



**THE THIRD REGIONAL WORKSHOP ON SHARED STOCKS
IN THE SOUTH CHINA SEA AREA**

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**COUNTRY STATUS REPORT
BRUNEI DARUSSALAM**

**STATUS OF SMALL PELAGIC FISHERIES IN
BRUNEI DARUSSALAM**

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1. INTRODUCTION

Pelagic capture fishery contributes a substantial amount to the total annual landing of fresh fish in Brunei Darussalam. In 1996, a two-phase pelagic survey estimated a total biomass of 15,320 m.t. and a potential yield of 7,660 m.t. from the EEZ. This paper presents the status of exploitation of the small pelagic resources, some biological aspects of the stocks and management measures.

2. STATUS OF FISHERIES

The 1997 rate is anticipated to be lower than the 1996 figure. A number of factors contribute to this prediction. The most prominent one would be the decline in the production of three important gears namely, the purse seine, gill net and traps that contributed an average of about 22% of the total pelagic landings. (see Table 1)

Table 1: Percentage fluctuation in the total pelagic fish production of various fishing gears from 1989 to 1997

	1989	1990	1991	1992	1993	1994	1995	1996	1997
Hook & Line	6 %	22 %	4 %	28 %	29 %	48 %	47 %	44 %	53 %
Gill Net	1 %	4 %	3 %	16 %	15 %	1 %	1 %	2 %	1 %
Trawl	16 %	6 %	7 %	14 %	10 %	20 %	15 %	24 %	31 %
Traps	8 %	17 %	12 %	13 %	14 %	13 %	18 %	3 %	1 %
Ring Net	22 %	24 %	64 %	25 %	26 %	17 %	17 %	25 %	15 %
P. Seine	8 %	6 %	4 %	5 %	6 %	1 %	2 %	2 %	0 %
Drift G. Net	19 %	9 %	2 %	0 %	0 %	0 %	0 %	0 %	0 %
Lampara	19 %	12 %	5 %	0 %	0 %	0 %	0 %	0 %	0 %
	100 %	100 %	100 %	100 %	100 %	100 %	100 %	100 %	100 %

3. CATCH EFFORT AND FISHING GEAR

Apart from specialised gears such as ring net, hook and line, purse seine and drift gill net, pelagic species are also caught by the demersal trawl, gill net and trap. Figure 1 shows the mean CPUE (in metric tons/operational days) from various fishing gears that catch small pelagic fishes. Purse seine provides the highest mean CPUE at 0.58 mt/operational day. It was followed by ring net and trap with 0.5 mt/operational days, respectively. (see also Table 2).

Figure 1 also provides the annual fluctuation in the CPUE of fishing gears during the period. The catch rate from purse seine, ring net and trawl shows a significant decline from 1991 to 1997 while traps, gill net and hook and line present an increasing trend especially among the traditional fisheries sector.

Figure 1: Annual fluctuation in the CPUE of various fishing gears.

