

The Japanese Tuna Fisheries in the Western Pacific Ocean

Miyabe, N., S. Chow, I. Warashina, T. Tanaka and Y. Nishikawa

National Research Institute of Far Seas Fisheries

5 Chome 7-1, Orido, Shimizu, 424, Japan

1. Introduction

The Japanese tuna fisheries are composed of three major fisheries in the western Pacific Ocean. Two of which, i.e., longline and pole-and-line fishery have long history starting from much before the World War II. Purse seine fishery has also existed but the boats were small and the area of operation was limited to the coastal waters around Japan. Since the mid 1970's, this fishery expanded into further offshore and especially towards south targeting on the surface tuna schools in the western tropical Pacific.

Longline fishery is classified into three categories (coastal, offshore and distant water) according to the kind of license and size of boat. Currently all boats except the coastal longliners which operate inside the Japan's EEZ need to be licensed by the Minister of the Government. The size of boat for these three categories ranges less than 20 gross tonnage (GRT), 20-120 GRT and 120-500 GRT for coastal, offshore and distant water fisheries, respectively. All operations by the coastal and offshore licensed boats are made in the western Pacific, but the distant water licensed boats do not operate significantly in this area, although they occasionally operate in the marginal waters of the western Pacific such as the eastern edge around Hawaii Islands and in the area between Solomon Islands and the Coral Sea. The number of license (Table 1) for all categories started to decrease since the early 1980's, especially for the offshore license. In recent years, however, the number of license for coastal longline increased.

Pole-and-line fishery can be classified into three categories (coastal, offshore and distant water) as is the case of longline fishery. The offshore and distant water categories are required to have a license from the Minister. The major fishing areas are waters around Japan to further offshore around the Emperor Sea Mount. Medium- to large-sized boats go fishing in the tropical area. Skipjack catch has always prevailed among tuna catch. The number of license has declined significantly from the early 1980's, especially for the distant water license. It is said that the main reason for this is due to the worsening of economic situation.

Purse seiners are all Minister-licensed fishery except the very small-sized boat. There are many types of license mostly regulated by the area of operation allowed. The size of boat which operates for tunas are 100 to 500 GRT. The number of license which allowed to fish in

the tropical Pacific (south of 20°N) has been constant for the past decade (Table 1).

2. Catch and fishing condition for tuna fisheries during 1994

Longline fishery

1993 catch of bigeye and yellowfin for coastal and distant water license boats was 23,219 and 25,195 metric ton (MT), respectively. Bigeye catch declined from previous year by 7,000 MT while yellowfin catch stayed at about the same level. The estimates for 1994 catch is not yet available. However, almost similar catch as in 1993 is expected since there has been no significant known change in the number of boats operated and in the fishing condition.

The area of fishing is shown in Fig. 1. In the Micronesian waters it was reported that there were more than 500 small longliners operating in this region. It is reportedly said boats from Mainland China have increased substantially. Mean catch/day in the western part of this area (0-13°N, 130-150°E) for the first and the second half of 1994 was 1.0 and 0.8 MT/day, respectively. The same figures in the eastern part of this area (0-11°N, 150-170°E) were 1.3 and 1.2 MT/day, respectively. Throughout this area major species caught were yellowfin and bigeye tunas with minor catch of blue marlin. Bigeye catch was higher in the northern part of this area while yellowfin catch was better in the southern part. During the second half of 1994, 10 to 15 medium to large-sized boats operated around the south of Solomon Islands to Coral Sea. Major species caught were yellowfin and albacore followed by bigeye and marlins with mean catch/day of 2.0 MT.

Pole and line fishery

The majority of pole and line catch is skipjack followed by yellowfin and bigeye. The catch by species in 1993 was 142,800, 4,500 and 1,750 MT, respectively for these three species.

