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Salmon Stock Assessment in the North Pacific Ocean, 2005

by

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ABSTRACT

We summarize results of research cruises on salmon stock assessment conducted by Japan in the summer of 2005. Three Japanese salmon research vessels (*Oshoro maru, Kaiun maru* and *Wakatake maru*) conducted oceanographic observations, 49 gillnet (2,422 tans) , 32 longline (778 hachi) and 3 hook and lines fishing operations in the western, central, eastern North Pacific, and the Bering Sea from May to July. Mean sea surface temperature and abundance of Pacific salmon in 2005 are compared to those from 1992 to 2004. Mean sea surface temperature at salmon research stations in 2005 were close to the mean of 1992-2004. A total of 10,384 salmonids was caught using drift gillnets, longlines and hook and line including 5,552 pink (53.4%), 2,234 chum (21.5%), 1,825 sockeye (17.6%), 628 coho (6.0 %), 88 steelhead trout (0.9%), and 57 chinook salmon (0.6%). Mean CPUE of sockeye salmon in the summer of 2005 was in the highest level in 1992-2005, especially in the Bering Sea. Mean CPUE of chum salmon in 2005(49.6) was in the low level during 1992-2005 in the Bering Sea. Mean CPUE of pink salmon in 2005 was rather higher than the mean for odd-years in 1993-2005 in the Bering Sea and in the western North Pacific .

INTRODUCTION

According to the 2004 Work Plan of the North Pacific Anadromous Fish Commission (NPAFC), the Committee on Scientific Research and Statistics (CSRS) should review results of salmon stock assessment research and the condition of salmon stocks (NPAFC 2003). This report summarizes the oceanographic conditions, abundance, of salmon in the North Pacific Ocean and Bering Sea in the summer of 2005 from the salmon research conducted by Japan in the North Pacific Ocean. In this report, we compared results in 2005 with those from 1992 to 2004.

MATERIALS AND METHODS

Three Japanese salmon research vessels (*Oshoro maru, Kaiun maru,* and *Wakatake maru*) conducted 49 gillnet (2,422 tans) and 32 longline (778 hachi) fishing operations in the North Pacific Ocean and Bering Sea from May to July 2005 (Fig. 1). We divided the research area to 4 regions: the western North Pacific (38-51° N, 150-170° E), the central North Pacific (38-52° N, 170° E-170° W), the Bering Sea (52-59° N, 170° E-170° W), and the eastern North Pacific (38-56° N, 170-140°W). To examine abundance of salmon, mean numbers of fish caught by 30 tans of non-selective research gillnets (CPUEs) were calculated (Takagi 1975).

RESULTS

Sea Surface Temperature

Mean sea surface temperature at gillnet stations of Japanese salmon researches was 10.3°C in the western North Pacific, 10.8°C in the central North Pacific, 7.9°C in the Bering Sea, and 11.6°C in the eastern North Pacific in the summer of 2005 (Table 1). These were close to means in 1992-2004. In the Bering Sea, mean sea surface temperature (SST) was higher than the long-term mean SST during the summer of 2005 (Japan Meteorological Agency 2005).

Salmonid and Non-Salmonid Catches

A total of 10,383 salmonids was caught using drift gillnets, longlines and, hook and line including 5,552 pink (53.4%), 2,234 chum (21.5%), 1,825 sockeye (17.6%), 628 coho (6.0 %), 88 steelhead trout (0.9%), and 57 chinook salmon (0.6%) in 2005 (Table 2). No Dolly Varden was caught. Dominant non-salmonid catches included 7,352 Pacific saury (*Cololabis saira*), 1,228 neon flying squid (*Ommastrephes bartrami*), and 4,396 Pacific pomfret (*Brama japonica*).

Salmon Abundance

Mean CPUE of sockeye salmon in the summer of 2005 was in the highest level in 1992-2005, especially in the Bering Sea (Fig. 2). Sockeye salmon are mainly distributed in the Bering Sea and the eastern North Pacific in summer. In 2005, mean CPUE of sockeye salmon in the Bering Sea (88.2) was 224% of the mean in 1992-2004(39.4). In contrast, sockeye CPUE in the eastern North Pacific (5.33) was lowest in the recent years, 13.9% of the mean in 1992-2004 (38.4).

Mean CPUE of chum salmon in 2005(49.6) was in the low level during 1992-2005 in the Bering Sea (Fig. 3). Chum salmon are mainly distributed in the Bering Sea in summer. In this region, chum CPUE is higher in even years than in odd years. Mean CPUE of chum salmon in the Bering Sea (49.6) was lower than the mean in odd-years of 1993-2003 (91.04 ± 38.79 SD), and the lowest year from 1992.

