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National report of Japan¹

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The total landing of tunas (excluding skipjack) caught by Japanese fisheries in the north Pacific Ocean in 2007 was 127,000 metric ton (t) and the total landing of swordfish and billfishes (striped marlin, blue marlin and black marlin) was 11,200 t. The landing of skipjack tuna was 225,000 t. Japanese tunas, billfishes and skipjacks catch in 2007 stayed the same level from 2006. Japanese tuna fisheries consist of the three major fisheries, i.e., longline, purse seine, pole-and-line, and other miscellaneous fisheries like troll, drift-net, set-net fisheries. These fisheries occupy around 90 % of the total tuna catch of Japanese fisheries in recent years. This paper described the recent trend of the Japanese tuna fisheries in the north Pacific Ocean and updated the statistics given in the previous National Report for ISC8 (Yokawa, Uosaki and Sato 2008). Also there was a brief description on Japanese research activities on tuna and tuna-like species in the Pacific Ocean in 2008 and first half of 2009.

1. Trends in fleet size

Table 1 shows the number of Japanese tuna vessels actually engaged in fishing by type of fishery and by vessel size class during 1980-2006 (Anonymous 1982-2007). Statistics for 2007 is not yet available by the end of June 2009. The total number of longline vessels shows continuous declining trend since the early 1990s and the number of vessel in 2006 is 1,208 which is about 60% of the average of the one in the 1980s. The number of longline vessels of the largest size class (larger than 200 Gross Register Tonnage (GRT)) was near constant in the period between the late 1960s and the mid 1990s. In accordance with the agreement of the FAO's international action plan on fishing capacity, Japan decreased its large longline boats by 20% in 1998. The number of longline boats continued to decline thereafter. While the number of vessels for 20-49 GRT and 50-100 GRT showed a sharp decline since the late 1980s, the number of vessels of smallest size class (less than 20 GRT) fluctuated at around 700. As information for the late 2005 and after, the declining trend has been accelerated by the further slowdown of economics surrounding longline fishing (high fuel cost, low price of tuna, high supply of tuna from the foreign fisheries and low catches due to the decline of stock size). Many longline operators ceased their business and many vessels are now moored at the various home ports. This year, a part of the Japanese distant-water longliners decided to suspend fishing for some time because of high fuel cost. This declining trend was likely to continue in 2007 and probably in the future..

The number of purse seine vessels shown in Table 1 includes only the vessel mainly targeting tunas. The total number of purse seine vessel was 52 in 2006, and it was nearly 80% of that in the 1980s. The total number of purse seine vessel in 2007 is not yet available. The number of the smaller size (smaller than 200 GRT) purse seine vessels has decreased since the late 1980s. The larger vessels which operate mainly in the tropical waters do not change much in number.

In case of the pole-and-line boats, the number of vessels larger than 20 GRT declined to 121 in 2006 from 140 in 2005, which corresponds to almost one third of the average in the 1980s. The trend in the number of vessels smaller than 20 GRT also shows the general decreasing trend since the 1980s, and the number of vessels in 2006 was only 8% of the average of the 1980s.

The number of vessel by gear and vessel type in 2007 is not yet available due to changes of fishery statistics collection system.

2. Catch and effort trends of the major fisheries

Catch and effort data used in this paper are mostly based on the logbook data compiled by the National Research Institute of Far Seas Fisheries, Fisheries Research Agency (NRIFSF). The data source of catch and effort for the coastal longline and pole-and-line fisheries are mainly derived from Statistics Department, Ministry of Agriculture, Forestry and Fishery (Anonymous 1982-2008).

2.1. Longline

Longline fisheries had been classified by the type of license issued by the Government, i.e., coastal (correspond to vessel smaller than 20 GRT), offshore (20-120 GRT), and distant water (larger than 120 GRT) until 2001. Since 2002, the categorization of the license was changed, and longline vessels of 10–20 GRT operating outside the Japanese EEZ were re-categorized as offshore license. Latest available fleet statistics are provisional 2006 data for both vessels larger and less than 20 GRT.

Total fishing effort (days at sea) for longline vessels less than 20 GRT has gradually increased since 1990 (Table 2). The same statistics for 2005 was 138,000 days which showed a 80 % increase over the average in the 1980s. Total tuna and billfish catch of these vessels fluctuated between 31,000 to 41,000 t in the most recent 10 years. Albacore occupies the largest portion corresponding to about a half of the total catch. Albacore catch has increased remarkably since 1993 and peaked at 25,000 t in 1997, but decreased to 13,000 t in 2004, and again increased to 18,000 t in 2007.

Total catch of longline vessels larger than 20 GRT (offshore and distant water fisheries) in the north Pacific were 29,000 t in 2007, which was the lowest value since 1980 (Table 3). Bigeye has been the dominant species for the north Pacific and the catch in 2006 were 15,000 t in the north Pacific.

The fishing effort of longline vessels larger than 20 GRT remained stable at around 200 million hooks in the North Pacific in the 1980s, and then it decreased continuously to 100 million hooks in the early 2000s, and it has further decreased in the most recent years. The amount of effort in the 2006 is about 40% of the average in the 1980s. The similar declining trend is also seen in the South Pacific. Catch of bigeye, yellowfin and marlins in both the North and the South Pacific were stable in the 1980s, but it showed a decreasing trend in the 1990s and thereafter. It was in the lowest level since 1980 in the most recent years. Catches of Pacific bluefin tuna and albacore in the North Pacific showed some drops during the mid 1980s and a recovery in the early 1990s, and then declined again, though the bluefin catch showed an increase in 2004 and 2005. The catch of swordfish appears to be relatively stable. The catch of striped marlin in the North Pacific shows steady decreasing trend since the late 1980s, and is the lowest since 1980.

