JAPANESE TUNA FISHERIES IN THE INDIAN OCEAN, UP TO 1999

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SUMMARY

Longline and purse seine fisheries are two types of Japanese tuna fisheries currently operating in the Indian Ocean.

Fishing effort of longline fishery is high in the tropical and south (southeast and south west) area. Fluctuations are observed in the historical trend of catch. Recently, 4 major tuna species (southern bluefin, albacore, bigeye and yellowfin) accounted for about 90% of total catch. In recent years the proportion of SBT is small, and that of yellowfin is increasing and exceeded bigeye in 1999.

In recent years fishing ground of purse seine fishery is concentrated in western tropical area. Fishing effort peaked in 1992 and drastically declined since then, which is considered to be due to economic reason. The proportion of free swimming school or log associated school is small and FAD associated school is in large proportion. Catch of purse seine fishery also peaked in 1992 (about 45,000 MT) and decreased steeply to 7000 MT in 1999. As for species composition, most of the catch is skipjack, and yellowfin and bigeye follows.

Both longline and purse seine vessels should submit log sheets which contain the information of temporal or spatial data, fishing gear and catch. Using these log sheets, statistics are processed and compiled. Since 1998, as for longline fishery, new format of log sheet started to use, which included additional information of fishing gear, that is, length of branch lines and float lines and interval of branch lines on the main line.

Size data and other biological data of tunas and billfishes caught by Japanese tuna fisheries are obtained from port sampling, on-board measurement by commercial fishing, training and research vessels, and observer programs, though not high coverage from commercial fishing.

INTRODUCTION

Longline and purse seine fisheries are two types of Japanese tuna fisheries currently operating in the Indian Ocean. Longline fishery started its operation in 1952 when limitation of operational area was removed. On the other hand, commercial purse seine fleet commenced fishing in the Indian Ocean in 1991 after several years of experimental fishing.

As for longline fishery, the number of Japanese distant water longline vessels reduced by about 20% last year for the conservation of stocks and it probably affects longline catch.

This paper reviews the history of these two tuna fisheries and describes the recent situation on the amount of catch, area of fishing, and other relevant information.

JAPANESE TUNA FISHING ACTIVITY IN THE INDIAN OCEAN

Longline fishery

Fishing Effort

Seasonal change in geographical distributions of the longline effort in Indian Ocean is shown in . In the second and third quarters, concentrations of fishing effort in the waters off South Africa and southwest Australia are apparent, while distribution of fishing effort are relatively sparse in the western and southern offshore of Indonesia north of 20°S. For the other quarters, the vise situation is observed.

Observing the annual trend since 1971 (Table 1), the amount of fishing effort had increased year by year and reached a first peak in 1985 (127 million hooks). After 1985, it dropped significantly and surpassed the previous low level reaching at about 45-60 million hooks in early 90s. After 1995 it increased steeply up to 126 million hooks in 1997. 20 to 28% of total effort of Japanese longline fishery was used in the Indian Ocean in the most recent five years.

Catch

Total catch in weight from 1971 exploited by Japanese longliners in the Indian Ocean (new IOTC statistical area) was shown in Table 1 (1999 is preliminary data). Total catch was kept in the high level during 1983 to 1988 with a peak about 50000 MT in 1985. It declined continuously since then to about 18000 MT in 1991. Total catch increased thereafter as replying to the increase in effort, and reach to around 45000MT in 1998. Recently, 4 major tuna species (southern bluefin, albacore, bigeye and yellowfin) accounted for about 90% of total catch (). The catch composition of southern bluefin tuna in total catch weight was about 50% or more in 1970s (peak was 77% in 1976) and about 30% in 1980s and became about 10% in latest five years. In contrast, the catch composition of bigeye and

yellowfin became higher, 40-50% and 20-30%, respectively in recent six years. In particular, the ratio of yellowfin is increasing and exceeded bigeye in 1999. . This is probably due to the decrease of the catch of bigeye and shift of the target to yellowfin. Comparatively higher effort of Japanese longline vessels is observed in the western tropical area (), where CPUE of yellowfin is higher than other waters ().

