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IN THE SOUTH CHINA SEA AREA**

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**COUNTRY STATUS REPORT
BRUNEI DARUSSALAM**

**MACKERELS, ROUND SCADS AND
NERITIC TUNAS FISHERIES OF
NEGARA BRUNEI DARUSSALAM**

By

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1. INTRODUCTION

Pelagic capture fishery plays an important role as one of the contributor to the annual domestic fish requirement in Negara Brunei Darussalam. Of all households expenditure on seafood in the country, 23% goes to pelagic fishes and only 15% on demersals as can be seen from the **Table** below.

Table 1: Expenditure on Seafood in Brunei, by Category

Pelagics	23%
Shrimp and prawns	22%
Cured fish products	16%
Demersals	15%
Other fish	9%
Other Crustacea and molluscs	4%
Canned fish	3%
Other	8%
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	100%
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Source of Data: Statistics Division, EPU, Ministry of Finance.

Out of the total of 23% expenditure on pelagics, 14% spending is on the small pelagic fishes and the rest 9% goes to large pelagics. For the purpose of this workshop, the paper deals with the fisheries of mackerels, round scads and neritic tunas only, although data on the other pelagics are also included.

2. FISHING GROUND AND TYPES OF GEAR EMPLOYED

Brunei Darussalam has an EEZ totalling roughly 38,600 sq. km., of which, the continental shelf area is about 8,600 sq. km.

Fishing is carried out in the continental shelf area, the majority within the 10 to 50 metre depth range. **Figure 1** shows the main areas where scads, selars, mackerels and neritic tunas are normally caught.

The presence of offshore oil installations is of vital importance to the pelagic fishing whereby these structures served as artificial reefs and aggregating devices for both migratory and residential fishes to obtain shelter, food and reorientation point. In addition to these oil installations there are also FADs deployed by fishermen for the purse seine, ring net and hand lines fisheries.

Table 2 shows the number of licensed fishermen according to gear.

Table 2: Number of Licensed Fishermen by Gear

	1984	1990	1992	1993	1994
Purse Seine	2	3	3	5	3
Demersal Trawl	4	10	10	15	17
Small ring net	31	20	31	32	42
Drift gill net	82	24	59	58	34
Bottom set gill net	34	127	135	121	104
Handlines	162	227	279	279	253

Source of Data: Department of Fisheries.

Table 3: Type of Gear and Target Groups

<i>Gear</i>	<i>Operational Depth of Water</i>	<i>Target Groups</i>	<i>By Catches</i>
1. Purse Seine	20 — 50 m	Mackerels, selars, scads neritic tunas, sardines, black pomfret	King mackerel, hard tail scad
2. Small ring net	10 — 30 m	Mackerels, selars, sardines, anchovies	Round scads, neritic tunas
3. Drift gill net	10 — 30 m	King mackerel, black pomfret, hard tail scad	Neritic tunas
4. Bottom set gill net	10 — 25 m	Demersal and pelagics (small mackerels and neritic tunas)	King mackerel, round scads
5. Hand-lines	5 — 60 m	A wide range of demersals and pelagics. The pelagics include trevallies, mackerels, selars, neritic tunas, scads	Larger tuna species sardine
6. Demersal trawl	20 — 70 m	Demersal fishes	A number of pelagic groups, notably

Table 3 indicates the type of gear and the targeted groups of fishes. The purse seine, small ring net, drift gill net, bottom set gill net and hand-lines are the main gear utilised by fishermen to catch the pelagics. However, a substantial amount of pelagics are also caught by the demersal trawlers.

Table 4: Pelagic Catch Composition of Four Artisanal Gear, 1991

<i>Species/ Gear</i>	<i>Small Ring Net</i>	<i>Drift Gill Net</i>	<i>Bottom Set Gillnet</i>	<i>Hand Lines</i>
Round scads	40%	—	3%	2%
Mackerels	38%	—	9%	1.5%
King mackerels	—	26%	—	16%
Neritic tunas	8%	72%	4%	1.5%
Skipjack tuna	14%	2%	62%	*52.8%
Selars	—	—	20%	26%
Hardtail scad	—	—	2%	0.2%

* Trolling.

The majority of mackerels, round scads and neritic tunas landed in the country are caught using purse seine, hand-lines and bottom set gill nets. **Table 4** shows the catch composition of four main artisanal fishing gears for the year 1991.