The catch and effort by the Japanese distant water longline fishery is likely to decrease due to the economic circumstances (i.e. high fuel cost, low price of tuna, high labor cost). As most of these vessels have operated in the waters other than the North Pacific (more than 80%), the decline is likely to be more severe in those waters.

Annual distribution of fishing effort for longline vessels larger than 20 GRT in 2005 and 2006 are shown in Figure 1. In both years, the fishing grounds are located in east-west direction off Japan to Hawaii, equatorial area between 15 °S and 15 °N, off Australia and off Peru.

Length frequency distribution for tunas and swordfish caught in the Pacific, which was measured on board or at landing port, is shown in Fig. 2. The length of albacore ranged from 60 to 120 cm in fork length (FL). The length of bigeye and yellowfin had wider ranges approximately from 60 to 180 cm but fish larger than 90 cm formed a dominant part of the catch. The length of the swordfish measured ranged from 50 to 220 cm in eye-fork length.

2.2. Purse seine

There are two different types of purse seiners that target tunas in Japan, i.e., single and group purse seine fisheries. The group seiner consists of one net purse seiner (100-200 GRT) and one searching vessel and two carrier vessels, and operates in the temperate northwestern Pacific. New type of group seiner launched at March 2005, which consists of one relatively large seiner (300 GRT) than typical size of the purse seiner and one carrier

instead of two carriers. The group purse seiner operates in the offshore waters off Japan. The carrier holds fish in chilled water with ice and unloads those catches. On the other hand, the single purse seiner (349-500 GRT) operates mainly in the tropical waters of the central and western Pacific, but seasonally operates in the temperate waters. This type of purse seine fishery is so called the distant water purse seine fishery.

Annual distribution of fishing effort (Figure 3) showed that the fishing grounds were well separated by latitude into the northern temperate waters around Japan and the tropical waters. In the northern area, the number of sets made was large at about 3,500-4,000 sets in the mid 1980s, decreased to about 2,000 sets during the late 1980s, and then recovered in 1998 and remained at about 2,500-3,400 sets in recent years. In the tropical area, the number of sets peaked at 7,000 sets in 1984 then gradually decreased to around 4,000 sets until the early 2000s and leveled off thereafter (Table 4). Total catch in the northern area has fluctuated in the range between 23,000 and 102,000 t since 1980. The skipjack catch dominated among species in this area followed by yellowfin and Pacific bluefin, but catch by species also fluctuated. The skipjack catch in 1998 in this area was the highest in the history, resulting in 96,000 t in total catch.

In the tropical waters, fishing effort increased rapidly until 1983 and then it was leveled off. Total catch in the tropical area was stable at around 150,000 t or more after the mid 1980s. Skipjack accounted for the most of the catch followed by yellowfin and bigeye.

The length of skipjack caught by the purse seine fishery in the southern area ranges from 30 to 70 cm in FL and bigeye ranges from 30 to 90 cm (Figure 4). Most of the yellowfin catch is also in the range from 30 to 60cm but there are some fishes larger than 80 cm.

2.3. Pole-and-line

The pole-and-line fishery is composed of three different categories, i.e., coastal (smaller than 20 GRT), offshore (20-120 GRT) and distant water (larger than 120 GRT) vessels in terms of the license of this fishery. The pole-and-line fishery can be also categorized into large, middle, and small (sized) vessels which correspond to larger than 230 GRT, 20-230 GRT and less than 20 GRT in vessel size. This categorization is useful to discriminate between those fisheries in terms of fishing ground and fishing strategy.

The middle-sized vessels generally operate in near shore waters of Japan and their trip is within 10 days. Southern most fishing area for these vessels, in recent years, is near 15°N, but the important fishing ground is waters north of 25°N around Japan and adjacent areas. These vessels primarily fish skipjack and albacore tunas from spring through autumn off Pacific side of Japan, and also harvest relatively small amount of yellowfin and bigeye. They hold fish in cooled water and unload it as fresh fish. The activity of the small pole-and-line vessels is more or less similar to that of the middle vessels but the area of fishing is limited to the coastal waters of Japan.

On the contrary, the large vessels operate much more offshore waters and their trips are for two to three months. Usually they primarily fish for albacore from summer through autumn season in the waters north of 20°N, and skipjack tuna in winter and spring in the waters south of 20°N. These vessels equip a brine freezer, in which fish caught are immediately stored into a tank filled with cooled brine, and then unloads it as frozen fish.

Fishing grounds of the pole-and-line fishery are separated by latitude but more continuous than the purse seine fishing grounds (Figure 5). Generally, fishing effort has been decreasing, especially in the tropical area (Table 5). The amount of effort in the north Pacific in 2007 is 302,000 poles which is close to the lowest (294,000 in 2006) since 1980. Despite the substantial reduction of the fishing effort, the catch of skipjack in the north Pacific appears to be moderately decreased. The catch of albacore in the north Pacific has fluctuated in the range of 6,000-49,000 without trend. Recent annual catch by the coastal pole-and-line fishery are around 10,000 t or less and relatively minor compared with that of the offshore and distant water pole-and-line fisheries.

The size of skipjack caught by this fishery is ranged from 40 to 60 cm FL and ranged from 50 to 90 cm for albacore. Several clear modes are obvious (Figure 6).

2.4. Other fisheries

There are miscellaneous small scale fisheries which catch tunas and tuna-like species in the Japanese coastal waters. Among them, the largest catch is made by the troll fishery with annual catch in 2004 of about 6,200 t for tunas and 15,000 t for skipjack (Anonymous 2007).

The large mesh driftnet fishery, that historically expanded its fishing ground covering areas of the temperate north and South Pacific in the 1980s, was suspended in 1991 in the South Pacific and in the high seas of the North Pacific in 1992 due to UN resolution implemented for this fishery.

