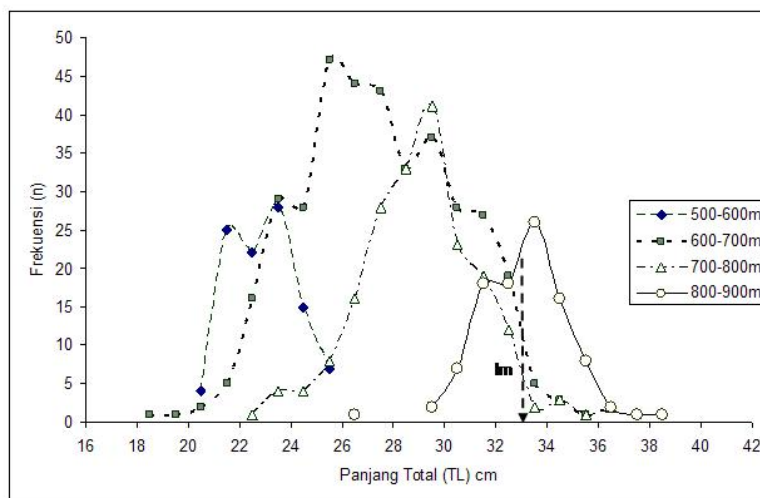
Length of size distribution TL (cm) of *Diretmoides pauciradiatus*

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Distribusi panjang TL (cm) *Ostracoberyx dorygenys* berdasarkan kisaran kedalaman (A) di lokasi Barat Laut Simeulue S4 dan (B) di lokasi Barat Banda Aceh S5

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**Length of size distribution FL (cm) *Hoplostethus rubellopterus* in West of Banda Aceh (S5)**

**DEEP SEA DEMERSAL FISHES OF INDIAN OCEAN (INDONESIA)  
CURRENTLY IS COMMERCIALY EXPLOITED**



Jenis ikan komersial demersal *laut-dalam* yang ditangkap oleh F/V Koshin Maru No 01 dan KR Baruna Jaya IV di perairan barat Aceh

No	Nama Ikan	F/V Koshin Maru 01 (2008)	K/R Baruna Jaya IV (2005)
		Proporsi	Proporsi
1	<i>Hoplostethus rubellopterus</i>	63.34	70.84
2	<i>Beryx splendens</i>	18.85	4.67
3	<i>Ostracoberyx dorygenys</i>	3.57	7.89
4	<i>Thyrsitoides marleyi</i>	2.39	-
5	<i>Erythrocles schlegelii</i>	2.24	-
6	<i>Diretmoides pauciradiatus</i>	2.01	10.67
7	<i>Pseudanthias sp</i>	1.84	-
8	<i>Promethichthys prometheus</i>	1.72	0.05
9	<i>Etelis carbunculus</i>	1.37	-

Proporsi < 1 %

<i>Zenopsis conchifer</i>	<i>Pristigenys nipponia</i>	<i>Epigonees denticulatus</i>
<i>Epinephelus fuscoguttatus</i>	<i>Pristipomoides sieboldii</i>	<i>Etelis radiosus</i>
<i>Neopinnula orientalis</i>	<i>Beryx decadactylus</i>	<i>Lutjanus lutjanus</i>
<i>Antigonia capros</i>	<i>Caelorinchus divergens</i>	<i>Epinephelus chlorostigma</i>
<i>Setarches guentheri</i>	<i>Randallichthys filamentosus</i>	<i>Nettastoma parviceps</i>
<i>Ariomma brevipinnatus</i>	<i>Polymixia berndti</i>	<i>Histioporus typus</i>
<i>Cookeolus japonicus</i>	<i>Ostichthys japonicus</i>	<i>Pontinus macrocephalus</i>
<i>Gephyroberyx darwini</i>	<i>Etelis coruscans</i>	<i>Pristilepis oligolepis</i>
<i>Sebastes iracundus</i>	<i>Hoplostethus crassispinus</i>	<i>Trichiurus lepturus</i>
	<i>Epinephelus flavocaeruleus</i>	<i>Xenolepidichthys dakjleishi</i>

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Potential *deep-sea* demersal fishes  
With high density in west of Aceh



*Beryx splendens*



*Hoplostethus rubellopterus*



*Hoplostethus crassispinus* ?