Purse Seine Fishery

Fishing Effort

Annual trend of geographical distributions of Japanese purse seine fishery since 1991 are shown in and annual trends of catch and effort are shown in Table 2 and . In recent years fishing ground is concentrated in western tropical area (0-10 ^{o}S, 80-100 ^{o}E). Fishing effort (fishing days including searching days) peaked in 1992 (about 2400 days) and drastically declined to 781 days in 1996. According to the explanation given by one purse seine company, this dramatic change is not due to decline of catch but economical problem derived from rise of Japanese Yen during that time. Because of the low price of tuna, they had to choose one of two ways, saving the costs for transshipment or shifting their fishing ground to the Pacific Ocean. In the eastern Indian Ocean they do not need to transship because catches are unloaded at the nearest ports (Singapore or Phuket) near whare canneries are close by.

The Japanese purse seiners have targeted traditionally on fish associated with floating objects especially on log-associated schools. In the eastern Indian Ocean, however, logs are few, hence purse seiners utilize fish aggregating devices (FADs) extensively. As observed in , sets on FADs-associated school accounted for more than 75 % of total sets, and if natural log sets are added to it, total set on associated school reaches over 90 %.

Catch

Total catch in weight shows a similar trend as that of effort, that is, increased from about 5000 MT in 1989 to 45000 MT in 1992, and decreased steeply to 7000 MT in 1999 (Table 2). Catch weight of each species in 1998 (1999) were 5,748MT (4,588MT), 1,949MT (1,501MT), and 915MT (899MT) for skipjack, yellowfin and bigeye, respectively. Percentages of catch by species were 22% in yellowfin tuna, 65% in skipjack, and 13% in bigeye tuna in 1999, which is stable in the last three years. Since 1994, rate of bigeye was kept higher, 11-15%, compared to 4-8% in 1990. This increase of percentage of bigeye is probably caused by the shift of fishing ground.

DATA PROCESSING AND COMPILATION

The owners of fishing vessels have obligation to submit the log sheet on their operations and catch information to Japanese Government. In the log sheet of longline, set by set data on catch number and weight in each species, and operational information such as fishing date and location, fishing effort (the number of basket and hook), water temperature are included. The number of hook per basket is important as it suggests the depth of the gear and target species. Six tunas (northern bluefin, southern bluefin, albacore, bigeye, yellowfin and skipjack), swordfish and six billfishes (striped marlin, blue marlin, black marlin, sailfish and shortbill spearfish) are included separately in the catch category. Additionally, information on the cruise (date and port of starting and finishing of the cruise), vessel (name, size, license number call sign), the number of crew, and the configuration of the fishing gear (material of main line and branch line) are requested to fill on the top part of the log sheet for each cruise. Since 1998 new format of log sheet started to use, which included additional information of fishing gear, that is, length of branch lines and float lines and interval of branch lines on the main line. Now old format log sheet is still used by some vessels, but the reporting rates with new format is increasing.

Although the data sheet format for purse seine is similar to that of longline, there are several different points between them. In the case of purse seine log sheet, catch data is recorded in weight data for each species and catch in number are not available. Information of all sets (operation) is recorded and if there is no set made but searched, this is also recorded. School types are also recorded for each set which are filled by codes. School types are categorized to six schools associated to floating objects (log, artificial floating object, vessel, shark and whale) and four free swimming schools (dolphin associated, free, boiling, Jumping). Start and finish times of each operation are also recorded in log data sheet. Species included in purse seine log sheet are skipjack, frigate tunas, yellowfin, bigeye, bluefin and albacore and others. Moreover, yellowfin and bluefin are divided into two categories, large size class (larger than 10kg) and middle-small (smaller than 10kg), respectively. There is a problem that some of small bigeye tuna are reported as yellowfin tuna and the catch of bigeye is underestimated, while yellowfin catch is likely overestimated. Regarding the fishing gear configuration, length and depth of fishing net are recorded. Gear configurations are very important information to know the change of fishing efficiency in both LL and PS fisheries. The log sheets of both LL and PS are submitted by each cruise.