2.5. Recent trends for Pacific bluefin tuna, albacore and swordfish fisheries

Total catch of Pacific bluefin by Japan has been fluctuating in the range between 11,000 and 14,000 t since 2001, except for 2005 and 2008 when the catch increased to about 20,000 t due to the increased catches by purse seine primarily targeting small pelagic fish, set net and troll fisheries (Oshima and Takeuchi 2009). In 2008, remarkably increased catches by set net gear also contributed to the high catch in addition to Purse seine targeting small pelagic fish and troll fishery. Although 2008 catch of set net is still provisional, set net catch in 2008 is next to purse seine targeting small pelagic fish and the largest after 1980. The longline catch had increased to 2,300 t in 2007, which was the highest in the recent decade. The annual troll catch has been fluctuated between 1,500 – 5,100 t since 1994, and the catch in 2008 was slightly higher than the average (3,100 t) of this period (1994 – 2008). The troll fishery supplies fish not only for local market but also for the fattening.

The catches of north Pacific albacore are mainly made by the longline and the pole-and-line fisheries. The pole-and-line catch was 38,000 t in 2007, which is almost the same as the catch in 2004 and more than twice of the catch in 2006. This is due to that very good fishing ground was developed from May to June at relatively near shore area (32-38°N, 142-148°E) by the middle-sized pole-and-line vessels. The albacore catch by longline in the north Pacific was 22,000 t in 2007 (Tables 2 and 3) corresponding to 88% of the average catch in recent decade.

Japanese swordfish catch in the North Pacific has been fluctuated between 6,300 and 11,500 tons since 1980, and the catch in 2006 (9,200 t) was nearly the average value in the period between 1980 and 2006. In the most recent years, total Japanese swordfish catch showed gradual increasing trend primary due to the increase of catch by longliners, which recorded relatively higher catch ratio in the recent years. The length composition of catch in 2006 is mono-modal one with its peak around 130 cm (eye fork length), and is roughly the same as the one in 2005 (Fig. 2).

3. Compilation of basic fisheries data

The logbook systems have been in place for offshore and distant water longline, pole-and-line, and purse seine fisheries. From 1994, the logbook system was introduced to the coastal longline vessels (10-20 GRT) fishing both within and outside the Japanese EEZ and these vessels were included in the offshore category since 2002. Historical Category II data was compiled from those logbook data and submitted to the ISC Statistics Working Group in July 2007.

There are small scale fisheries in the coastal waters of Japan such as troll and set net which are not covered by the current logbook system. Catches by these fisheries are covered by the landing statistics collected by the Statistics Department of the Ministry of Agriculture, Forestry and Fisheries (Anonymous 1982-2005). The Fishery Agency of Japan, in cooperation with the NRIFS and local prefectural fisheries experimental stations, has run the nationwide port sampling project for collection of catch, effort and size data at the major landing ports since the early 1990s.

4. Research activities

Researches on tunas and tuna-like species in the Pacific Ocean have been carried out by the NRIFS for broad scientific areas of basic biology, behavior, and stock assessment. In addition, there are cooperative works

with prefectural fisheries experimental stations and universities. Several cooperative studies are also on going with foreign countries including international organizations.

4.1. Research cruises

There have been several research cruises in 2008/9 conducted by the Fisheries Agency of Japan and the NRIFSF relating to tunas and billfish in the Pacific, in addition to the several short cruises for tagging.

Two research cruises for sampling tuna larvae and early juveniles were conducted by using plankton net and a mid-water trawl gear in 2009. They were conducted under the 3-year research project on prediction of bluefin recruitment from 2006. The purpose of one cruise was to study distributions of larvae and early juvenile of bluefin tuna caught by the mid-water trawl gear in the vicinity of Nansei-Islands in June. The other one was for bluefin larvae caught by plankton nets in the vicinity of Nansei-Islands during May to July. The purpose of this cruise was to study survival process and distribution during early life history of bluefin tuna. In both research cruises, some bluefin tuna larvae and early juveniles were successfully caught, and analysis of data and samples is being conducted by the staff of NRIFSF.

In November and December 2008, R/V Shoyo-maru conducted a research cruise to investigate albacore maturity in the subtropical waters, samples of gonad and the others from adult albacore were collected by longlining. In addition, larvae of tunas were collected by ring net towing. It was observed that sex ratio of albacore was far from even and that female was only 17% of observed albacore.

To develop mitigation measures for reducing incidental mortality of sea turtles and seabirds in longline fishery, experimental fishing operations were conducted in the western North Pacific by RV Taikei No.2, and a commercial vessel Taiho-maru in 2007. Mitigation effectiveness and practical feasibility of tori-lines and circle hooks were examined in these experiments.

4.2. Tagging

The tagging using conventional tag has been conducted by research and training vessels as well as commercial vessels. Some of these activities are opportunistic tagging. In addition to the conventional tagging, tagging using the archival tag and archival popup tag has been conducted for tuna and tuna-like species.

For conventional tagging activity in 2008, 163 bigeye, 1,183 yellowfin and 2,380 skipjack were tagged and released. There were reported recoveries 10 bigeye, 63 yellowfin, and 57 skipjack. In addition to conventional tagging, 40 albacore, 12 bigeye and 6 yellowfin were tagged with an electronic tags (archival and pop-up tags) and released. Of those, 1 archival tag attached on bigeye tuna and another for yellowfin were recovered.

4.3. Studies on biological parameter

Following is the studies on biological parameters recently carried out by the NRIFSF.

- Study on age determination and growth of Pacific bluefin have started with focusing on larger fish in collaboration with National Taiwan University. The sex combined growth curve was estimated using otoliths collected, and this growth curve were used for the stock assessment of bluefin tuna conducted in May, 2008.

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Table 1. Number of Japanese tuna fishing vessels operated in the Pacific Ocean by type of fisheries and vessel size.