Most of the fleet did not operate until February due to New Year's holiday. Fishing grounds for large-sized boats (499 GRT class) were located in the south (10-14°S, 157-164°E) and the eastern offshore (5-10°S, 164-173°E) of Solomon Islands (Fig. 2). It was reported that catch per day's fishing ranged 4 to 60 MT but fishing was unstable with considerable fluctuations among days and boats. The main size of skipjack caught was 2 to 4 kg in the south and 2 to 6 kg in the eastern offshore of Solomon Islands.

Medium-sized boats (299-350 GRT class) including some large-sized boats which do not have live bait tanks with temperature controller operated in the west of Mariana Islands (12-15°N,

139-141°E). Skipjack catch of 2 to 18 MT was recorded with major fish ranged between 3 and 6 kg. Since this area is closer to Japan and the price of the fish was higher, most of the fishing effort was reallocated to this area. Some scouting was made in the eastern waters of Mariana Islands. As a result, a new skipjack fishing ground was formed in the wide area between the west of Marshall Islands (8-12°N, 150-160°E) and the east of Mariana Islands (15-17°N, 150-155°E). Fishing in these areas was good with 4 to 43 MT of day's catch which composed of very large fish which is the typical size of fish caught in the North Equatorial Current and the Subtropical Counter Current. In May, the major fishing ground moved north-eastwards reaching the northern edge of subtropical counter current (22-24°N, 150-168°E). Good catch per day (3 to 30 MT) of large skipjack (7-14 kg) was recorded. The fishing ground further shifted to north (26-33°N, 160-165°E) in June. The catch per day's fishing improved (12 to 38 MT) while the fish were smaller (2.3 to 4.3 kg). It should be noted that the area of fishing ground in June (26-33°N, 160-165°E) has never been a fishing ground in the past.

Due to good fishing for albacore as well as good price for fresh skipjack, the fleet stayed in the North Pacific until the end of October. Fishing in the tropical area was started by 2 boats in late September. By the middle of November, the whole fleet turned to south. As usual, fishing was taken place around Wake Island (21-22°N, 162-163°E). Good fishing (9 to 50 MT) was recorded but the fleet further went down south due to bad weather (Typhoon) in October. By scouting, very good fishing ground was found in the northeast of Holland Baker Islands (3-4°N, 173-174°W) but it did not last long. The skipjack caught composed of mainly 3 to 6 kg fish with a very wide size range (1 to 10 kg). Since then, the fishing grounds were scattered into three areas (North Equatorial Current waters, 10-12°N, 165-173°E; south of Pohnpei Island, 0-1°N, 154-162°E; south of Kiribati, 4-7°S, 170-173°E). Skipjack catch in the North Equatorial Current was 4 to 25 MT per day with main size of 4 to 6 kg fish while it was 3 to 20 MT with main size of 2.3 to 3.5 kg fish in the south of Pohnpei. The best catch was observed in the south of Kiribati with 20 to 60 MT per day. The skipjack in this area were composed of three size groups; 1 to 2 kg, 3 to 4 kg and 5 to 7 kg.

Wide size range of skipjack caught seemed to be the characteristic in 1994, especially in the latter half of that. Since the fishery attempts not to catch very small fish (below 1.2 kg) due to low price, the significant appearance of very small fish in the catch may suggests the higher abundance of this fish size.

Purse seine fishery

1994 catch estimates are 150,000, 38,000 and 1600 MT, respectively, for skipjack, yellowfin and bigeye. Skipjack catch increased by 18,000 MT but yellowfin catch decreased by 19,000

MT. Bigeye catch in 1994 was comparable to that in 1993.

For 4 months from late November of 1993 through early March of 1994, a good fishing ground was formed in the waters east of Solomon Islands (0-10°S, 164-173°E; see Fig. 3) where high SST distribution over 29°C was observed. In January the fleets targeting free swimming school recorded very good catch (50 to 150 MT/set) with frequent large catch larger than 100 MT/set. Fairly good and stable catch (0 to 80 MT/set) was also recorded in February. Wide variety of fish schools were targeted. Unusual catch of 20-25 kg of albacore was reported in the sets on free swimming school of yellowfin. The fleets gradually moved northward, and operated in the wide area of 0-6°N, 132-173°E by June. Large catch of very small skipjack (0.5-0.8 kg) was recorded when log-associated fish schools were targeted. Especially in waters of Palau to south of Yap Islands (west of 140°E), 80 to 85% of total skipjack catch was composed of the very small skipjack (smaller than 1.0 kg).