Using the log sheets submitted by Japanese longliners and purse seiners, the NRIFSF (National Research Institute of Far Seas Fisheries) processes and compiles statistics. NRIFSF also prepares and sends these statistics in required forms to each of international tuna organizations (SPC, ICCAT, IATTC, IOTC).

Size data and other biological data of tunas and billfishes caught by Japanese tuna fisheries are obtained from port sampling, on-board measurement by commercial fishing, training and research vessels, and observer programs, though not high coverage from commercial fishing. However, since most catches by purse seiners in the Indian Ocean were unloaded at the ports in the Southeast Asian countries, it is unable to conduct port sampling for those catches. These data are compiled and used for providing timely fisheries information and for studies on stock status.

Table 1. Fishing effort and catch in weight (MT) by the Japanese longline fishery in the Indian Ocean (new IOTC statistical area), 1971-1999. 1999 is preliminary. Sets and hooks are in thousand. "Total" include skipjack tuna.

Year	Sets	Hooks	Catch						
			SBT	ALB	BET	YFT	SWO	Total billfish	Total
1971	36	85769	20953	3295	11149	13339	1039	3559	53469
1972	29	70931	21470	1353	8128	7467	865	2564	42037
1973	41	77129	22730	1980	5128	3913	814	1559	36150
1974	38	81416	24011	2778	6722	4785	750	2898	41973
1975	42	84048	17951	1260	5424	6326	781	2127	33891
1976	33	76415	23399	1168	2097	2753	427	1156	31014
1977	25	57689	19211	404	3137	2098	287	930	26072
1978	25	60076	11609	417	10837	4613	910	3174	31570
1979	26	63963	12594	390	4108	3236	550	1757	22636
1980	34	85451	17357	615	5876	3228	599	2050	29731
1981	33	83461	13413	1185	7774	4915	752	2038	30084
1982	34	87302	11548	1291	11394	7280	980	2086	34583
1983	44	112371	17409	1668	18332	7792	1176	2747	49125
1984	44	115814	15798	1824	14022	7903	1319	3187	44054
1985	47	126958	15580	2280	17239	9464	2164	3050	49785
1986	44	121491	10935	2492	15757	10704	1338	2661	43891
1987	39	106637	10285	2255	15509	8308	1356	1945	39661
1988	32	89208	9173	1275	12254	9255	1434	1300	34693
1989	27	75044	7606	841	7700	4592	912	625	22277
1990	16	44989	4206	835	8191	6321	980	537	21070
1991	21	59351	3947	958	7768	4388	882	459	18402
1992	21	57983	5190	1764	5628	5740	1714	583	20621
1993	18	51702	2707	1265	8317	5713	1412	486	19900
1994	29	80212	3264	1772	16218	8932	2438	894	33528
1995	32	90667	3145	2037	15815	7926	1671	785	31387
1996	37	106825	4351	2382	15273	11986	2063	950	37010
1997	43	125538	4568	3231	17470	14516	2696	1812	44297
1998	42	124766	5621	3175	16328	16057	2242	1843	45272
1999	34	101050	4811	2171	11806	14707	1618	1516	36631

Table 2. Catch and effort statistics for the Japanese purse seine fishery in the Indian Ocean. 1999 data are preliminary. The unit of catch and effort are metric ton and days, respectively. "Fishing days" includes searching days.

Year	Fishing days	Catch in MT			
		Total	SKJ	YFT	BET
1985	45	558	315	75	168
1986	84	864	562	160	142
1987	170	1319	937	260	122
1988	175	2917	2250	389	277
1989	350	4916	3453	882	581
1990	808	15632	11187	3220	1225
1991	1348	22305	15930	5099	1276
1992	2398	45111	31472	11882	1757
1993	2141	44222	31314	10949	1959
1994	1607	29629	20107	5341	4181
1995	1668	24426	16077	4750	3599
1996	781	12270	7024	3917	1329
1997	623	10576	6713	2612	1251
1998	701	8612	5748	1949	915
1999	483	6988	4588	1501	899