Year	Longline fishery ^{*1}						Purse seine fishery			Pole-and-line fishery					
	1-19	20-49	50-99	100-199	200-	Total	50-199	200-	Total	1-19	20-49	50-99	100-199	200-	Total
	GRT	GRT	GRT	GRT	GRT		GRT ^{*2}	GRT		GRT ^{*3}	GRT	GRT	GRT	GRT	
1980	821	57	715	103	645	2,341	50	16	66	3,232	14	350	10	198	3,804
1981	774	55	706	100	661	2,296	50	23	73	3,064	10	353	6	179	3,612
1982	722	43	634	90	589	2,078	52	33	85	3,011	11	320	6	138	3,486
1983	561	38	589	93	550	1,831	59	36	95	3,021	12	297	9	116	3,455
1984	523	32	538	108	610	1,811	54	33	87	2,904	8	273	10	105	3,300
1985	620	28	512	131	628	1,919	47	35	82	2,754	8	244	9	95	3,110
1986	536	25	435	168	632	1,796	53	38	91	2,455	6	224	9	91	2,785
1987	661	23	348	197	649	1,878	47	34	81	2,404	6	210	9	89	2,718
1988	586	21	289	233	649	1,778	48	39	87	2,613	5	191	11	70	2,890
1989	650	20	248	238	653	1,809	43	37	80	2,254	3	187	12	67	2,523
1990	685	21	227	241	664	1,838	43	35	78	2,228	4	176	9	66	2,483
1991	768	19	199	222	682	1,890	38	35	73	2,277	3	166	10	63	2,519
1992	793	19	164	206	681	1,863	31	38	69	2,093	3	156	11	46	2,309
1993	790	18	138	201	682	1,829	27	36	63	1,927	3	147	10	43	2,130
1994	819	21	110	198	675	1,823	23	33	56	1,830	3	124	10	48	2,015
1995	738	20	92	187	667	1,704	20	31	51	481	3	104	20	46	654
1996	711	17	91	155	640	1,614	21	32	53	512	3	89	29	43	676
1997	698	11	88	145	631	1,573	20	35	55	436	2	76	39	45	598
1998	712	11	80	129	623	1,555	20	35	55	382	2	73	40	46	543
1999	703	6	78	119	567	1,473	22	36	58	416	1	62	54	46	579
2000	732	3	76	111	496	1,418	23	37	60	357	1	56	57	47	518
2001	777	4	76	110	494	1,461	19	36	55	285	1	49	59	47	441
2002	780	4	69	110	484	1,447	18	36	54	251	1	45	58	48	403
2003	764	3	64	99	460	1,390	17	36	53	292	1	44	56	44	437
2004	702	2	55	77	455	1,291	17	36	53	284	1	38	57	43	423
2005	694	2	46	59	432	1,233	17	36	53	247	1	36	58	45	387
2006	709	1	43	54	401	1,208	16	36	52	213	1	27	58	36	335

*1 Longline vessels larger than 50 GRT include those operated in the area other than the Pacific

*2 50-199 GRT class vessels only include those operated in the Pacific side of northern Japan.

*3 1-19 GRT class vessels before 1995 include those engaged in trolling

Table 2. Catch in weight (t) by species and fishing effort (Number of days at sea) of longline vessels smaller than 20 GRT. Catch of Blue marlin includes some catch of black marlin. The values in this table are derived from Anonymous (1982-2007) for years 1980 to 2007. The values of the catch by species for 2002 and after were estimated from both Anonymous (2004-2007) and the logbook data. PBF: Pacific bluefin, ALB: albacore, BET: bigeye, YFT: yellowfin, SWO: swordfish, MLS: striped marlin, BUM: blue marlin, OTM: the other marlins. Data in 2007 is provisional.

Year	Days	PBF	ALB	BET	YFT	SWO	MLS	BUM	OTM	Total
1980	76,281	671	2,975	2,658	5,840	824	607	702	196	14,473
1981	77,644	277	2,908	2,523	5,123	675	259	820	80	12,665
1982	81,350	512	3,674	2,904	5,117	839	270	722	60	14,098
1983	75,735	130	3,808	4,201	6,207	955	320	1,058	101	16,780
1984	73,520	85	3,351	5,168	5,968	1,141	386	1,306	83	17,488
1985	82,600	67	4,045	4,607	6,229	980	711	1,037	176	17,852
1986	80,295	72	4,712	4,475	6,199	960	901	898	191	18,408
1987	81,915	181	5,503	4,023	7,148	819	1,187	1,526	393	20,780
1988	75,224	106	5,585	5,012	7,528	665	752	1,454	106	21,208
1989	74,443	172	4,711	6,101	7,685	742	1,081	1,261	52	21,805
1990	85,010	267	6,513	7,053	7,800	687	1,125	1,204	186	24,835
1991	97,304	170	6,664	7,025	8,034	799	1,197	1,342	305	25,536
1992	99,984	428	8,036	7,302	8,452	1,173	1,247	1,657	216	28,511
1993	104,173	667	16,591	6,889	7,950	1,394	1,723	2,092	189	37,495
1994	103,538	968	16,366	5,974	6,970	1,357	1,284	1,833	177	34,929
1995	101,658	571	17,497	5,532	6,886	1,386	1,840	1,687	344	35,743
1996	102,087	778	18,627	6,067	6,257	1,063	1,836	1,332	327	36,287
1997	108,097	1,158	24,926	5,442	6,079	1,213	1,400	1,023	209	41,450
1998	105,496	1,086	23,403	4,846	5,888	1,186	1,975	1,147	270	39,801
1999	107,304	1,030	21,219	5,805	5,500	1,047	1,551	1,063	172	37,387
2000	109,088	832	19,228	6,042	6,895	1,112	1,109	1,226	93	36,537
2001	110,638	728	17,539	5,587	5,944	899	1,326	1,215	74	33,312
2002	113,788	794	16,918	6,565	3,936	956	796	915	43	30,924
2003	114,344	1,152	16,309	8,402	6,385	1,058	842	1,228	35	35,411
2004	110,543	1,616	12,960	8,523	5,768	1,505	1,000	1,444	35	32,849
2005	138,327	1,818	15,208	9,179	5,676	1,289	668	1,129	23	34,989
2006		1,058	16,452	12,083	5,028	1,504	538	1,116	37	37,816
2007		2,225	18,299	11,305	4,875	1,978	846	1,183	52	40,761