*Diretmoides pauciradiatus*



*Ostracoberyx dorygenys*

## Potential deep-sea demersal fishes in west of Aceh



*Pseudanthias sp*



*Thyrsitoides marleyi*



*Etelis carbunculus*



*Erythrocles schlegelii*



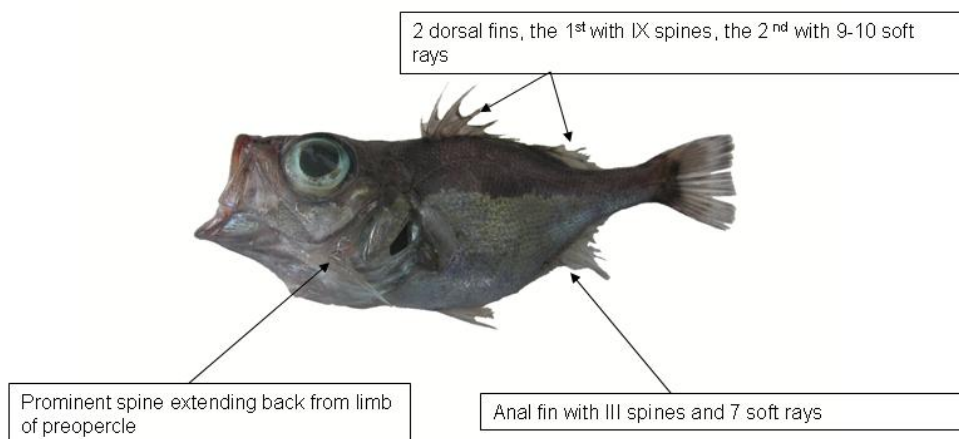
*Promethichthys prometheus*



*Etelis radiosus*

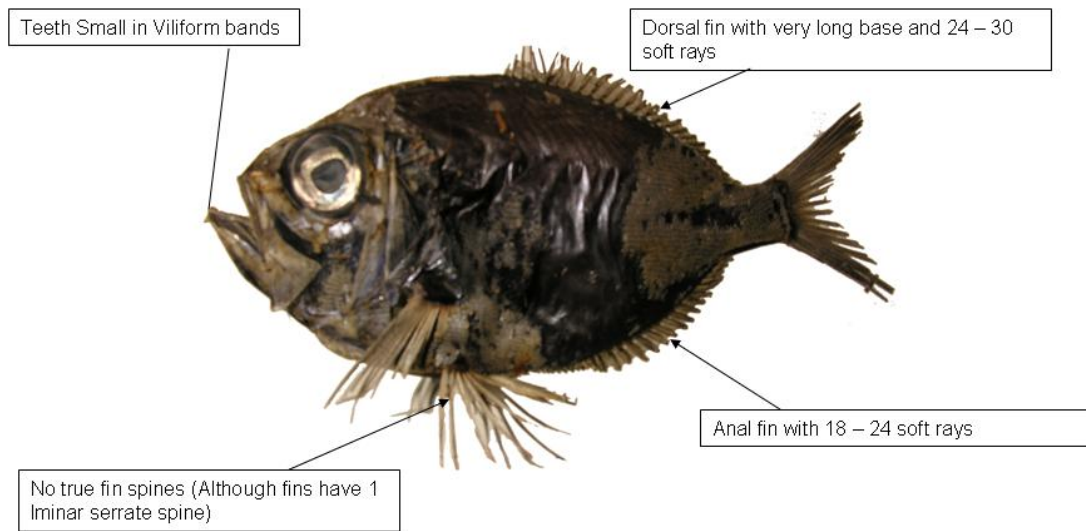
### OSTRACOBERYCIDAE (Ostracoberycids)