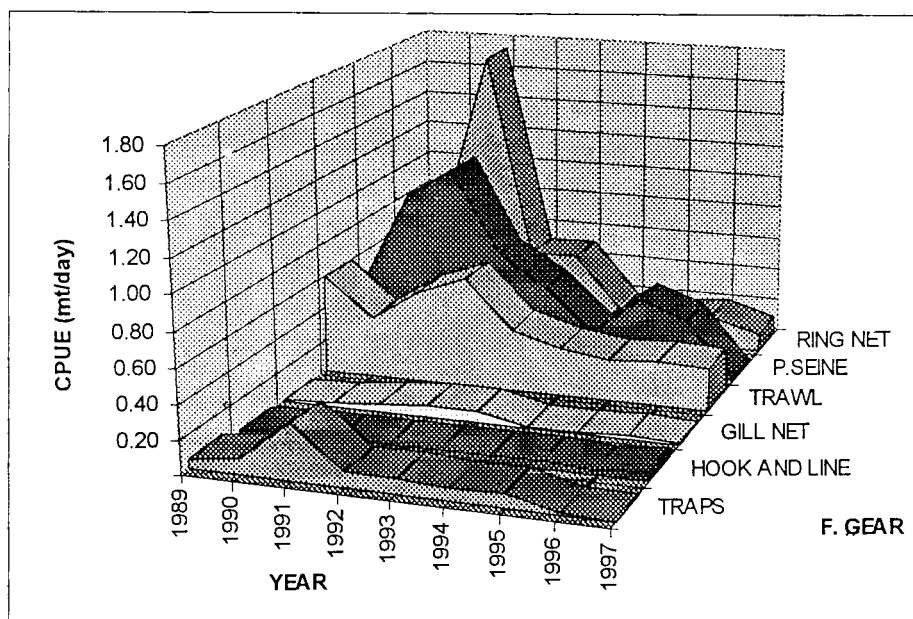


Table 2: Annual fluctuation in the mean CPUE (metric tons per operational day) of important fishing gears in the waters of Brunei Darussalam

	1989	1990	1991	1992	1993	1994	1995	1996	1997	Mean
Traps	0.06	0.10	0.32	0.09	0.09	0.07	0.08	0.01	0.004	0.09
Hook and Line	0.02	0.04	0.04	0.04	0.04	0.04	0.05	0.03	0.05	0.04
Gill Net	0.00	0.01	0.04	0.06	0.06	0.004	0.005	0.020	0.002	0.06
Trawl	0.59	0.36	0.54	0.65	0.37	0.29	0.25	0.26	0.25	0.40
P. Seine	0.41	0.97	1.15	0.64	0.46	0.20	0.44	0.34		0.58
Ring Net	0.44	0.68	1.74	0.50	0.50	0.18	0.17	0.19	0.11	0.50
Drift Gill Net	0.24	0.41	0.80	na	na	na	na	na	na	
Lampara Net	2.00	0.90	1.46	na	na	na	na	na	na	

4. PRODUCTION ESTIMATE

Table 3 presents the annual fluctuation in the total fish production among the major fishing gears from 1989 to 1997. The highest production was recorded in 1991 and from there the production started to decline. Considering the 1996 potential yield estimate of 7,660 metric tons, only about 43% (3,305 mt) have been exploited in 1996. However, during the period from 1990 to 1993 the fishing harvests exceeded the estimated potential yield. It is probable that the MSY might have been reached during that period. But this is yet to be confirmed by the present monitoring survey being conducted by the Department.

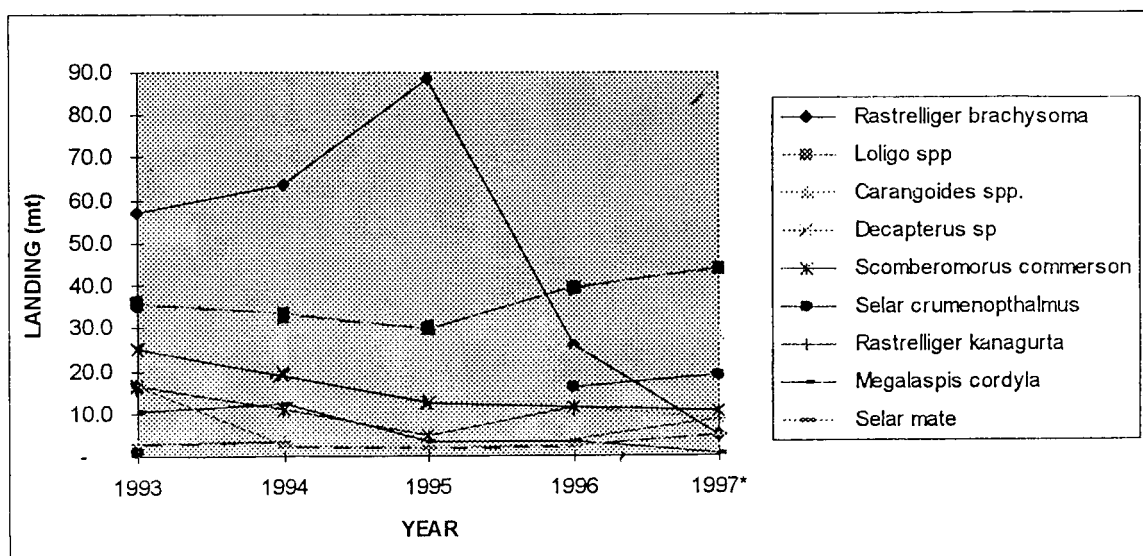
Table 3: Estimated annual fish production from the major fishing gears