Mean CPUE of pink salmon in 2005 was rather higher than the mean for odd-years in 1993-2005 in the Bering Sea and in the western North Pacific (Fig. 4). Pink salmon are mainly distributed in the Bering Sea and the western North Pacific. In the Bering Sea, CPUEs in odd years are higher than in even years. Mean CPUE in this region of 2005 (195.9) was about 84% of the mean in odd-years of 1993-2003 (234.5 ± 95.5 SD). In the western North Pacific, mean CPUEs in even years were higher than in odd years from 1992 to 1999, but pink salmon CPUE in 2004 (32.2) was rather lower than the mean in even-years of 1992-2004 (106.13 ± 43.03 SD). In contrast, CPUE in 2005 was (176.3) was higher than means of both odd and even yeas from 1992.

Trend of mean CPUE of coho salmon showed decrease from 1998 to 2003. Although mean CPUE of coho salmon in eastern North Pacific in 2004 showed the highest value in the recent 12 years, the CPUE in 2005 was rather low. Coho salmon are mainly distributed in the western, central, and eastern North Pacific. mean CPUE of western and central North Pacific were both still low level in 2005. Chinook salmon are distributed in the Bering Sea and their CPUE in 2005 was lower than mean in 1992-2004 (Fig. 6). Steelhead trout are mainly distributed in the eastern North Pacific and their CPUE in 2004 was still low level in 1992-2005 (Fig. 7).

ACKNOWLEDGMENTS

We thank captains, officers and crew of the *Wakatake maru*, *Oshoro maru*, and *Kaiun maru* for their careful collection of data and samples.

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Table 1. Mean sea surface temperature (°C), standard deviation, and number of observations (in parentheses) of gillnet stations of Japanese salmon researches by regions in the North Pacific Ocean in the summer of 1992-2005.

Year	Western North Pacific			Central North Pacific			Bering Sea			Eastern North Pacific		
1992	9.0	± 4.13	(38)	10.6	± 3.46	(38)	6.6	± 0.53	(11)	9.6	± 0.68	(9)
1993	11.0	± 3.50	(27)	12.0	± 2.94	(32)	7.5	± 0.56	(11)	9.4	± 1.30	(8)
1994	12.9	± 4.99	(29)	12.3	± 4.72	(32)	7.1	± 0.59	(11)	10.4	± 1.10	(10)
1995	11.6	± 4.14	(30)	11.6	± 2.81	(32)	7.8	± 0.70	(11)	9.8	± 1.62	(7)
1996	10.0	± 2.71	(25)	12.4	± 3.18	(33)	7.9	± 0.56	(9)	9.6	± 0.99	(9)
1997	9.2	± 1.79	(20)	11.6	± 3.55	(31)	8.4	± 0.64	(10)	12.2	± 0.43	(9)
1998	10.8	± 4.39	(23)	11.2	± 3.84	(22)	7.5	± 1.14	(11)	10.0	± 1.11	(12)
1999	9.6	± 3.63	(18)	10.7	± 4.22	(19)	6.7	± 0.60	(11)	9.7	± 2.82	(13)
2000	12.6	± 7.14	(21)	9.0	± 2.77	(10)	7.9	± 0.89	(11)	10.0	± 1.77	(14)
2001	12.7	± 4.99	(15)	12.5	± 4.11	(34)	6.0	± 0.69	(13)	8.4	± 1.11	(9)
2002	11.2	± 2.65	(7)	13.4	± 4.15	(37)	7.2	± 0.25	(13)	12.0	± 0.47	(6)
2003	13.9	± 5.38	(11)	13.4	± 5.03	(29)	8.0	± 0.35	(14)	14.7	± 0.34	(3)
2004	13.5	± 4.74	(9)	12.2	± 4.09	(28)	8.3	± 0.94	(14)	13.2	± 2.44	(5)
92-04	11.0	± 4.56	(280)	11.9	± 3.95	(365)	7.4	± 0.94	(150)	10.3	± 2.10	(117)
2005	10.3	± 3.80	(7)	10.8	± 4.02	(39)	7.9	± 0.53	(10)	11.6	± 0.74	(3)

Table 2. Numbers of salmonids and other organisms caught by the Japanese salmon research vessels in summer of 2005.