To around 20 cm, Demersal, nearbottom on continental Slope



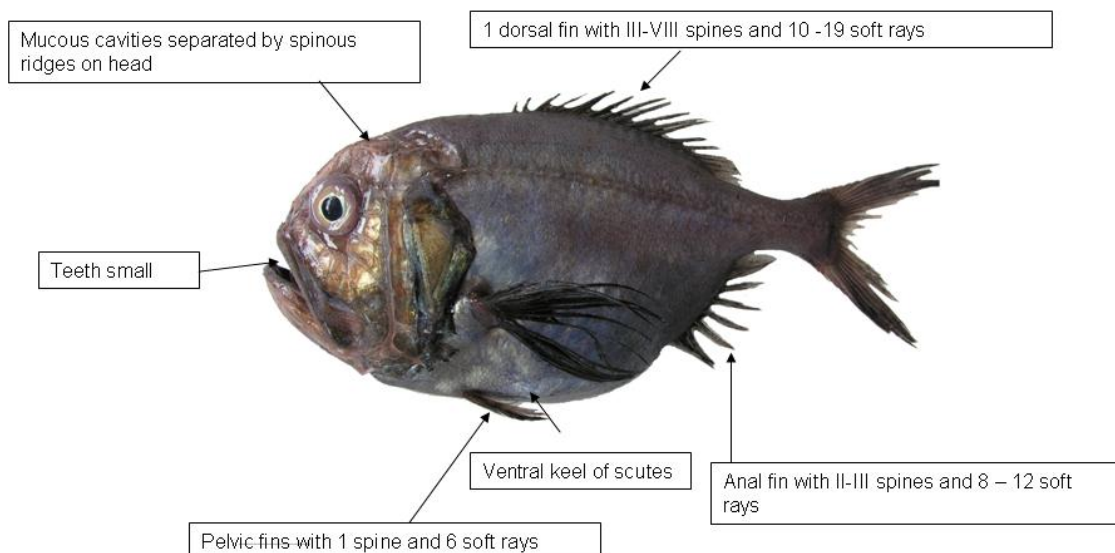


**DIRETMIDAE (SPINYFINS)**  
To 37 cm, Meso, Bathy, Demersal, Benthopelagic



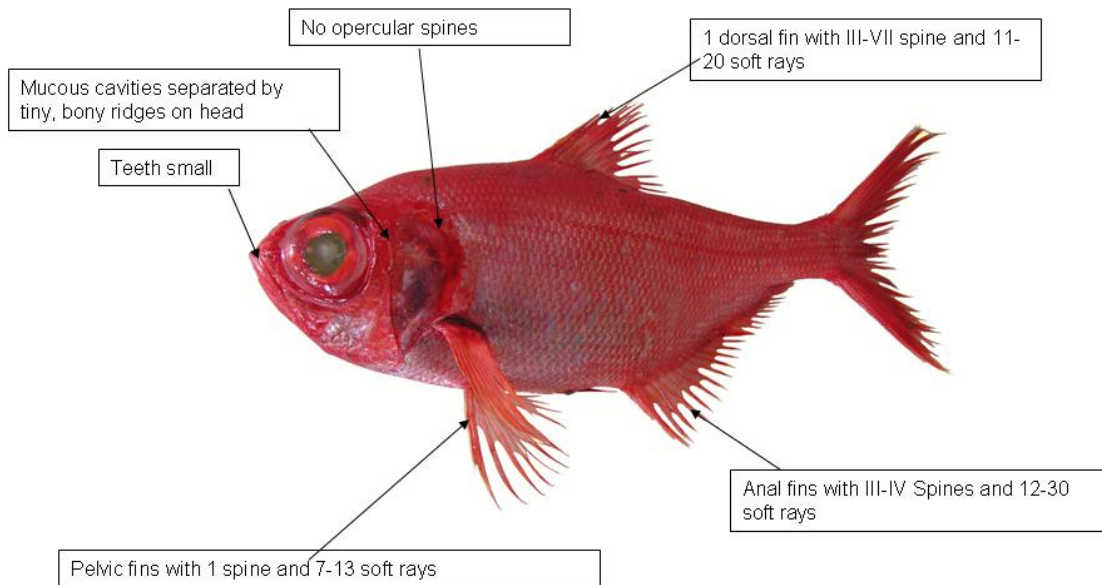
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**Trachichthyidae (Slimeheads)**  
demersal