3. LANDING TRENDS, CATCH COMPOSITION AND SEASONALITY

Table 5: Annual Landings of Selected Pelagic Fishes from 1989 to 1994 (in tonnes)

<i>No.</i>	<i>Species/year</i>	<i>1989</i>	<i>1990</i>	<i>1991</i>	<i>1992</i>	<i>1993</i>	<i>1994</i>
1.	(Round scads (<i>Decapterus</i> spp.))	74.24	29.82	11.54	9.31	37.14	22.55
2.	<i>R. brachysoma</i>	20.86	17.72	31.99	36.82	72.53	63.98
3.	<i>R. kanagurta</i>	240.89	160.27	127.34	53.58	58.28	33.35
4.	King mackerels (<i>S. commerson</i> and <i>S. guttatus</i>)	68.40	83.87	92.49	99.02	83.96	41.16
5.	Tuna (<i>A. thazard</i> <i>E. affinis</i> and <i>K. pelamis</i>)	67.83	72.33	85.38	64.61	74.53	54.13
6.	Selar (<i>S. mate</i> , <i>S. melanoptera</i> and <i>S. leptolepis</i>)	171.61	283.45	165.55	80.86	89.89	79.69
7.	<i>Sardinella gibbosa</i>	43.06	23.96	18.21	8.29	11.38	14.78
8.	<i>Sardinella fimbriata</i>	3.11	4.26	10.70	298.32	386.78	2.54
9.	<i>Megalaspis cordyla</i>	33.58	28.08	12.05	31.56	25.39	11.00
	TOTAL	723.58	703.76	555.25	682.37	839.88	323.18

Source of Data: Department of Fisheries.

Table 5 on the previous page shows the annual landings of selected pelagics.

The majority of landings from 1989 to 1991 comprised of the small mackerel (*Rastrelliger kanagurta*) and selar (*Selar mate* and *Selar melanoptera*). However the year 1992 to 1994 saw the decrease in the landings of these two dominant groups. The landings of the other small mackerel (*Rastrelliger brachysoma*), showed a notable increase from 31.9 tonnes in 1991 to 72.5 tonnes in 1993.

The landings of King Mackerels, Neritic Tunas and Hardtail scad show slight annual variations without a clear discernible trend. The year 1992 and 1993 saw an exceptionally high volume of sardines (*Sardinella fimbriata*) being landed.

Table 6A and **6B** show the monthly landings of purse seiners and demersal trawlers respectively for the year 1993. It is interesting to note that the demersal trawlers land more *R. brachysoma* than *R. kanagurta*, and the situation is reversed in the purse seiners. These landing data clearly indicated the all-year-round availability of the small mackerels, king mackerels, selars, scads and skipjack tuna. Although the neritic tunas species (*Auxis thazard* and *Euthynnus affinis*) are not clearly represented both in the catches of purse seiners and trawlers, records obtained from the artisanal fishermen and market statistics as well as the author's personal observations indicate that these species are available in the coastal waters through out the year. **Fig. 2** shows the monthly distribution of pelagics for the year 1993.

The total landing for 1994 is the lowest amongst all the landings over the past six years. One probable explanation would be due to the oil exploration work whereby extensive Seismic Surveys were conducted within the onshelf area thereby rendering the deployment of sufficient number of FAD to aggregate the fish. The purse seine fishery in particular, was severely affected and ceased operational in August of that year. This is reflected in the 1994 monthly landings of purse seiners (see **table 7A** and **7B**), in which the total landings is only about 17% of 1993 landings. The trawlers on the otherhand, are not affected and the rest of the pelagic landings for 1994 were contributed by the artisanal sector.

Table 6A: Monthly Landing of Purse Seiners 1993 (in kgs.)

No.	Species	Jan.	Feb.	Mac	Apr.	May	Jun	July	Aug.	Sep.	Oct.	Nov.	Dec.	Total
1.	<i>Decapterus maruadsi</i>	0	3,841	4,136	382	2,973	0	0	0	896	0	0	0	12,228
2.	<i>Auxis thazard</i>	0	0	0	0	0	0	0	0	0	0	2,449	496	2,945
3.	<i>Euthynnus affinis</i>	0	0	0	853	0	84	0	0	80	135	199	60	1,411
4.	<i>Katsuwonus pelamis</i>	0	105	3,692	269	0	62	254	23	193	387	437	0	5,422
5.	<i>Megalaspis cordyla</i>	0	0	0	280	50	0	0	0	0	0	0	0	330
6.	<i>Rastrelliger brachysoma</i>	0	0	370	1,557	49	765	19,507	0	82	142	3,622	245	26,339
7.	<i>Rastrelliger kanagurta</i>	0	12,370	32,993	23,178	28,815	32,269	0	15,821	13,131	11,201	12,557	4,796	187,131
8.	<i>S. commerson</i>	0	0	0	0	16	0	0	0	1,064	0	0	0	1,080
9.	<i>S. guttatus</i>	0	0	0	0	0	0	0	0	0	0	0	0	0
10.	<i>Selar mate</i>	0	1,763	1,777	1,606	10,455	7,543	5,524	5,844	5,627	2,997	1,196	1,060	45,392
11.	<i>Selar kalla</i>	0	0	0	0	0	0	0	0	42	0	0	0	42
12.	<i>Selar melanoptera</i>	0	10,902	30,119	12,820	4,077	1,559	559	335	700	768	6,178	3,783	71,800
13.	<i>Selaroides leptolepis</i>	0	0	0	0	382	1,195	1,590	1,155	629	844	677	361	6,833
	TOTAL	0	28,981	73,087	40,945	46,817	43,477	27,434	23,178	22,444	16,474	27,315	10,801	360,953

Source of Data: Department of Fisheries.