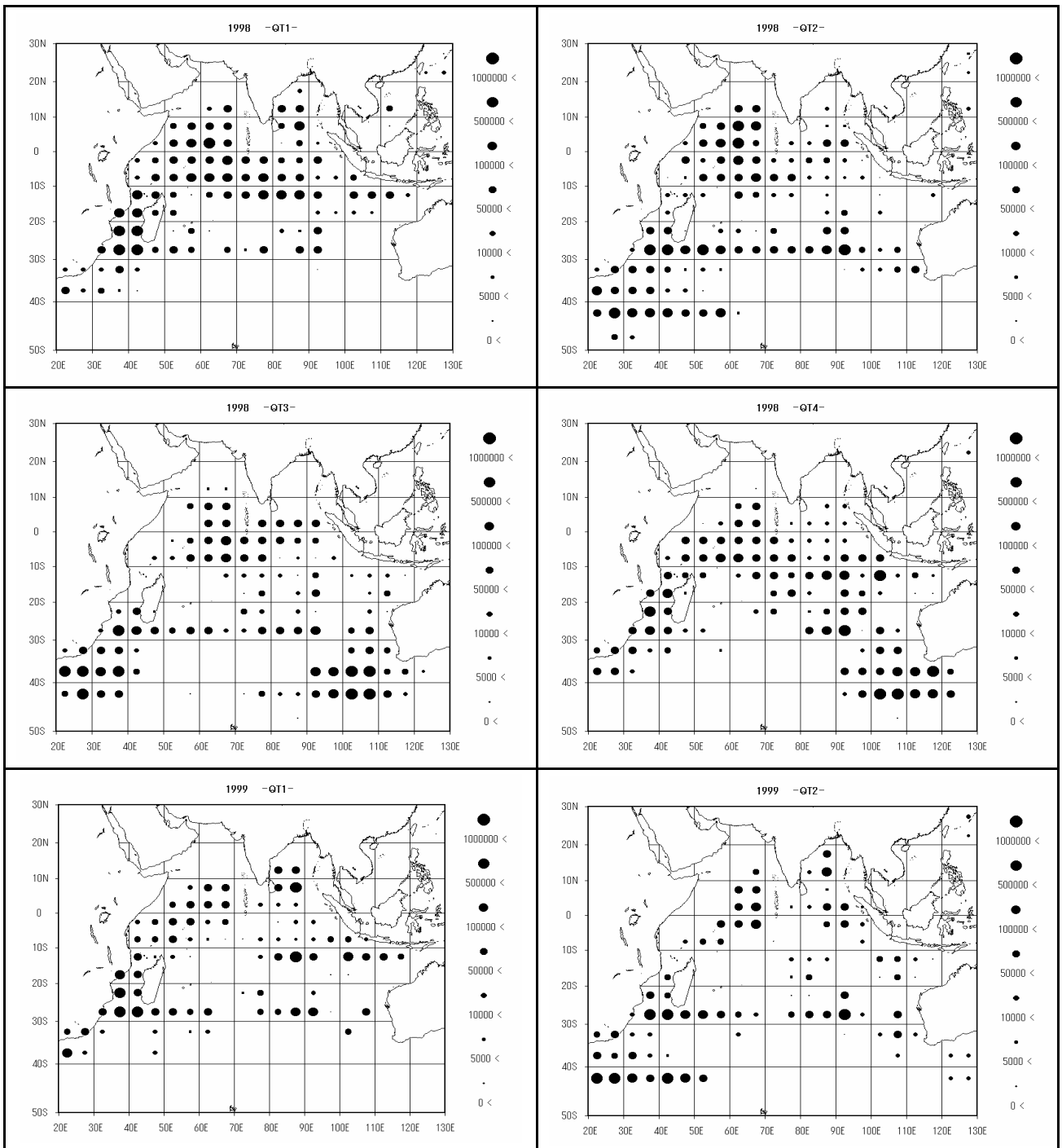