Table 3. Fishing effort (1,000 hooks) and catch in weight (t) by species for the vessels greater than 20 GRT of Japanese offshore longline fishery and distant water longline fishery in the Pacific. Data in 2007 is provisional. PBF: Pacific bluefin, SBF: southern bluefin, ALB: albacore, BET: bigeye, YFT: yellowfin, SWO: swordfish, MLS: striped marlin, BUM: blue marlin, BLM: Black marlin, SFA: sailfish and also includes spearfish

	Hooks	PBF	SBF	ALB	BET	YFT	SWO	MLS	BUM	BLM	SFA	Total
1980	215,102	140	0	11,623	44,651	44,827	6,005	5,871	5,613	388	532	119,650
1981	218,508	313	0	14,826	36,556	33,122	7,039	3,957	5,518	272	539	102,142
1982	200,830	206	0	12,939	44,655	28,539	6,064	5,211	6,051	206	891	104,762
1983	196,470	87	0	11,200	45,310	30,014	7,692	3,575	4,796	199	591	103,464
1984	201,106	57	0	11,604	41,347	26,402	7,177	3,335	6,248	226	337	96,733
1985	198,726	38	0	10,119	49,584	21,508	9,335	3,698	5,164	226	161	99,833
1986	189,379	30	0	8,094	48,445	24,340	8,721	5,178	5,922	124	211	101,065
1987	204,702	30	0	9,083	54,245	25,328	9,495	5,439	5,370	147	221	109,358
1988	206,674	51	0	8,976	39,193	19,880	8,574	5,768	5,054	146	293	87,935
1989	215,363	37	0	8,224	54,545	20,337	6,690	4,582	5,117	86	377	99,995
1990	198,126	42	0	9,190	55,286	22,963	5,833	2,298	4,116	75	117	99,920
1991	182,518	48	0	10,165	43,229	18,833	4,809	2,677	4,094	85	161	84,101
1992	172,732	85	0	10,735	49,136	21,688	7,234	2,757	3,720	111	128	95,594
1993	172,433	145	0	12,992	41,114	18,667	8,298	3,286	4,600	69	118	89,289
1994	157,907	238	0	13,199	37,738	16,510	7,366	2,911	4,715	99	214	82,992
1995	140,766	107	0	11,553	31,362	18,900	6,422	3,494	4,423	60	243	76,563
1996	125,077	123	0	13,813	24,921	17,211	6,916	1,951	2,357	54	103	67,450
1997	121,879	142	0	13,973	31,568	19,174	7,002	2,120	2,975	56	98	77,107
1998	119,921	169	0	12,352	34,806	12,812	6,233	1,784	2,448	60	119	70,784
1999	130,340	127	0	12,120	31,230	11,462	5,557	1,608	2,751	50	182	65,087
2000	121,093	121	0	10,767	26,450	14,492	6,180	1,152	2,552	61	153	61,927
2001	123,799	63	0	11,262	31,474	11,974	6,932	985	2,554	37	75	65,356
2002	112,469	47	0	6,667	30,584	8,713	6,230	764	2,242	59	60	55,367
2003	105,583	85	0	4,598	23,717	7,640	5,376	1,013	1,969	27	116	44,541
2004	96,336	231	0	4,381	24,273	6,443	5,350	620	1,927	26	71	43,321
2005	86,950	107	0	5,212	20,414	6,228	5,334	503	1,652	28	85	39,564
2006	87,085	63	0	4,575	19,942	5,974	6,105	545	1,650	26	136	39,014
2007	73,799	84	0	4,087	14,617	3,095	5,885	276	1,005	12	8	29,069

Table 4. Fishing effort (Number of set) and catch in weight (t) by species of the Japanese purse seine fisheries in the north Pacific. SKJ: skipjack, YFT: yellowfin, BET: bigeye, PBF: Pacific bluefin, ALB: albacore.

	Sets	SKJ	YFT	BET	PBF	ALB	Total
1980	3,053	45,251	19,033	527	11,327	329	76,468
1981	2,620	38,542	25,123	784	25,422	252	90,123
1982	2,697	53,309	22,082	869	19,234	561	96,055
1983	2,585	75,661	19,474	820	14,774	350	111,078
1984	3,747	110,251	28,069	625	4,433	3,380	146,759
1985	3,578	96,762	40,734	1,252	4,154	1,533	144,436
1986	4,260	112,800	36,589	1,397	7,412	1,542	159,740
1987	4,016	106,741	41,410	1,386	8,653	1,205	159,394
1988	3,009	170,669	28,891	580	3,605	1,208	204,953
1989	2,671	118,465	40,847	1,509	6,190	2,521	169,531
1990	2,055	131,056	36,717	1,921	2,989	1,995	174,677
1991	2,056	148,235	45,220	1,861	9,808	2,652	207,775
1992	1,997	106,351	42,163	1,792	7,162	4,104	161,572
1993	2,141	110,168	44,898	1,630	6,600	2,889	166,185
1994	1,703	115,010	26,453	1,359	8,131	2,026	152,979
1995	2,185	129,771	36,084	1,599	18,909	1,177	187,539
1996	1,573	142,423	22,319	1,447	7,644	581	174,415
1997	2,772	132,104	35,751	6,669	13,152	1,068	188,743
1998	2,853	165,506	23,321	1,258	5,390	1,554	197,029
1999	2,640	114,689	28,622	2,401	16,173	6,872	168,756
2000	2,928	120,188	17,329	2,798	16,486	2,408	159,209
2001	2,492	98,058	14,017	3,053	7,620	974	123,722
2002	2,446	118,077	12,841	2,921	9,273	3,303	146,415
2003	3,024	160,247	18,956	3,589	6,432	627	189,850
2004	2,611	119,970	15,344	3,140	7,421	7,200	153,075
2005	3,418	157,032	18,654	2,322	11,450	850	190,308
2006	2,483	151,292	17,550	2,508	7,234	364	178,947
2007	2,547	148,788	11,474	3,164	5,900	5,682	175,006