Table 6B: Monthly Landing of Pelagic Fishes by Demersal Trawlers 1993 (in kgs.)

No.	Species	Jan.	Feb.	Mac	Apr.	May	Jun	July	Aug.	Sep.	Oct.	Nov.	Dec.	Total
1.	<i>Decapterus</i> spp.	1,064	6,509	202	385	694	5,335	460	320	1,309	1,561	2,300	4,773	24,912
2.	<i>Euthynnus affinis</i>	0	0	0	0	0	0	0	0	0	0	0	122	122
3.	<i>Katsuwonus pelamis</i>	0	0	0	0	0	0	0	0	0	0	0	25	25
4.	<i>Megalaspis cordyla</i>	1,710	1,524	1,001	56	238	292	497	654	780	1,162	685	1,636	10,235
5.	<i>Rastrelliger brachysoma</i>	176	1,433	11,630	355	457	9,626	805	4,619	10,201	6,570	1,819	9,470	57,161
6.	<i>Rastrelliger kanagurta</i>	520	141	0	0	457	263	9	59	172	312	474	391	2,798
7.	<i>S. commerson</i>	1,782	2,994	1,179	500	526	1,145	781	1,677	1,667	1,526	985	1,912	16,674
8.	<i>S. guttatus</i>	0	0	0	0	0	0	124	25	17	286	293	0	745
9.	<i>Selar mate</i>	174	852	272	47	0	0	25	42	291	299	141	580	2,723
10.	<i>Selar kalla</i>	0	119	0	0	0	0	0	0	0	0	0	0	119
	TOTAL	5,426	13,572	14,284	1,343	2,372	16,661	2,701	7,396	14,437	11,716	6,697	18,909	115,514

Source of Data: Department of Fisheries.

Table 7A: Monthly Landings of Purse Seiners 1994 (in kgs)

No.	Species	Jan.	Feb.	Mac	Apr.	May	Jun	July	Aug.	Sep.	Oct.	Nov.	Dec.	Total
1.	<i>Decapterus maruadsi</i>	0	20	1,474	321	896	980	227	0	0	0	0	0	3,918
2.	<i>Auxis thazard</i>	0	0	0	0	0	0	0	0	0	0	0	0	0
3.	<i>Euthynnus affinis</i>	105	0	0	24	0	232	22	0	0	0	0	0	383
4.	<i>Katsuwonus pelamis</i>	46	65	0	0	93	0	0	0	0	0	0	0	204
5.	<i>Megalaspis cordyla</i>	0	0	0	0	0	0	0	0	0	0	0	0	0
6.	<i>Rastrelliger brachysoma</i>	225	0	0	0	0	0	0	0	0	0	0	0	225
7.	<i>Rastrelliger kanagurta</i>	3,714	5,424	2,618	8,021	5,210	4,344	583	0	0	0	0	0	29,914
8.	<i>S. commerson</i>	0	0	0	0	0	0	0	0	0	0	0	0	0
9.	<i>S. guttatus</i>	0	0	0	0	0	0	0	0	0	0	0	0	0
10.	<i>Selar mate</i>	2,406	1,391	713	6,553	1,516	930	367	0	0	0	0	0	13,876
11.	<i>Selar kalla</i>	0	0	0	0	0	0	0	0	0	0	0	0	0
12.	<i>Selar melanoptera</i>	3,349	2,700	2,601	3,225	142	0	0	0	0	0	0	0	12,017
13.	<i>Selaroides leptolepis</i>	0	0	0	0	0	0	0	0	0	0	0	0	0
	TOTAL	9,845	9,600	7,406	18,144	7,857	6,486	1,199	0	0	0	0	0	60,537

Source of Data: Department of Fisheries.

Note: Only (2) purse seine vessels operational. They stop operating in August
(Please see text for explanation).

Table 7B: Monthly Landings of Pelagic Fishes by Demersal Trawlers 1994 (in kgs.)