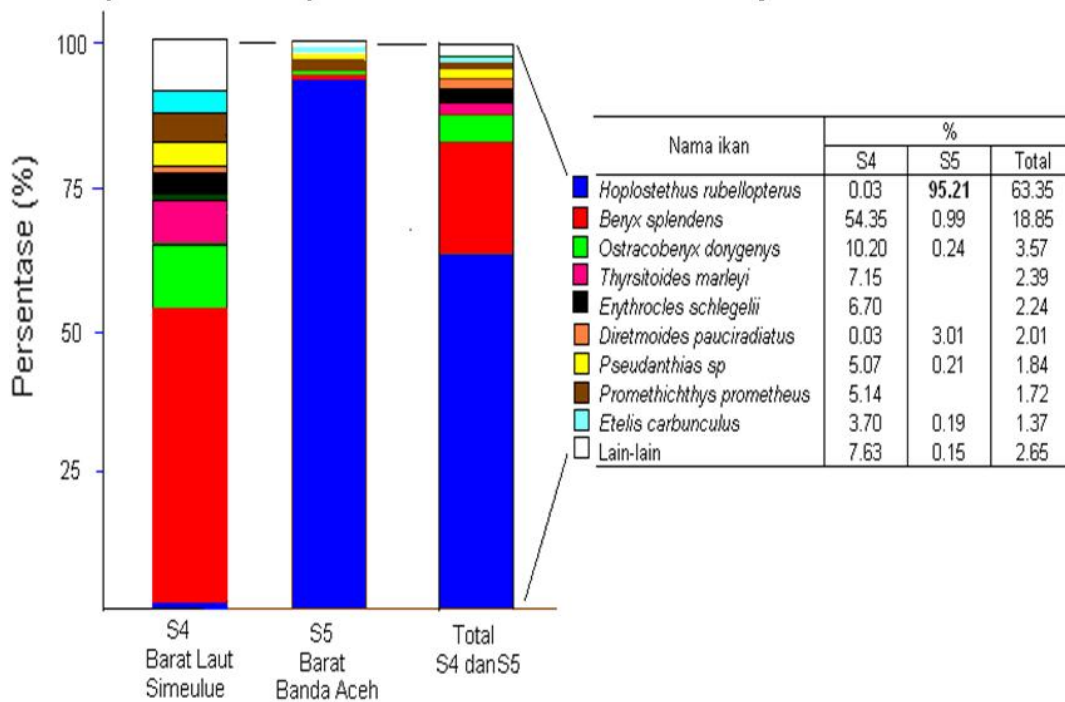


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### Berycidae (Alfonsinos) demersal or benthopelagic on the continental and slope



### Proportion of deep sea demersal fishes utilized by F/V Koshin Maru No 01



CPUA (kg/km<sup>2</sup>) 10 species of *deep sea demersal fishes* Northwest of Simeulue (S4) By KR Baruna Jaya IV

Nama ikan	Kisaran kedalaman (m)											
	400-500		500-600		600-700		700-800		800-900		900-1000	
	CPUA	SE	CPUA	SE	CPUA	SE	CPUA	SE	CPUA	SE	CPUA	SE
<i>Ostracoberyx dorygony</i>	2.585,96	1.248,34	34,17	32,12	-	-	-	-	-	-	-	-
<i>Beryx splendens</i>	316,83	133,71	1.587,74	318,85	49,95	-	-	-	14,16	-	-	-
<i>Dirismoides pauciradiatus</i>	98,92	64,42	442,18	180,39	82,00	15,42	29,96	20,13	14,71	10,10	-	-
<i>Hoplostethus rubellopterus</i>	-	-	0,19	0,15	2,10	0,74	14,75	6,65	22,66	13,11	-	-
<i>Hoplostethus crassispinus</i>	-	-	160,86	51,44	417,02	95,54	72,92	18,08	-	-	-	-
<i>Caelorinchus divergens</i>	-	-	74,84	22,05	112,45	21,68	72,03	12,41	112,87	20,99	25,36	-
<i>Lamprogrammus niger</i>	-	-	-	-	6,27	-	3,24	1,98	205,06	157,68	13,29	-
<i>Glyptothidium sp.</i>	-	-	1,26	0,33	12,81	4,61	38,20	23,75	-	-	-	-
<i>Hexatrygon longirostra</i>	-	-	-	-	105,29	-	55,13	11,42	961,39	-	-	-
<i>Grammicolepis sp.1</i>	91,88	18,97	70,17	17,97	16,15	2,56	-	-	-	-	-	-

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CPUA (kg/km<sup>2</sup>) 10 species of *deep sea demersal fishes* West Band Aceh (S5) By KR Baruna Jaya IV

Nama ikan	Kisaran kedalaman (m)											
	300-400		400-500		500-600		600-700		700-800		800-900	
	CPUA	SE	CPUA	SE	CPUA	SE	CPUA	SE	CPUA	SE	CPUA	SE
<i>Hoplostethus rubellopterus</i>	20,98	-	-	-	3.308,25	2.903,73	17.358,93	10.577,23	5.827,88	3.585,86	2.656,92	2.175,37
<i>Ostracoberyx dorygony</i>	23,47	-	97,77	90,94	3.730,58	2.112,61	-	-	0,75	-	-	-
<i>Dirismoides pauciradiatus</i>	41,79	31,09	-	-	1.360,35	904,71	1.139,27	871,81	758,22	419,48	907,61	372,04
<i>Caelorinchus divergens</i>	114,17	-	-	-	39,77	15,14	131,28	53,41	134,37	27,38	139,63	60,16
<i>Beryx splendens</i>	-	-	13,41	0,35	152,95	118,57	68,14	36,26	221,35	-	-	-
<i>Netastoma solitarium</i>	239,83	-	-	-	-	-	26,99	9,16	112,75	63,39	36,88	25,02
<i>Hoplostethus crassispinus</i>	-	-	4,00	-	-	-	-	-	-	-	-	-
<i>Chlorophthalmus sp. 1</i>	13,26	-	113,69	98,88	0,43	-	-	-	-	-	5,71	-
<i>Berthodanus tenuis</i>	5,30	-	6,33	4,73	27,76	9,69	10,48	6,38	11,01	9,34	-	-
<i>Muraenosox sp.</i>	4,75	-	-	-	6,75	-	22,80	3,94	30,18	-	15,36	-

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### Discards Estimation R/V Baruna Jaya IV (2005)



Discard Estimation with respect to weight  
 Total → 13,4 %

Discard Estimation with respect to Species  
 Total → 94,8 %

Only a few species has high densities.