Table 5. Fishing effort (Number of poles-days) and catch in weight (t) by species and of Japanese offshore and distant water pole-and-line fisheries in the north Pacific. SKJ: skipjack, ALB: albacore, YFT: yellowfin, PBF: Pacific bluefin, BET: bigeye.

	Poles*days	SKJ	ALB	YFT	PBF	BET	Total
1980	1,133,547	220,815	46,742	5,904	1,392	1,918	276,770
1981	1,097,515	176,500	27,426	8,135	754	2,281	215,096
1982	1,007,846	177,754	29,614	8,613	1,777	3,451	221,210
1983	867,055	206,493	21,098	8,863	356	3,733	240,543
1984	832,838	261,847	26,013	8,309	587	3,196	299,952
1985	680,141	124,298	20,714	9,897	1,817	3,786	160,512
1986	664,585	195,167	16,096	8,216	1,086	2,481	223,045
1987	669,430	170,349	19,082	8,078	1,565	2,731	201,805
1988	560,661	189,834	6,216	8,027	907	3,627	208,612
1989	505,391	156,345	8,629	8,241	754	3,568	177,538
1990	467,445	105,788	8,532	5,953	536	3,265	124,074
1991	323,700	130,995	7,103	4,578	286	1,219	144,181
1992	340,832	108,299	13,888	5,530	166	1,025	128,908
1993	352,585	156,070	12,797	4,084	129	1,760	174,839
1994	324,862	95,652	26,389	3,906	162	1,873	127,982
1995	338,779	122,502	20,981	4,455	270	2,607	150,814
1996	315,589	88,335	20,272	4,848	94	2,537	116,087
1997	347,687	111,710	32,238	3,656	34	2,574	150,212
1998	372,668	123,014	22,926	3,051	85	1,341	150,417
1999	383,904	109,636	50,369	3,568	35	1,073	164,681
2000	425,805	138,082	21,550	3,474	102	1,792	165,000
2001	402,566	95,482	29,430	2,614	180	1,321	129,026
2002	375,455	80,620	48,454	2,473	99	1,687	133,333
2003	380,833	111,102	36,114	2,054	44	812	150,126
2004	351,123	87,530	32,255	2,221	132	3,299	125,437
2005	364,965	121,864	16,133	3,091	549	1,271	142,907
2006	293,637	85,787	15,400	2,623	108	3,701	107,620
2007	301,616	76,121	37,768	2,168	236	1,665	117,957

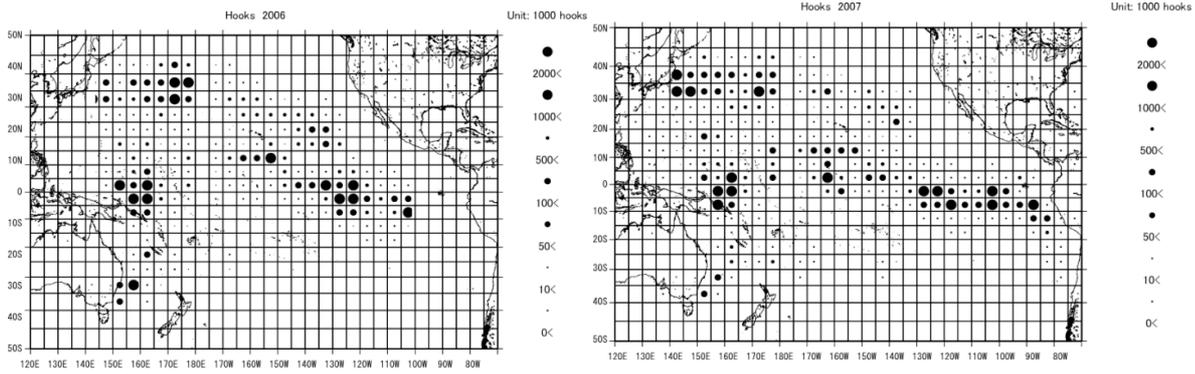


Figure 1. Distribution of fishing effort (Number of hooks) for the Japanese longline fishery (larger than 20 GRT vessels) in the Pacific. Left: 2006, right: 2007.