During the second half of 1994, fishing ground for purse seine fishery was inclined to east mostly in the south of Truk and Kiribati Islands ranging 4°N-3°S, 150-170°E. In contrast, operation in the waters west of 150°E was infrequent. Search for fishing ground in the waters west of 160°E indicated lowering of SST and infrequent finding of fish schools. Permission of fishing within 200 mile zone of Marshall-Kiribati Islands after November 1993 seemed to be one of the reasons for this inclination of fishing ground. Furthermore, the occurrence of high SST over 29°C in the eastern area caused by El Nino may also be another factor. The fleets mostly targeted on log associated fish school. Good and stable catches were recorded throughout the period, in which catch of larger than 100 MT/set were often recorded. Small to very small-sized skipjack (0.5-2.0 kg) dominated in the catch, and this situation continued until the targets shifted from log-associated school to free swimming one in December.

Large catch of these small sized skipjack extending over a wide area was well coincident with the frequent finding of the fish schools of small fishes by fishermen. These strongly suggest that the small and very small skipjack are considerably abundant.

3. Research activities

Data processing and compilation

The NRIFSF is responsible for the compilation for tuna longline and purse seine fisheries statistics. Catch and effort statistics were sent to SPC up to 1993 and 1994 for longline and purse seine fisheries, respectively. Preliminary data for 1994 longline fishery will be processed soon. The similar statistics for pole and line fishery are processed and maintained by the Tohoku National Research Institute of Fisheries. Length and weight data are also

compiled at the same Institutes.

Research on stock status for tropical tunas

Research activities under this subject is described in the various documents including the information paper submitted to the SCTB. Major activities are related to the work thorough the Western Pacific Yellowfin Research Group, and will be presented at the this year's meeting.

Research on longline gear efficiency

Starting from at around 1993, some distant water longliners (large-sized boat) introduced monofilament lines not only for the branch line and snell but also for main line. As for main line, braided nylon has also introduced. The use of these materials seems to be increasing. There appears several advantages to utilize them. First of all, the improvement of catch rates for tunas. The other is the ease of handling of these gear, since those materials are much lighter than traditionally used kuralon main line and branch line. On the other hand, drawbacks are also pointed out that they are less durable and cause more entanglement. It is reportedly said that the increase of catch rates are not large as expected at this moment. One possible reason is that the depth of hook comes to shallower waters affected by wind and water current since they are lighter. In order to investigate the difference in gear efficiency between these new ones and traditional one, experimental longlining using nylon monofilament was made in the eastern Pacific this year. Several time and depth recorders were attached to snell to study the true depth change of hooks by time. Preliminary results indicate that after the first decent to the ordinal depth the hook went up considerably suggesting a larger influence of water current and wind.

Research project on small tunas caught by the purse seine fishery

The objectives of this project is to quantify the catch and size range of small tunas (yellowfin, bigeye and skipjack) which are caught by the purse seine fishery in the tropical Pacific and Indian Ocean. This project was started in 1994 with three-year term. The project itself was consigned to the Japan Marine Resources Research Center (JAMARC) by the Fishery Agency of Japan, but the NRIFSF is very much involved in most activities, especially in the sampling scheme and data processing. The most important activities are taking measurements of fish at unloading sites. Unfortunately in the past, port sampling has not been easy task in Japan mostly because it takes unnecessary time which spoils the quality of fish as well as unnecessary work for employees engaged in unloading. However, at this occasion, this burden was removed by the kind cooperation of tuna fishing industry (fishing company and market).