### DISCARDS ESTIMATION F/V Koshin Maru No 01

N Trip	Estimasi Total Catch (Ton)	(Ditahan) Retained Catch (Ton)	(Dibuang) Discard Catch (Ton)	% Discard
Trip 1	491,20	242,10	249,10	50,71
Trip 2	543,50	414,80	128,70	23,68
Trip 3	169,80	156,20	13,60	8,01
<b>Total</b>	<b>1204,50</b>	<b>813,10</b>	<b>391,40</b>	<b>32,49</b>



## Deep sea Demersal Fishes Export to Phuket

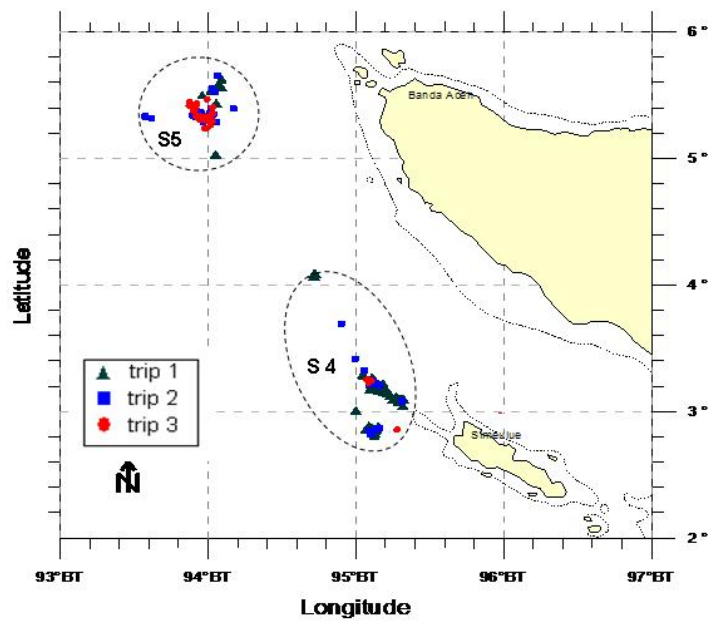


*Beryx splendens*



Phuket Thailand

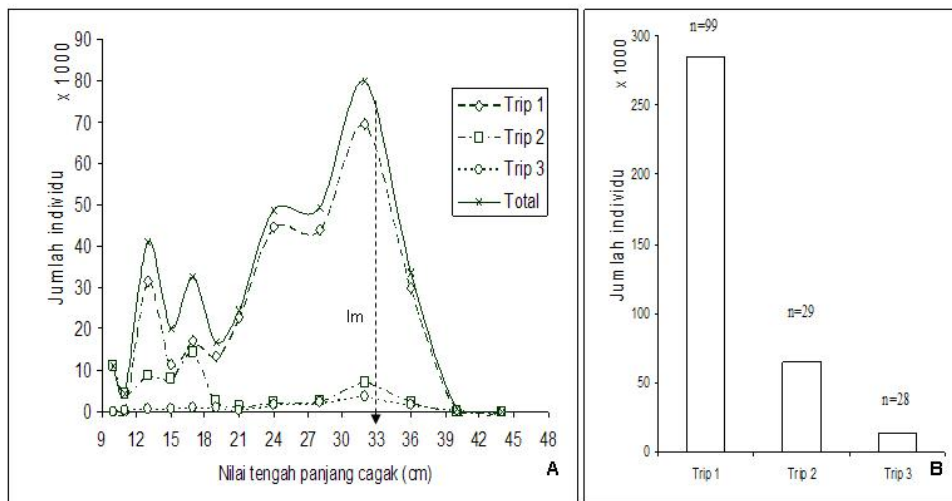
## Fishing Ground of F/V Koshin Maru no 01 (January to May 2008)