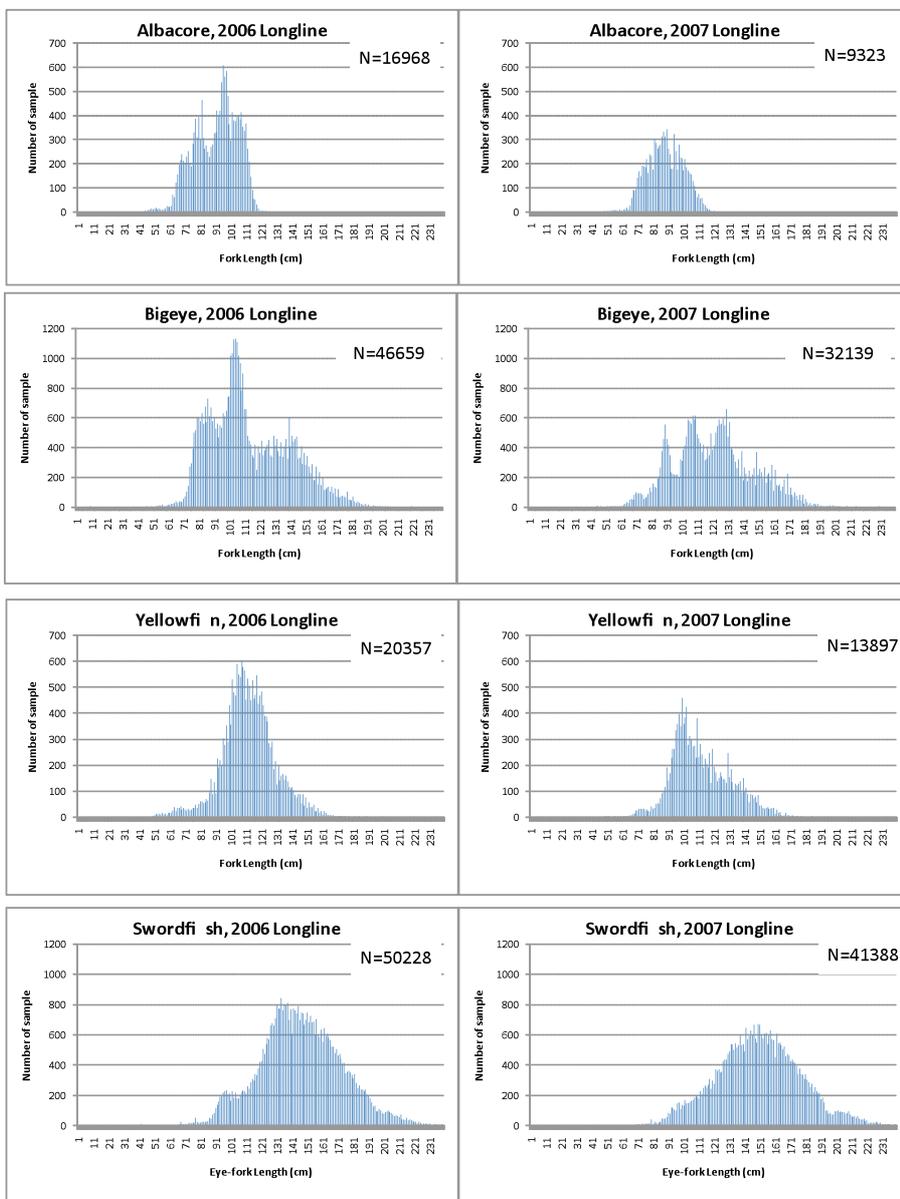


Figure 2. Annual length frequency distribution (simply summing up all measurements) for longline caught albacore, bigeye, yellowfin, and swordfish in 2006 (left) and 2007 (right). Texts in each graph indicate gear, species, year, and the number of fish measured.

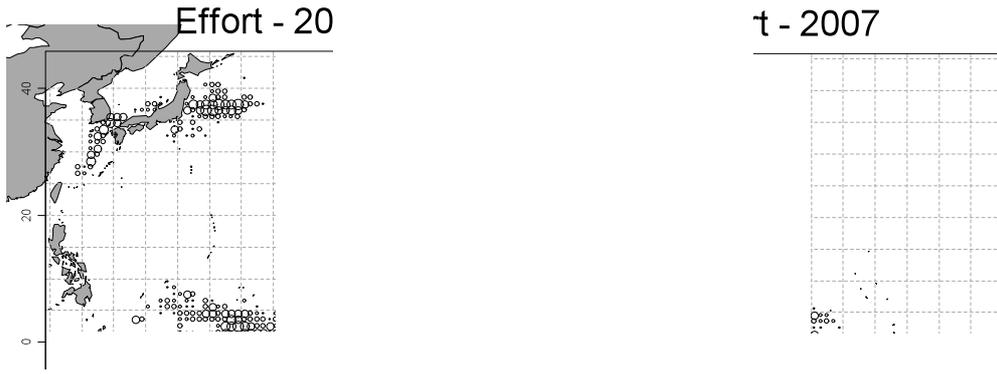


Figure 3. Distribution of fishing effort (number of sets) for the Japanese purse seine fishery in the Pacific. Left: 2006, right: 2007.