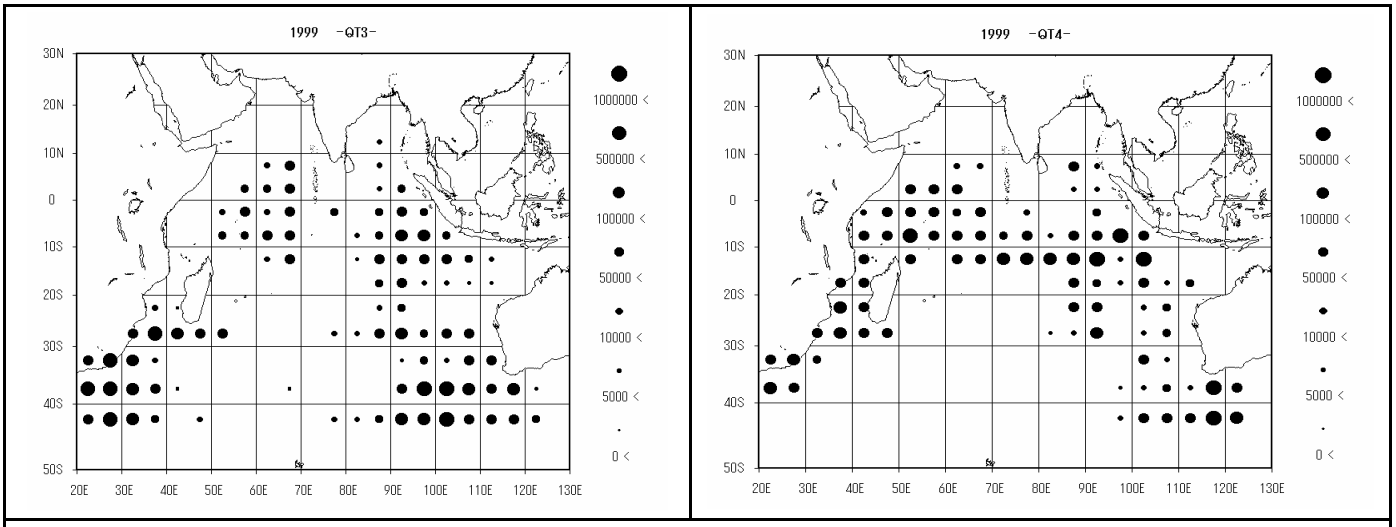