Two major unloading ports, Yaizu and Makurazaki, were selected and sampling is made on two and one boats at every month, respectively. This level of sampling would cover slightly less than 10 % of total cruises. Measurements are taken from every market category except so-

called PS grade product as well as fish in the certain wells (three wells in most cases) which time, area and school type can be identified. About 100 fish are measured for market category and about 1000 kg are measured for fish from a well irrespective of tuna species. At the later stage all logbooks and sales slips of unloading from all purse seiners fishing in the tropical area are gathered and processed in order to estimate the total catch at size.

Table 1. Number of the Japanese tuna boats registered by fishery and category.

Year	Longline			Pole-and-line			Purse seine	
	Distant Offshore Water	Coastal	Coastal	Distant Offshore Water	Coastal	Coastal	> 200 GRT	50-200 GRT
70	973	580	890	226	286	3148	NA	NA
71	998	564	908	230	280	3168	6	23
72	942	489	940	272	282	3596	7	31
73	917	511	959	299	351	3020	6	37
74	962	554	518	325	391	3225	10	42
75	883	535	720	324	372	2648	12	42
76	840	556	827	292	361	3101	15	43
77	842	586	726	293	369	3348	14	50
78	847	633	669	285	360	3035	14	47
79	860	635	648	270	355	3480	17	46
80	883	637	821	240	332	3232	16	50
81	892	630	774	216	332	3064	23	50
82	802	554	722	179	296	3011	33	52
83	747	523	561	157	277	3021	36	59
84	810	478	523	142	254	3904	33	54
85	823	476	620	129	227	2754	35	47
86	818	442	536	120	210	2455	38	53
87	819	398	661	115	199	2404	34	47
88	807	385	586	97	180	2613	39	48
89	806	353	650	94	175	2254	37	43
90	791	362	685	88	167	2228	35	43
91	790	332	768	82	160	2277	35(10)* ¹	38
92	768	302	793	63	153	2093	38(10)* ¹	31
93	767	272	790	59	144	1927	36(10)* ¹	27

*1. Numbers in the bracket are boats operating in the Indian Ocean.

Table 2. Catch in number (in thousand) and weight (MT), and fishing effort (million hooks) of the Japanese Longline Fishery (offshore and distant water-licensed boats) in WPYF total area.

Year	Hooks	Number of fish		Weight	
		BET	YFT	BET	YFT
70	172	694	1149	NA	40970
71	176	720	1056	29678	35664
72	174	976	1046	39476	38301
73	160	684	1134	27823	38094
74	185	778	1152	31369	37214
75	158	734	995	29247	36685
76	179	871	1118	37949	40420
77	169	983	1535	39735	47794
78	183	839	2213	31367	66576
79	213	939	1759	35497	57623
80	222	913	2294	34285	69063
81	242	756	1930	28388	56520
82	225	872	1617	32710	47864
83	198	815	1627	28987	51808
84	203	889	1254	31506	39654
85	211	947	1328	33348	46830
86	184	752	996	29820	32161
87	182	942	901	38416	29237
88	202	769	1077	29326	37827
89	185	827	859	32184	29878
90	177	933	890	37116	32408
91	158	680	635	25499	22544
92	148	708	716	30852	25363
93	143	565	704	23219	25195

Table 3. Total catch (MT) by the Japanese purse seine fishery (larger than 100 GRT boats) in WPYF area.

Year	Days fishing	SKJ	YFT	BET
70	114	365	164	0
71	2659	7948	2867	129
72	3322	12145	4184	119
73	3364	12356	7281	182
74	2069	4841	9419	294
75	2511	6749	5595	265
76	3136	17719	7649	390
77	2638	18255	6807	302
78	2932	25821	8523	609
79	4219	28298	19013	706
80	4203	41138	19701	564
81	5325	43912	27161	925
82	7159	75016	31035	1131
83	10085	115731	30819	1468
84	12698	128528	38647	697
85	12473	119155	47925	1379
86	11716	130805	44463	1531
87	11189	112924	44504	1602
88	11177	174346	30106	605
89	11273	120495	40872	1527
90	10056	138299	37617	2121
91	9476	142404	46255	1528
92	9156	136690	52889	2561
93	10720	132522	57866	1885
94	8477	150760	38437	1604

Table 4. Total catch (MT) of the Japanese pole and line fishery (offshore and distant water-licensed boats) in WPYF area.