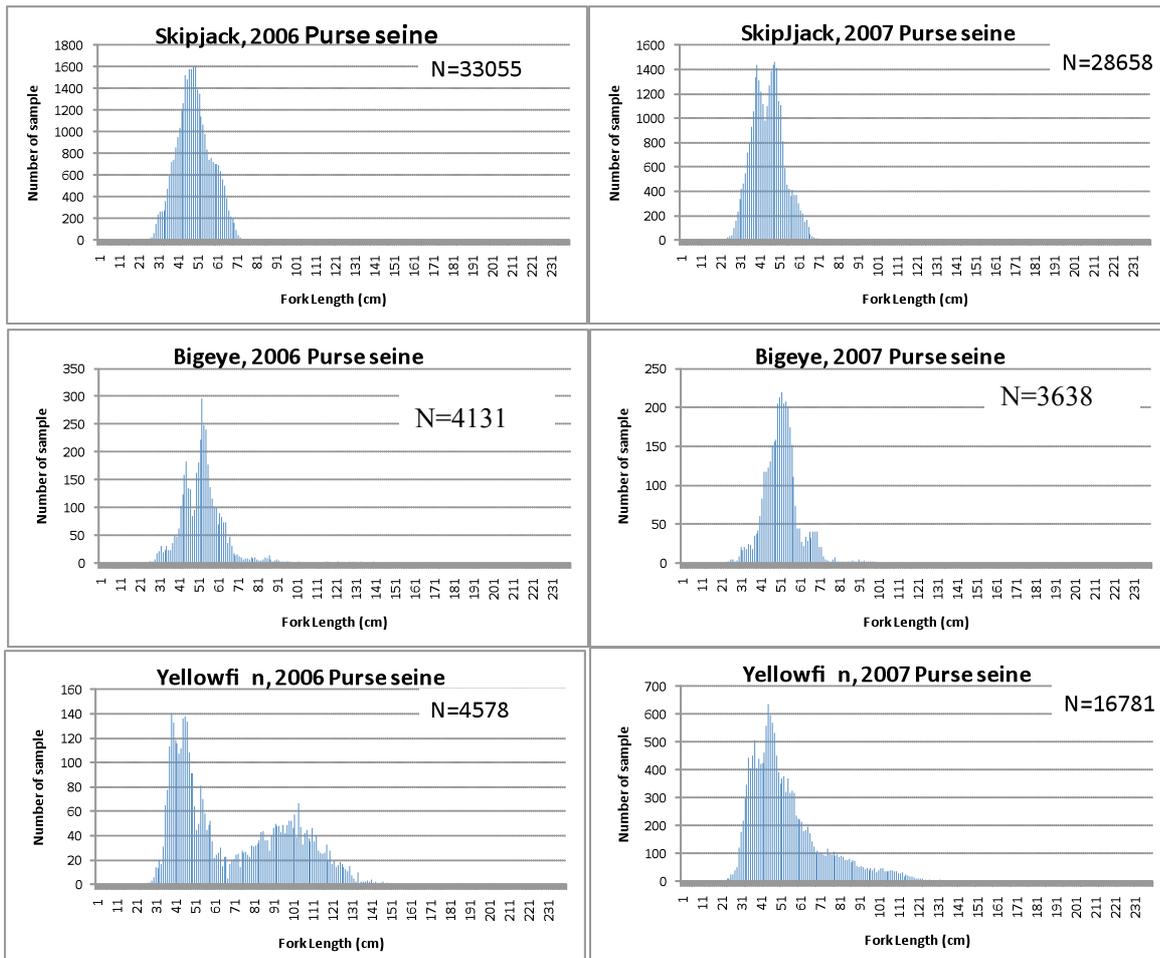
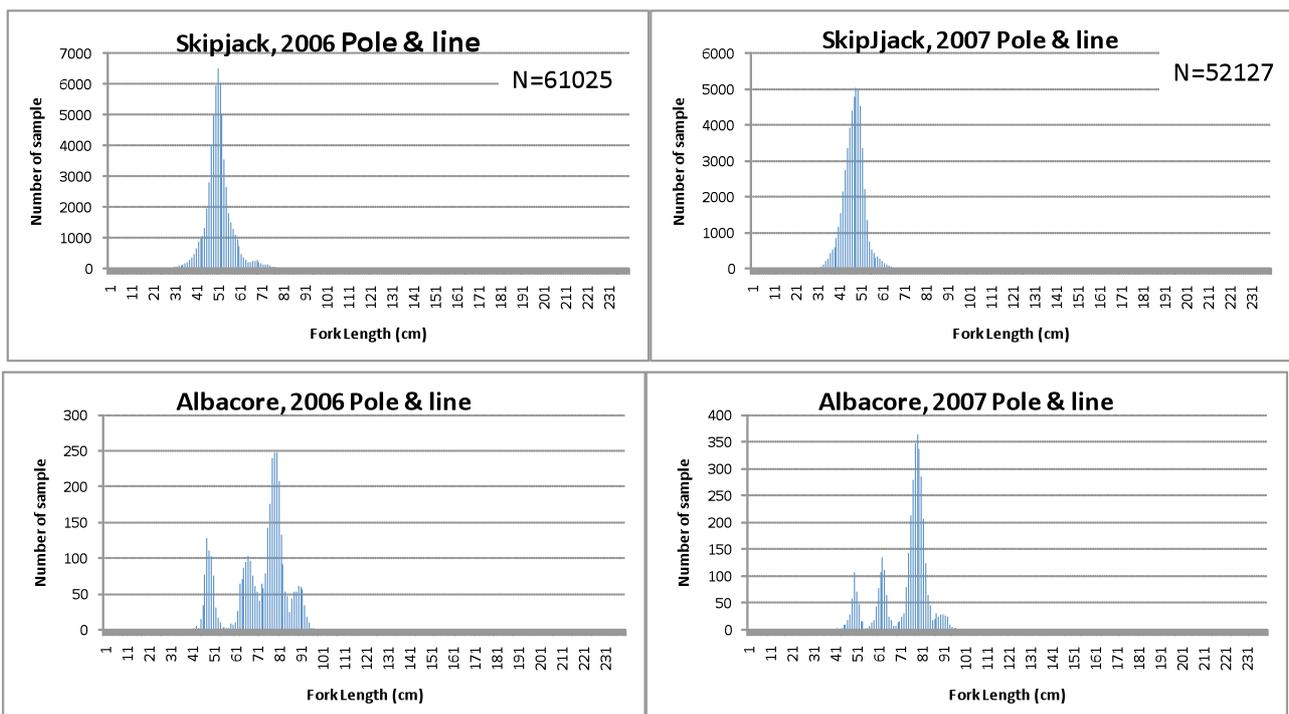


Figure 4. Annual length frequency distribution (so called catch-at-length) for distant water purse seine caught skipjack, bigeye, and yellowfin in 2006 (left) and 2007 (right). Texts in each graph indicate gear, species, year, and estimated number of fish caught by this fishery.



Figure 5. Distribution of fishing effort (number of poles·days) of the Japanese pole-and-line fishery (larger than 20 GRT vessels) in the Pacific. Left: 2006, right: 2007.



下2つのグラフにはサンプル数が入っていない！

Figure 6. Annual length frequency distribution (simply summing up all measurements) for offshore and distant water pole-and-line caught skipjack and albacore in 2006 (left) and 2007 (right). Texts in each graph indicate gear, species, year, and the number of fish measured.