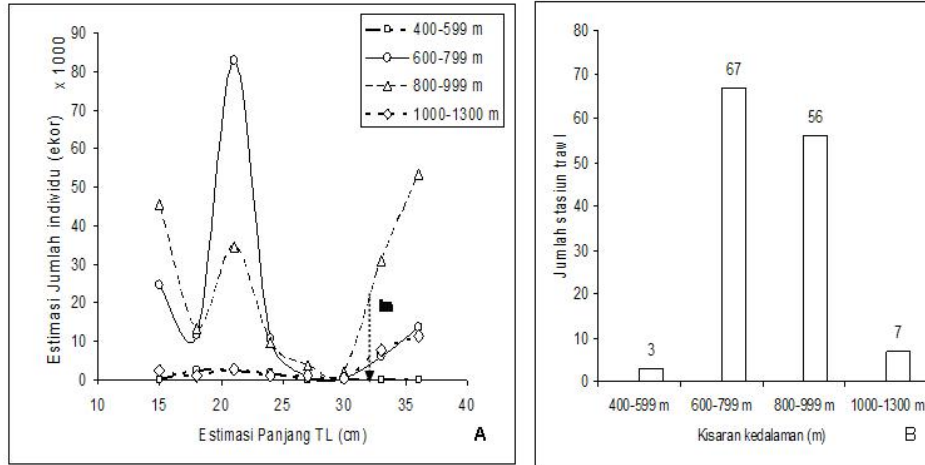


Activities in wet Laboratory R/V Baruna Jaya IV, Sorting, Identification, Biological observation

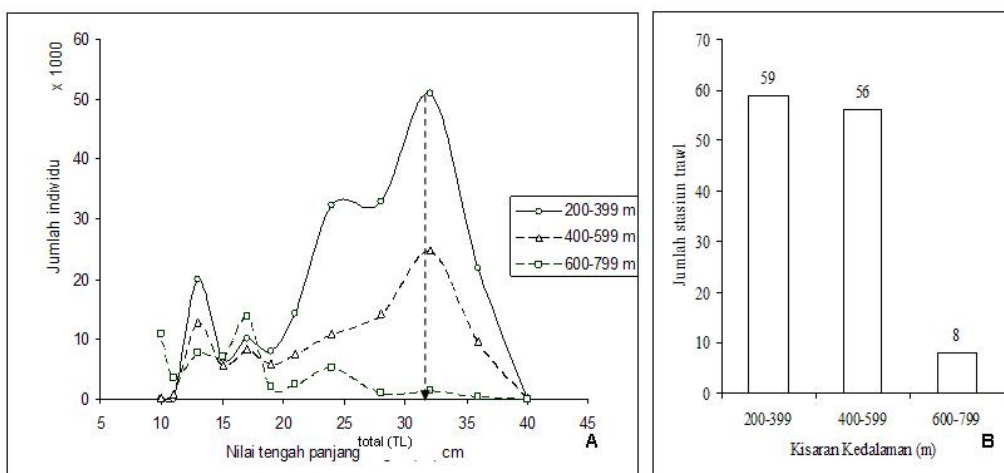
*Beryx splendens*: Catch, size, Im, and trips



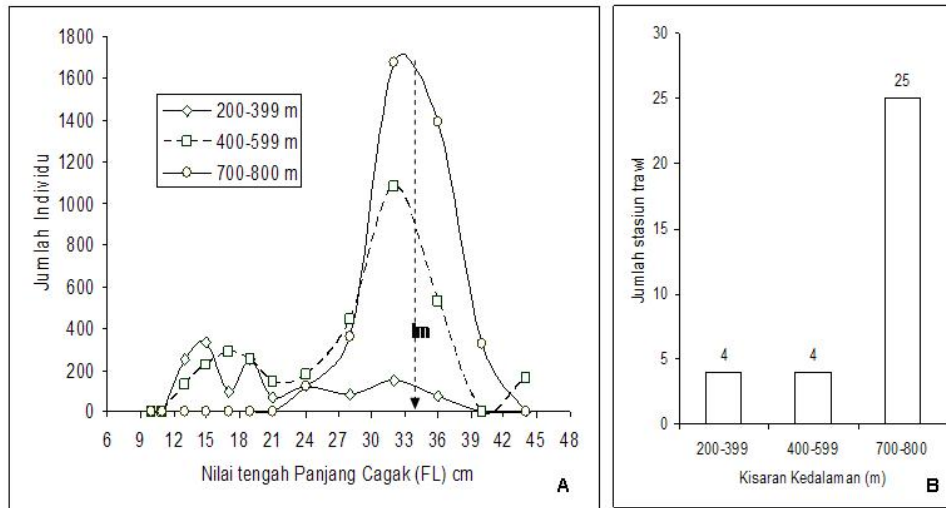
### *Hoplostethus rubellopterus* : Catch, size, Im, and depth range (West Banda Aceh)