Fig. 1. Seasonal change in longline effort distribution in the Indian Ocean by quarter (1998).



. *(Continued) (1999).*

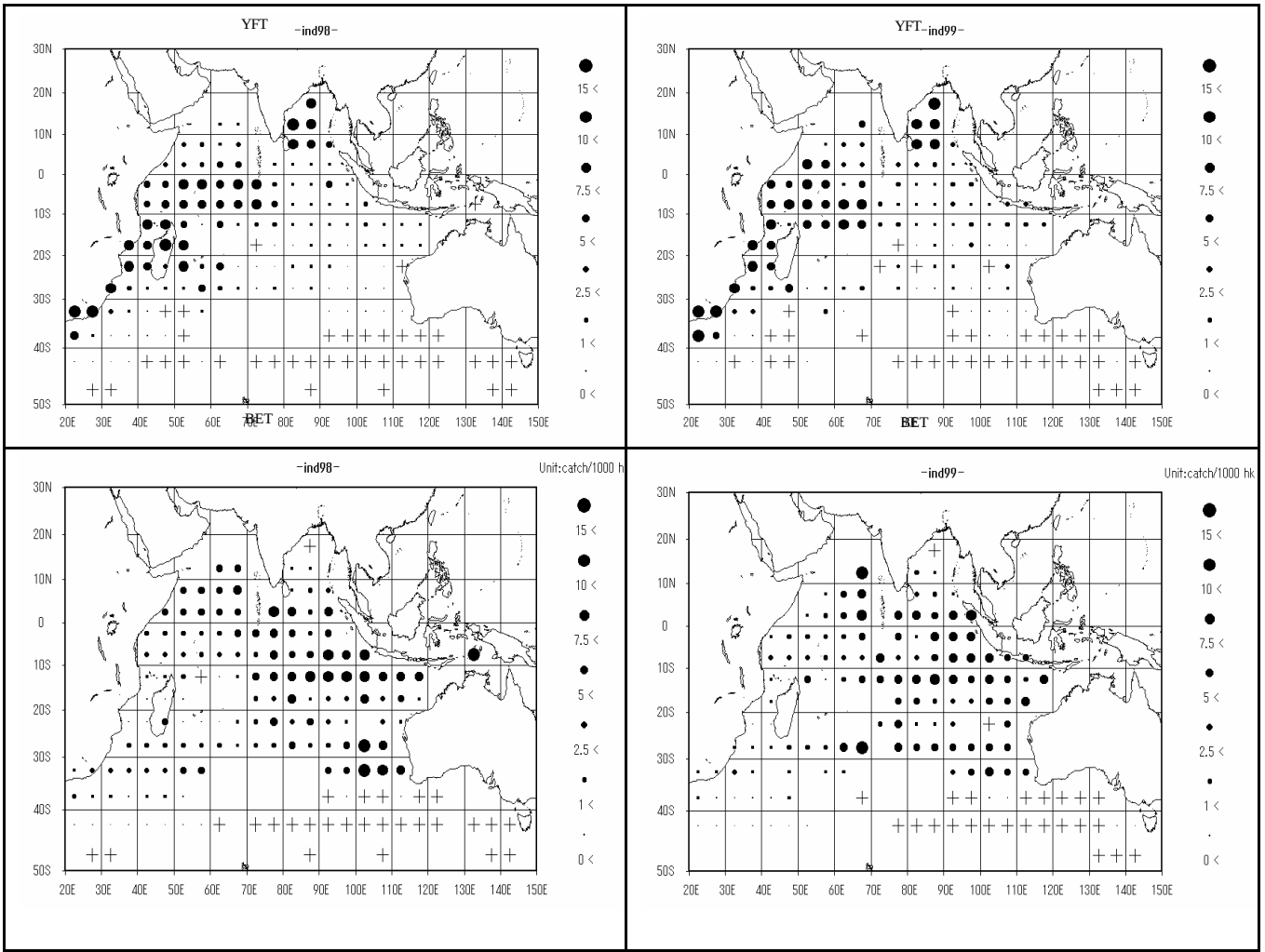


Fig. 2. Geographical distribution of CPUE for longline catch of yellowfin (upper) and bigeye (lower) tuna in 1998 and 1999 in the Indian Ocean. "+" means CPUE=0.

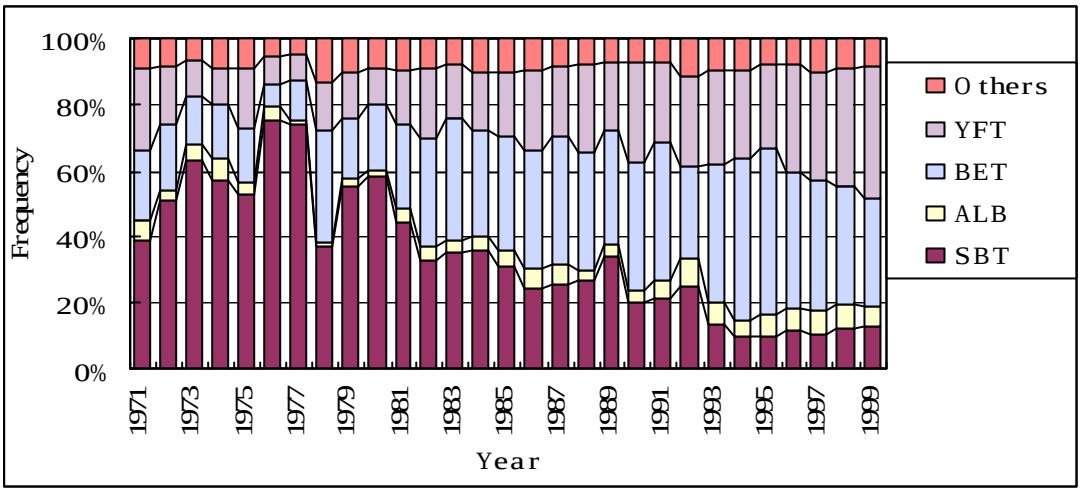


Fig. 3 Annual catch composition (in weight) of the Japanese longline fisheries in the Indian Ocean(1971-99).