Year	F. Days	SKJ	YFT	BET
72	44128	131678	5534	1626
73	53263	197151	6047	1141
74	53283	210915	4406	969
75	56753	171564	5415	1264
76	61798	212607	7306	3313
77	71276	233302	9895	3231
78	59621	219781	7628	3170
79	60943	197044	5833	2118
80	58180	215464	6186	1994
81	60768	192625	9050	2337
82	56619	182219	9490	3807
83	48343	209300	9326	3762
84	46531	245242	8690	3192
85	43324	158513	12920	3981
86	40093	222149	8410	2519
87	38400	170755	8452	2810
88	15564	122813	1908	1449
89	32095	174467	7789	3544
90	32135	110095	6925	3276
91	22330	144846	5405	1230
92	21735	109447	6829	1033
93	21443	142812	4485	1749
94	?			

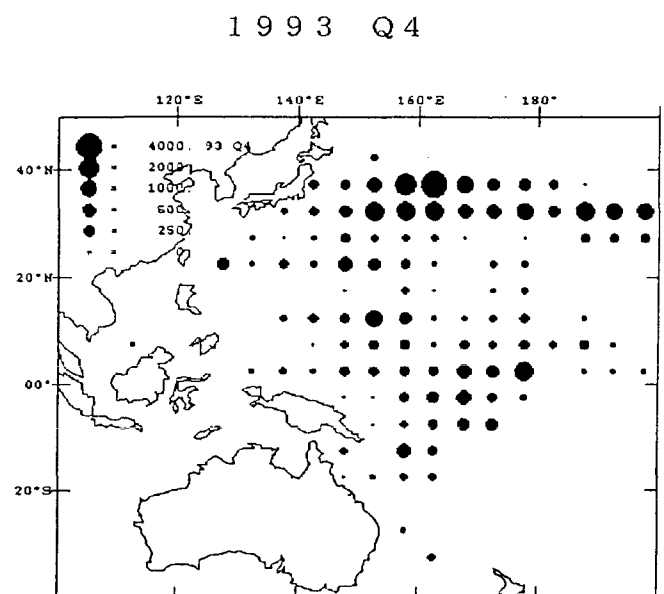
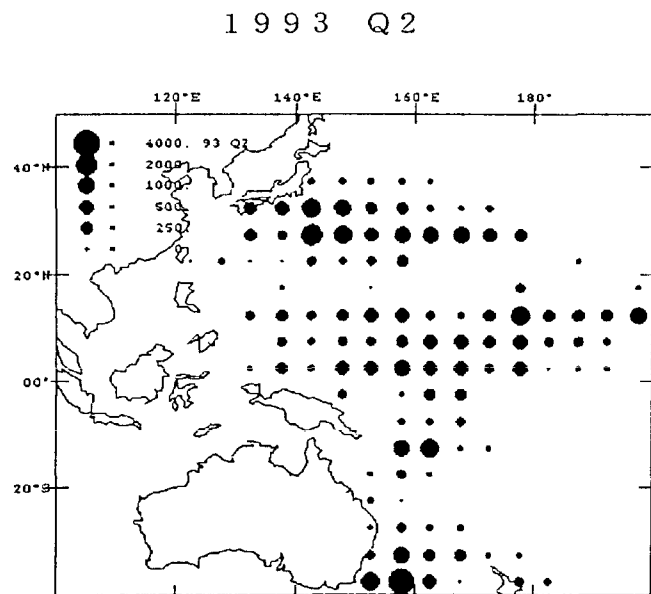
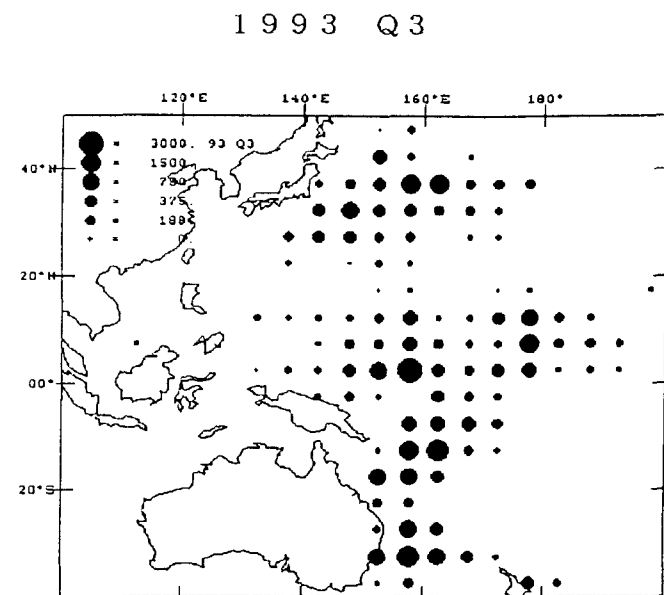
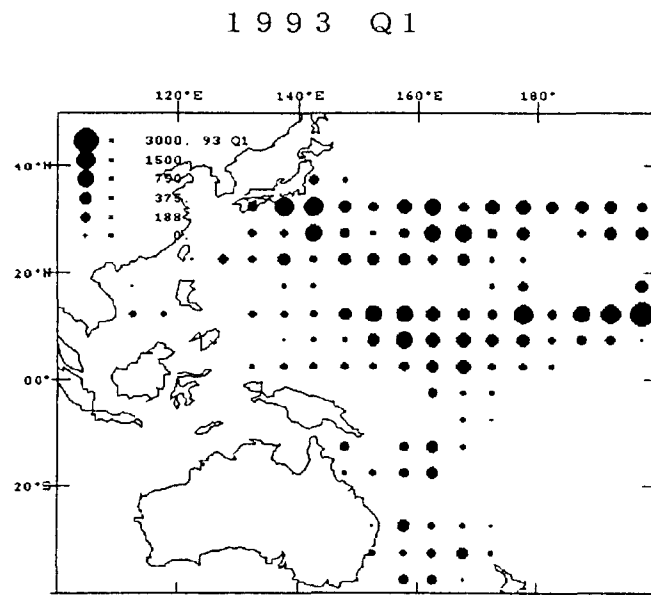


Fig. 1. Distribution of fishing effort for the Japanese longline fishery (offshore and distant water licenses) in the western and central Pacific Ocean in 1993.