	1989	1990	1991	1992	1993	1994	1995	1996	1997
Hook & Line	262	2,120	547	2,213	2,277	2,222	3,036	1,467	1,344
Gill Net	45	421	397	1,294	1,160	35	59	63	37
Trawl	689	542	992	1,082	795	916	979	796	783
Traps	339	1,642	1,720	1,011	1,146	585	1,119	87	15
Ring Net	943	2,394	9,604	2,033	2,098	776	1,090	822	374
P. Seine	317	563	663	371	459	66	111	71	-
Drift Gill Net	790	892	289	-	-	-	-	-	-
Lampara Net	810	1,222	703	-	-	-	-	-	-
	4,195	9,796	14,915	8,003	7,935	4,600	6,394	3,305	2,553

5. SPECIES COMPOSITION

Figure 2 presents the fluctuation in the landings of selected species from the catch composition of trawlers from 1993 to 1997. The catch during the period was dominated by *Rastrelliger brachysoma* (on average during the period) which contributed about 27% of the total landings. However, it indicated the largest decline from 1995 to 1997. It was followed closely by *Loligo sp.* at 21%. The squid registered the increase during the same period that might indicate symptoms of overexploitation. In some areas like the Philippines, the dominance of squid in the fish landings is marked as one of the indicators of overexploitation.

Figure 2: Estimated annual fluctuation in the species composition from the catch of trawlers from 1993-1997



6. BIOLOGY OF PELAGIC FISHES

Growth parameters

Table 4 shows the growth parameter estimates for three small pelagic species being monitored in the waters of Brunei Darussalam. Similar treatment is being done on the length frequency data collected from the major fishing gears observed in the area.

Table 4: Growth parameters of selected pelagic species in Brunei Darussalam

Species	L_{inf}	k	NRP	Z	M	F
<i>Caranx malabaricus</i>	28.57	1.8	1	5.9	2.8	2.5
<i>Parastromateus niger</i>	28.35	1.3	2	4.7	2.2	2.6
<i>Rastrelliger kanagurata</i>	29.05	0.9	1	5.3	3.4	2.0

Length-weight relationships

The length-weight relationship was established for 20 small pelagic fishes in the waters of Brunei Darussalam. The data were lifted from the hydrobiological survey conducted in 1996. A total of about 2,000 individuals belonging to 8 families were used in the analysis. The mean b-value was estimated at 2.83. The length-weight relation was used in various aspects of stock assessment such as weight frequency distribution, production estimates and biomass estimate using the target strength taken from the hydroacoustic survey. Table 5 presents the length-weight relationship parameters such as a and b.

Table 5: Length-weight relationship of small-pelagic fishes found in Brunei Darussalam

Species	a	b	r	Min	Max
<i>Ariomma indica</i>	0.24237	2.10454	0.61125	12.5	15.0
<i>Caranx malabaricus</i>	0.01517	3.09487	0.93757	6.8	25.2
<i>Deapterus macrosoma</i>	0.06708	2.36172	0.85047	10.5	19.1
<i>Dussumieria acuta</i>	0.13847	2.07430	0.64000	12.0	16.5
<i>Dussumieria hasselti</i>	0.08869	2.23870	0.68000	12.0	16.8
<i>Magalaspis cordyla</i>	0.01217	2.99384	0.73784	17.4	21.0
<i>Parastromateus niger</i>	0.07276	2.58875	0.77758	7.5	19.0
<i>Pentaprion longimanus</i>	0.04237	2.64988	0.80664	5.5	13.9
<i>Pterocaesio chrysozona</i>	0.01154	3.03647	0.52716	7.2	12.1
<i>Rastrelliger brachysoma</i>	0.01140	3.15136	0.69235	14.5	16.5
<i>Rastrelliger kanagurta</i>	0.03125	2.73316	0.61873	18.8	20.6
<i>Sardinella albella</i>	0.01236	2.99018	0.92218	11.2	16.8
<i>Selar crumenophthalmus</i>	0.00578	3.36844	0.95477	12.4	21.6
<i>Selaroides leptolepis</i>	0.01000	3.17880	0.96219	9.2	13.5
<i>Seriolina igrofasciata</i>	0.05144	2.69884	0.98179	19.7	31.0
<i>Sphyraena barracuda</i>	0.00410	3.12303	0.83384	28.5	34.0
<i>Sphyraena jello</i>	0.01735	2.68945	0.71517	18.0	22.5
<i>Stolephorus indicus</i>	0.01055	3.00191	0.95674	7.1	14.0
<i>Thrichiurus haumela</i>	0.00024	3.28033	0.97027	31.7	51.7
<i>Uraspis helvola</i>	0.01147	3.30355	0.88103	4.0	12.5