No.	Species	Jan.	Feb.	Mac	Apr.	May	Jun	July	Aug.	Sep.	Oct.	Nov.	Dec.	Total
1.	<i>Decapterus</i> spp.	2,371	2,852	881	3,082	844	1,618	571	1,128	1,726	644	579	2,340	18,636
2.	<i>Euthynnus affinis</i>	0	0	0	0	0	0	0	0	0	0	0	0	0
3.	<i>Katsuwonus pelamis</i>	0	0	0	0	0	0	0	0	94	37	0	0	131
4.	<i>Megalaspis cordyla</i>	910	3,901	2,224	1,871	339	37	637	570	230	424	488	550	12,181
5.	<i>Rastrelliger brachysoma</i>	11,525	3,224	1,272	889	1,736	2,688	12,818	4,044	5,129	3,982	10,211	6,237	63,755
6.	<i>Rastrelliger kanagurta</i>	1,504	256	903	34	325	0	0	110	0	0	264	44	3,440
7.	<i>S. commerson</i>	1,959	1,659	1,706	1,068	337	0	620	581	649	587	915	893	10,974
8.	<i>S. guttatus</i>	228	99	44	0	0	0	0	0	0	44	104	96	615
9.	<i>Selar mate</i>	50	161	315	1,596	37	0	97	175	30	15	0	70	2,546
	TOTAL	18,547	12,152	7,345	8,540	3,618	4,343	14,743	6,608	7,858	5,733	12,561	10,230	112,278

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Source of Data: Department of Fisheries.

4. STOCK ESTIMATION, POTENTIAL YIELD AND STATUS OF EXPLOITATION

A preliminary survey on the pelagic biomass was conducted in June 1989. The survey, which was done during the mid-south west monsoon period, may have missed the seasonal fluctuation in abundance of the small pelagics. Fig. 3 illustrates the density distribution of the small pelagics on the continental shelf of Brunei Darussalam. As with the various other observations within the region, the abundance of small pelagics tend to decline with depth. Table 8 gives the estimate of biomass and composition of small pelagics in Brunei Darussalam onshelf waters.

Table 8: Biomass Estimate of Small Pelagics
(on Shelf Waters, 0 — 200 m depth)

<i>Genera/Group</i>	<i>Biomass (tons)</i>	<i>Relative abundance (%)</i>
<i>Dussumieria</i> spp.	3,705	24.0
<i>Carangoides</i> spp.	3,580	23.2
<i>Decapterus</i> spp.	3,230	21.0
<i>Ariomma</i> spp.	2,550	16.5
<i>Selar</i> spp.	1,400	9.1
<i>Rastrelliger</i> spp.	270	1.8
Others	680	4.4
Total	15,415	100.00

Source of Data: Department of Fisheries (1989).

Silvestre et al (1992) come up with estimates of potential yield of the onshelf area as can be seen from the table below.

Table 9: Estimates of Potential Yield of Pelagics and Proposed Maximum Harvest Limit

<i>Resources</i>	<i>Potential yield estimate (ton/yr.)</i>	<i>Proposed maximum harvest limit (ton/yr.)</i>
Small pelagics	7,700	6,000
Large pelagics	2,100	1,600
Total:	9,800	7,600

Source of Data: Silvestre et al (1992).

A maximum harvest limit of 7,600 ton/yr. for the pelagics is recommended. The assessments conducted so far give indication that the pelagic resources are lightly exploited. The total pelagic harvested during the year 1989 to 1993 was from 723.58 to 839.88 tons per year which give the yield to biomass ratio of 0.07 to 0.08. These values of Y/B indicate an overall light exploitation of the pelagic resources of the onshelf area. The maximum harvest of 839.88 tons in 1993 accounts for only about 11% of the total proposed maximum harvest in a year. However these estimates are only preliminary and another survey concerning the small pelagics are scheduled to be in Sept./Oct. of 1995 and Feb./March of 1996.

5. BIOLOGICAL, OCEANOGRAPHIC AND ENVIRONMENTAL PARAMETERS RELATED TO MARINE FISHERIES

Apart from length-weight frequency of specific groups or species of fish (Pelagics and demersals), some oceanographic as well as physico-chemico parameters pertaining to water quality of the sea water obtained from various sampling stations within the Brunei Bay and the offshore areas, there is very little or no information available concerning the migration pattern, geographic limits of the stock, distribution depth, and other biological information with regard to growth, mortality, age, recruitment, spawning and nursery ground, fecundity, sex ratio, food and feeding habit, particularly the prey-predator relationship on round scads, mackerels and neritic tunas.

Realising the importance of these informations to the biological and management advisory team, the department is planning to undertake studies in the area of ecosystem and multi species fisheries.

A pelagic resources survey would be conducted in Sept./Oct. of 1995 and Feb./Mar. of 1996. Divided into two phases, the survey is designed to take into account the seasonality of the small pelagics within the onshelf as well as offshore areas. A study on the gut contents of neritic tunas has just started in May of 1995.

The constraint faced by the department is the lack of qualified personnel to undertake the specific research works and along this line collaborative research works particularly concerning the pelagics and other migratory species which are shared by neighbouring Malaysian States of Sabah and Sarawak and the other South East Asian countries, are needed.

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