Note: "YFT": yellowfin, "BET": bigeye, "ALB": albacore, "SBT": southern bluefin, "other": skipjack tuna, swordfish and billfishes.

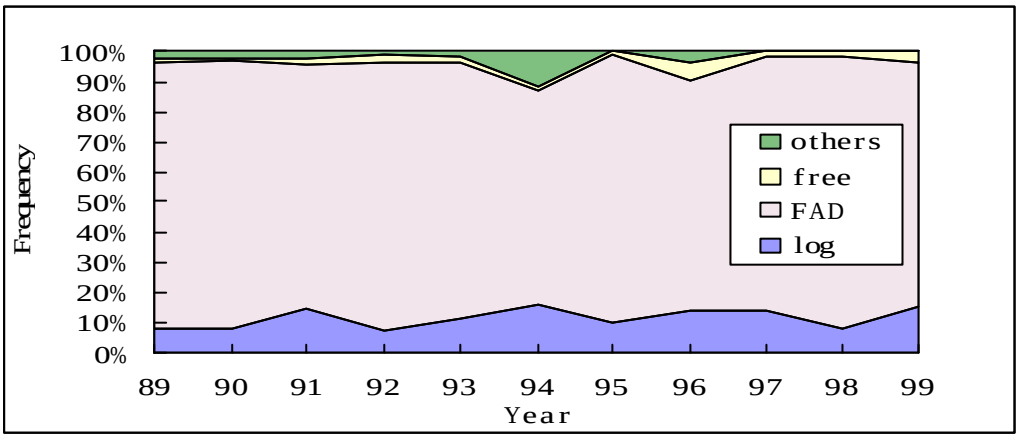


Fig. 4. Annual composition of operation type of Japanese tuna purse seine fisheries in the eastern Indian Ocean (1989-99).

Note: "free": free school, "FAD": FAD (fish aggregating device) associated school and "log": log associated school.

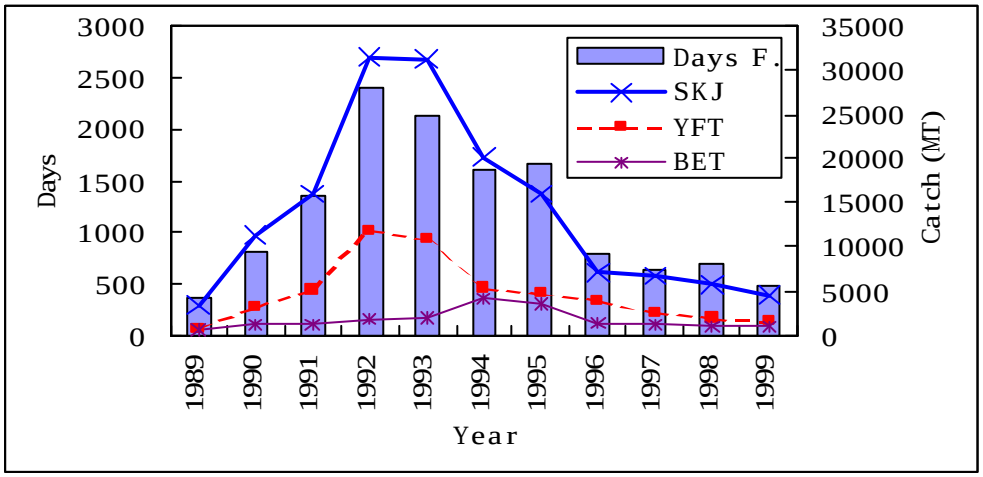


Fig. 5. Change in the proportion of each operation type in the total number of operation. "free" : free school, "FAD" : FAD (fish aggregating device) associated school and "log" : log associated school.