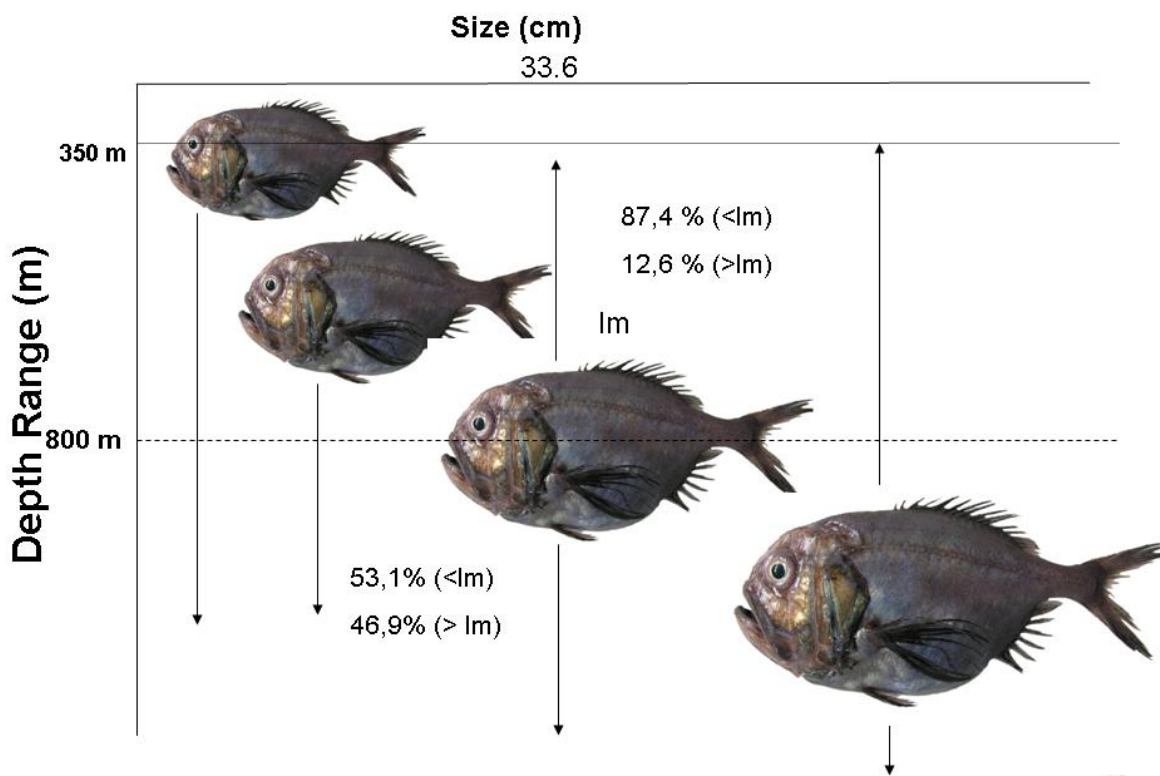
### *Beryx splendens* : Catch, size, Im, and depth range (Northwest Simeulue)