7. OCEANOGRAPHIC, REMOTE SENSING AND ENVIRONMENTAL DATA

A complete and continuously collected oceanographic data are not available. The 1996 pelagic survey collected physical oceanographic data only. In 1992 the Coastal Resources Management Plan team had, under their project, included a study on benthos composition and diversity in the coastal waters of Brunei Darussalam. A study on the water quality of the coastal areas was also carried out. The previous demersal surveys in the 1970s did not include benthic study/sample collection although bottom sediments were obtained but merely for the observation and recording of the sea bed condition.

The Department of Fisheries however is continuously collecting seawater samples from various sampling stations within the bay and offshore areas, for the red tide monitoring. No remote sensing data presently available although these could be obtained from external sources such as NOAA.

8. CONCLUSIONS

- ‡ The general trend in the pelagic fish production in the waters of Brunei Darussalam is declining since 1991 and it is due to a number of factors such as the suspected overexploitation of the stocks and conflicting interests between the trawlers and other gears such as ring nets in the use of fishing grounds and deployment of FAD's.
- ‡ The following are some of the measures that are being considered to abate the decline in the fish production:
 - => a continuous research and monitoring on the biology and assessment of the fish stocks
 - => experimentation on the improvement and selectivity of fishing gears
 - => deployment of various fish aggregating devices and fish shelter structures
 - => preventing the trawl operations near the shoreline

Annex 1:

Catch trend of pelagic fishes by commercial P. Seiners

Species	1993	1994	1995	1996	Total	%
<i>Rastrelliger kanagurta</i>	187,131	29,914	61,873	31,570	310,488	50.51
<i>Selar mate</i>	45,392	13,876	19,931	19,895	99,094	16.12
<i>Alepes melanoptera</i>	71,800	12,017	7,613	3,852	95,282	15.50
<i>Decapterus sp</i>	10,150	3,252	11,307	9,373	34,082	5.54
<i>Rastrelliger brachysoma</i>	26,339	225	137	396	27,097	4.41
<i>Sardinella sp</i>	4,750	1,506	4,345	2,098	12,699	2.07
<i>Parastromateus niger</i>	4,059	4,039	491	1,161	9,750	1.59
<i>Selaroides leptolepis</i>	6,833	-	171	588	7,592	1.24
<i>Selar Crumenophthalmus</i>	2,078	666	2,316	1,920	6,980	1.14
<i>Katsuwonus pelamis</i>	5,422	204	-	-	5,626	0.92
<i>Euthynnus affinis</i>	1,411	383	2,506	209	4,509	0.73
<i>Scomberomorus commerson</i>	1,080	na	na	na	1,080	0.18
<i>Megalaspis cordyla</i>	330	na	na	na	330	0.05
<i>Selar kalla</i>	42	na	na	na	42	0.01
<i>Arioma indica</i>	na	na	na	na	na	na
<i>Auxis thazard</i>	na	na	na	na	na	na
<i>Carangoides malabaricus</i>	na	na	na	na	na	na
<i>Dussumieria acuta</i>	na	na	na	na	na	na
<i>Dussumieria hasselti</i>	na	na	na	na	na	na
<i>Gnathanodon speciosus</i>	na	na	na	na	na	na
<i>Illisha melastoma</i>	na	na	na	na	na	na
<i>Loligo spp</i>	na	na	na	na	na	na
<i>Rachycentron canadus</i>	na	na	na	na	na	na
<i>Scomberomorus guttatus</i>	na	na	na	na	na	na
<i>Sphyraena jello</i>	na	na	na	na	na	na
<i>Sphyraena obtusata</i>	na	na	na	na	na	na
<i>Stolephorus indicus</i>	na	na	na	na	na	na
<i>Thunnus albacares</i>	na	na	na	na	na	na
<i>Thunnus obesus</i>	na	na	na	na	na	na
<i>Thunnus tonggol</i>	na	na	na	na	na	na
<i>Uraspis uraspis</i>	na	na	na	na	na	na
<i>Alectis ciliaris</i>	na	na	na	na	na	na
<i>Alepes djadaba</i>	na	na	na	na	na	na