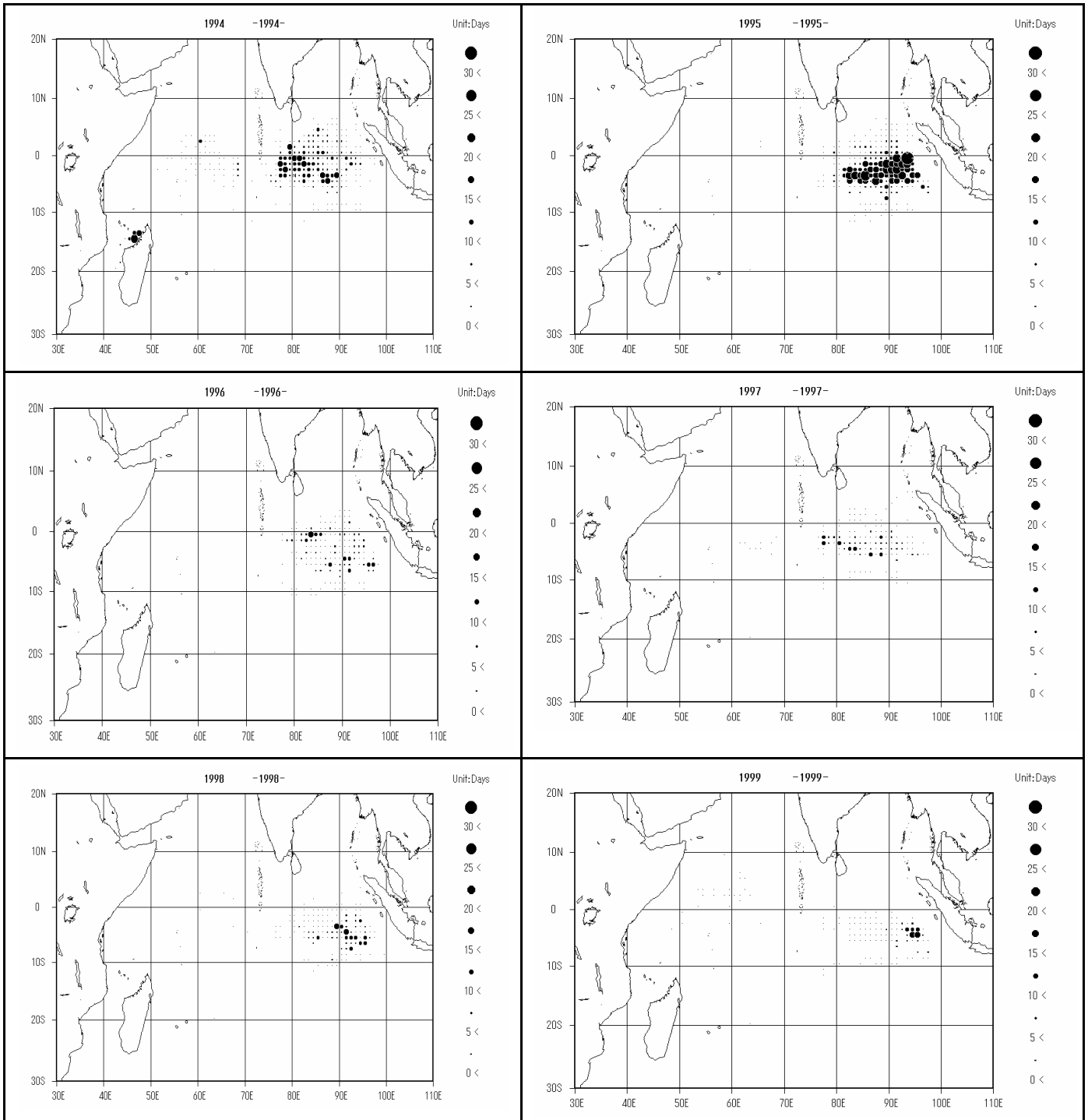


Fig. 6. Distribution of effort (fishing and searching days) by Japanese purse seiners in the Indian Ocean from 1994 to 1999.