12

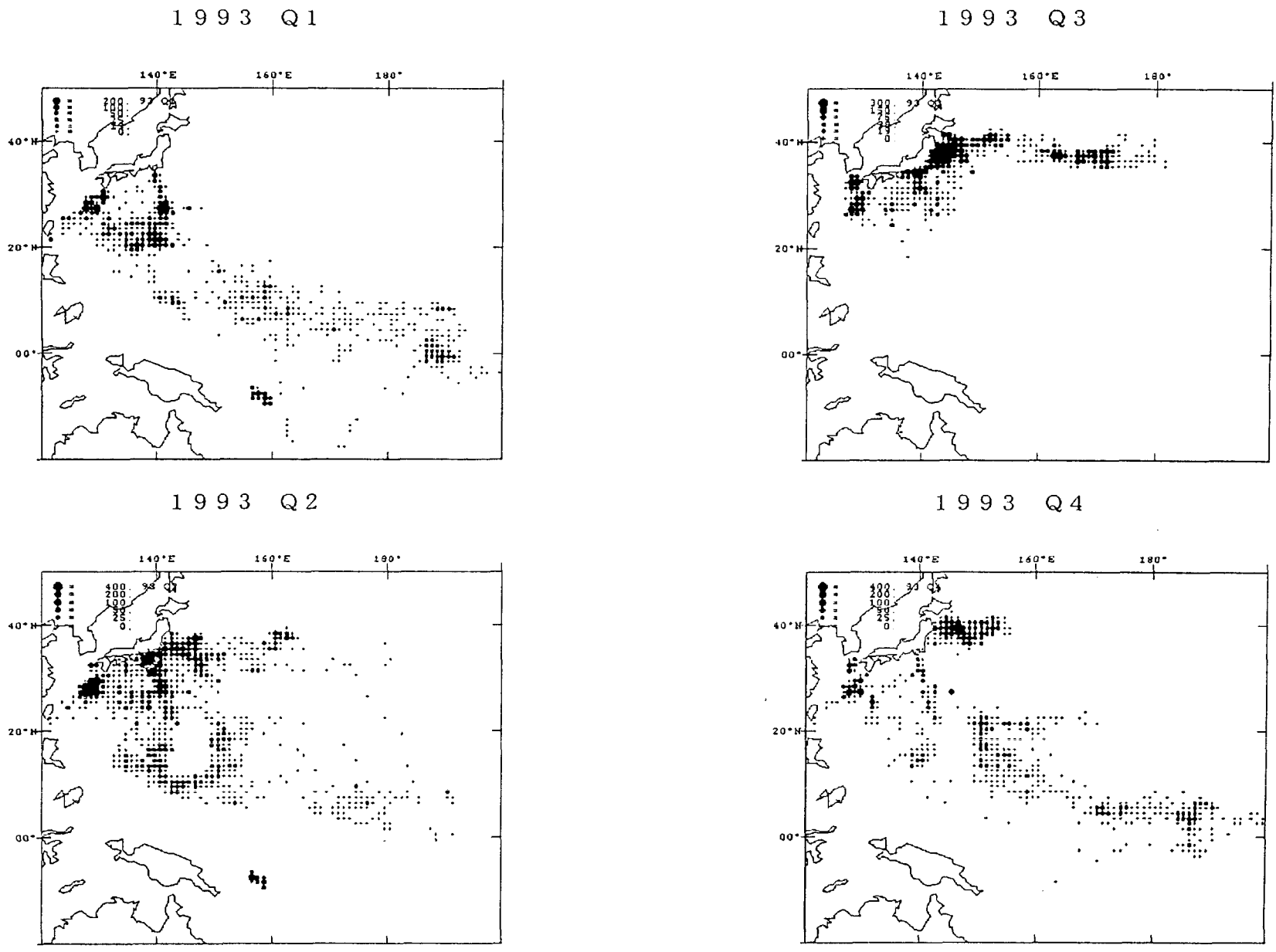
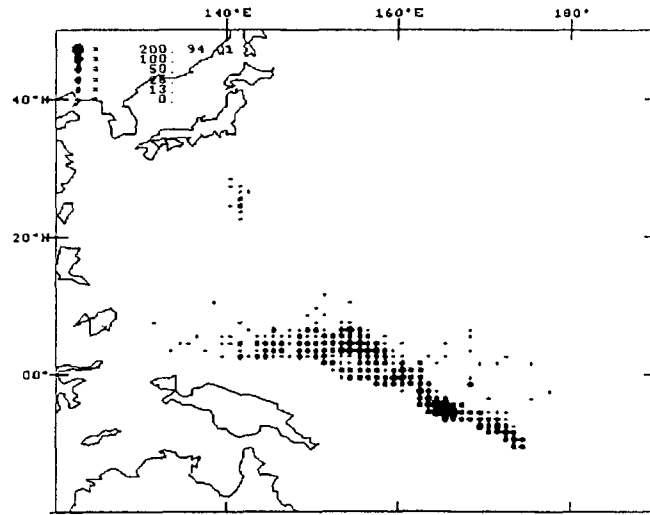
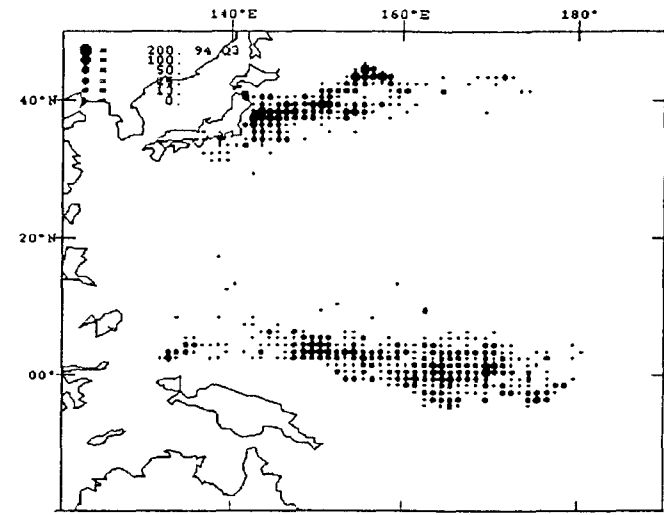