*Catches in kilograms

Annex 2:

Catch trend of pelagic fishes by commercial Trawlers

Species	1993	1994	1995	1996	1997*	Total	%
<i>Rastrelliger brachysoma</i>	57,161	63,755	88,575	25,895	4,709	240,095	27.47
<i>Loligo spp</i>	35,887	33,650	29,468	39,760	43,812	182,577	20.89
<i>Carangoides spp</i>	35,512	37,630	26,324	23,921	28,304	151,691	17.36
<i>Decapterus sp</i>	24,912	18,636	12,242	11,343	8,660	75,793	8.67
<i>Scomberomorus commerson</i>	16,674	10,974	4,695	11,173	10,369	53,885	6.17
<i>Selar crumenophthalmus</i>	1,037	na	na	16,097	18,632	35,766	4.09
<i>Rastrelliger kanagurta</i>	2,798	3,440	11,125	3,836	8,571	29,770	3.41
<i>Megalaspis cordyla</i>	10,235	12,181	3,304	3,075	449	29,244	3.35
<i>Selar mate</i>	16,674	2,546	1,674	2,196	4,786	27,876	3.19
<i>Pampus argenteus</i>	3,048	2,255	2,896	3,200	1,520	12,919	1.48
<i>Selaroides leptolepis</i>	5	na	na	2,979	4,379	7,363	0.84
<i>Parastromateus niger</i>	1,330	1,235	1,199	1,880	876	6,520	0.75
<i>Rachycentron canadus</i>	41	11	72	173	4,655	4,952	0.57
<i>Scomberomorus guttatus</i>	745	615	850	1,019	1,231	4,460	0.51
<i>Sphyræna obtusata</i>	365	151	920	644	1,100	3,180	0.36
<i>Euthynnus affinis</i>	122	131	940	431	886	2,510	0.29
<i>Gnathanodon speciosus</i>	237	1,335	215	467	61	2,315	0.26
<i>Sardinella sp</i>	533	193	364	204	782	2,076	0.24
<i>Alectis indicus</i>	689	103	na	na	na	792	0.09
<i>Sphyræna jello</i>	38	na	48	na	na	86	0.01
<i>Katsuwonus pelamis</i>	25	na	12	na	na	37	0.00
<i>Alectis ciliaris</i>	na	na	na	na	na	na	na
<i>Alepes djadaba</i>	na	na	na	na	na	na	na
<i>Alepes melanoptera</i>	na	na	na	na	na	na	na
<i>Arioma indiacæ</i>	na	na	na	na	na	na	na
<i>Auxis thazard</i>	na	na	na	na	na	na	na
<i>Dussumieria acuta</i>	na	na	na	na	na	na	na
<i>Dussumieria hasselti</i>	na	na	na	na	na	na	na
<i>Illisha melastoma</i>	na	na	na	na	na	na	na
<i>Selar kalla</i>	na	na	na	na	na	na	na
<i>Stolephorus indicus</i>	na	na	na	na	na	na	na
<i>Thunnus albacares</i>	na	na	na	na	na	na	na
<i>Thunnus obesus</i>	na	na	na	na	na	na	na
<i>Thunnus tonggol</i>	na	na	na	na	na	na	na
<i>uraspis uraspis</i>	na	na	na	na	na	na	na
	na	na	na	na	na	na	na

*Data from January to August only

**Catches in kilograms