### *Beryx splendens* : Catch, size, lm, and depth range (West Banda Aceh)

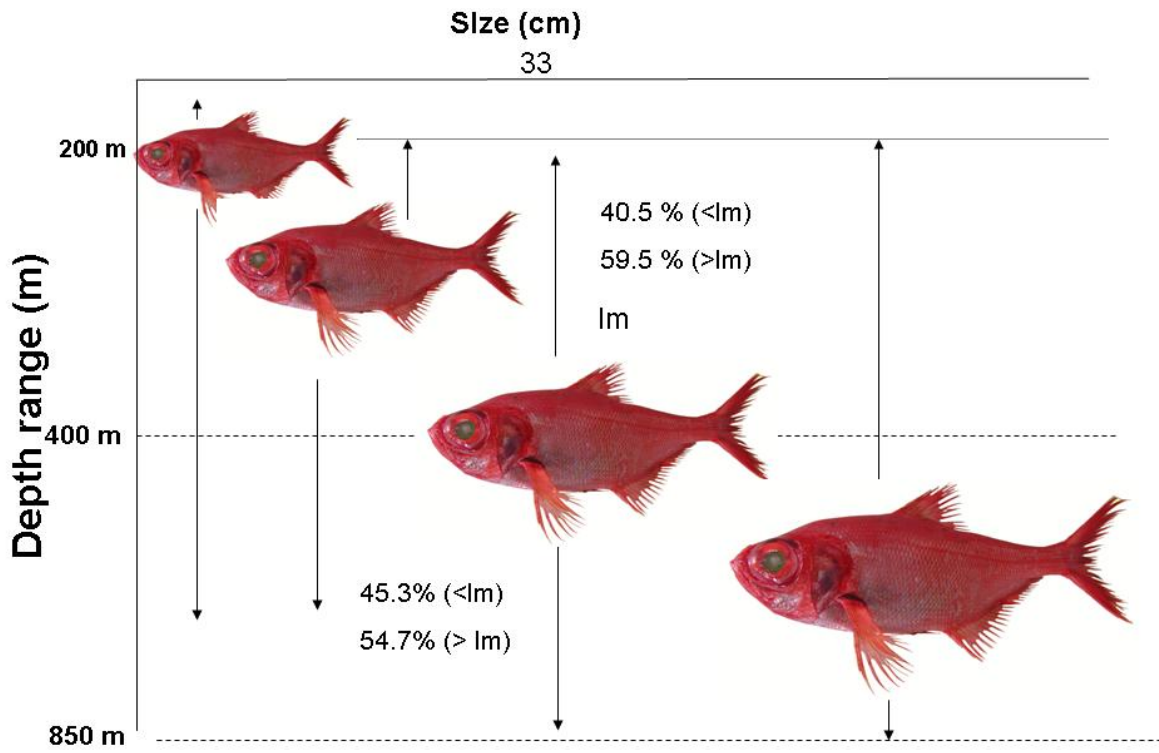


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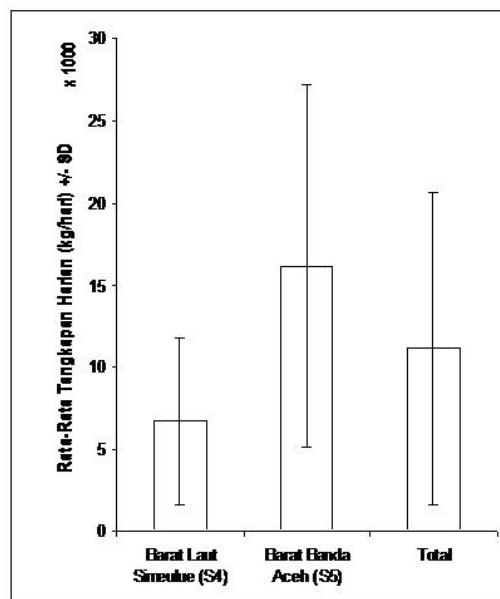


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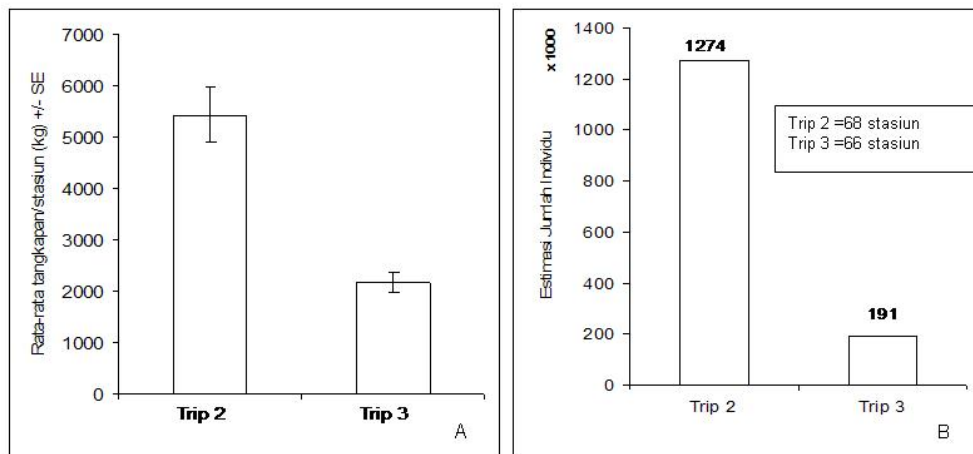




Daily catch of F/V Koshin Maru No 01

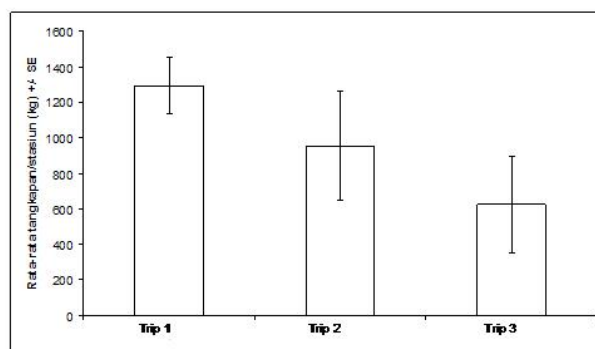


### Catch of *Hoplostethus rubellopterus*/station VS Trips



*The catch decrease over trips*

### Catch of *Beryx splendens* /station VS Trips



*The catch decrease over the fishing trips*