Fig. 2. Distribution of fishing effort for the Japanese pole and line fishery (offshore and distant water licenses) in the Pacific Ocean in 1993.

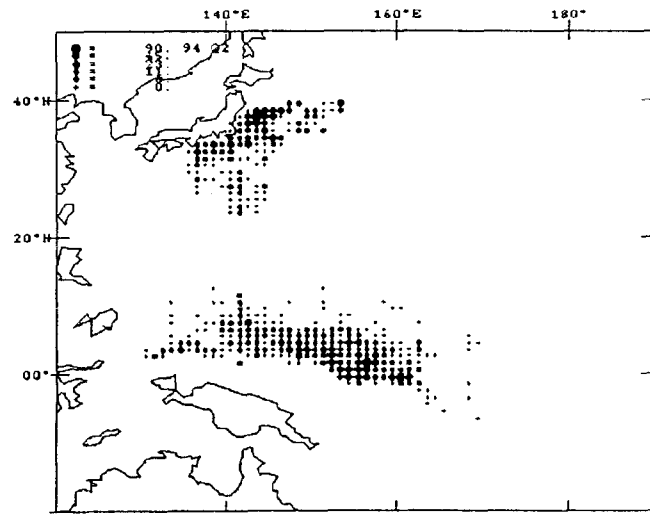
1994 Q1



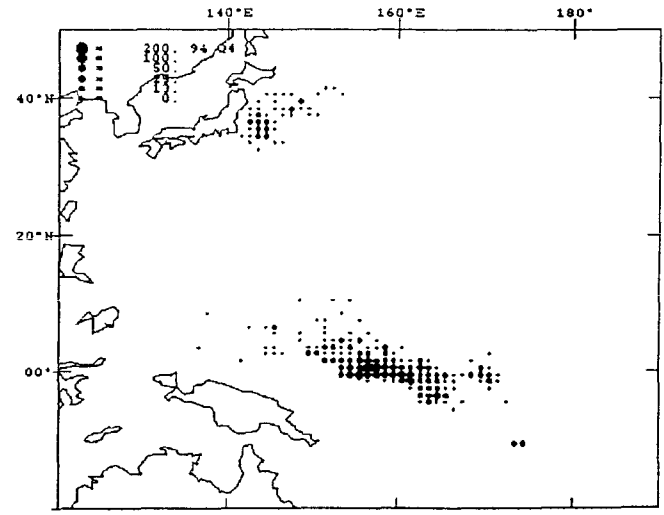
1994 Q3



1994 Q2



1994 Q4



13

Fig. 3. Distribution of fishing effort for the Japanese purse seine fishery (larger than 100 GRT) in the Pacific Ocean in 1994.