Region	Research Vessel	Gear	Date	No. operation	Tan/ hachi	Sockeye	Chum	Pink	Coho	Chinook	Steel	Flying squid	Other squid	Pacific pomfret	Pacific saury	Lancet fish	Sharks	Atka mackerel	Walleye pollock	Other fishes	Sea-birds	Mammals
Western	*Oshoro*	Research	May 15-Jul 03	7	210	6	107	1234	5	2	0	6	66	251	0	0	8	0	0	26	13	0
North	*maru*	Commercial	May 15-Jul 03	7	84	1	178	67	10	1	0	4	0	116	0	1	7	0	0	0	10	1
Pacific		Small-mesh	May 15-Jul 03	7	49	0	0	0	0	0	0	0	16	6	52	1	0	0	0	21	0	0
		Longline	Jul 03	1	10	0	3	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0
		Hook & line	Jul 03-Jul04	2		3	5	51	10	0	0	0	0	0	0	0	0	0	0	0	0	0
	Total		May 15-Jul 04			10	293	1353	25	3	0	10	82	373	52	2	15	0	0	47	23	1
Central	*Wakatake*	Research	Jun 16-Jun 22	8	240	354	291	129	110	3	20	0	158	1233	0	0	2	0	0	25	2	0
North	*maru*	Commercial	Jun 16-Jun 22	8	152	3	69	56	129	2	35	1	0	95	0	1	5	0	0	0	0	0
		Longline	Jun 16-Jun 26	11	330	12	79	8	79	1	4	0	1	159	0	3	0	0	0	0	0	0
	Kaiun	Research	Jul 10-Aug 1	21	630	2	247	55	128	5	10	989	432	1290	1361	2	95	1	0	143	5	0
	maru	Commercial	Jul 10-Aug 1	21	336	0	255	66	132	12	8	168	2	689	0	1	35	0	0	73	9	1
		Small-mesh	Jul 10-Aug 1	21	84	0	0	0	0	0	0	1	23	43	5891	0	0	0	0	951	0	0
	Total		Jun 10-Aug 1			371	941	314	578	23	77	1159	616	3509	7252	7	137	1	0	1192	16	1
Bering	*Wakatake*	Research	Jul 1-Jul 14	10	300	882	496	1959	6	17	0	0	20	0	3	0	0	3	0	0	29	0
Sea	*maru*	Commercial	Jul 1-Jul 14	10	190	452	261	1798	3	7	0	0	0	0	0	0	0	0	0	2	22	0
		Longline	Jun 25-Jul 13	18	420	74	133	126	1	7	0	0	0	0	0	0	0	2	0	1	1	0
	Total		Jun 25-Jul 13			1408	890	3883	10	31	0	0	20	0	3	0	0	5	0	3	52	0
Eastern	*Oshoro*	Research	Jul 26-Jul 29	3	90	16	85	1	5	0	4	34	68	298	3	1	2	0	0	165	0	0
North	*maru*	Commercial	Jul 26-Jul 29	3	36	14	14	1	9	0	6	25	0	145	0	0	2	0	0	15	0	0
Pacific		Small-mesh	Jul 26-Jul 29	3	21	1	2	0	1	0	0	0	1	12	42	0	0	0	0	8	0	0
		Longline	Jul 26-Jul 28	2	18	0	0	0	0	0	0	0	0	59	0	0	0	0	0	1	0	0
		Hook &line	Jul 25	1		5	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Total		Jul 25-Jul 29			36	110	2	15	0	10	59	69	514	45	1	4	0	0	189	0	0

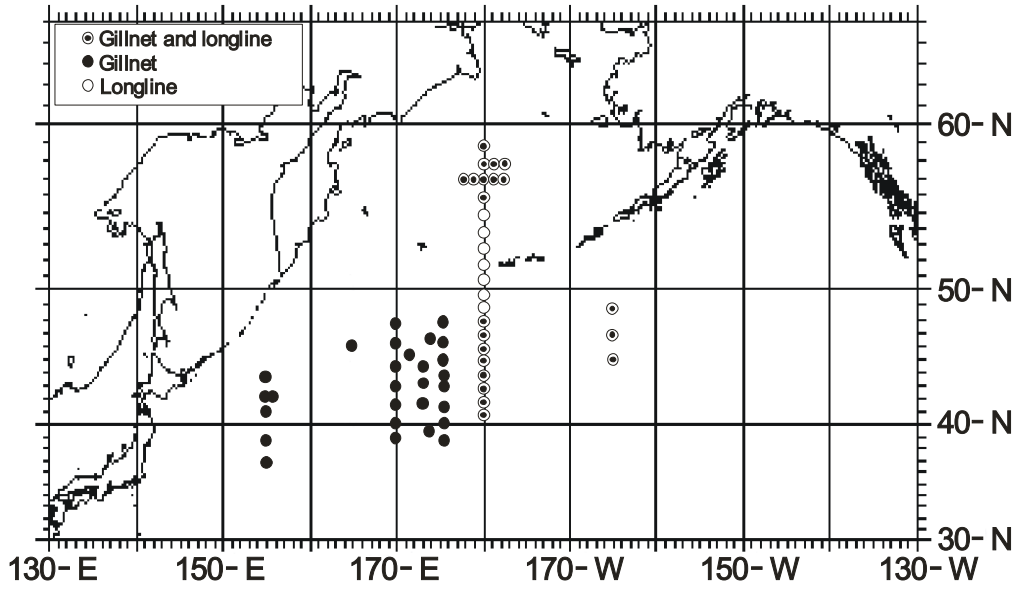

Fig. 1. Sampling locations for Japanese salmon research vessels in the North Pacific Ocean from May to August of 2005.

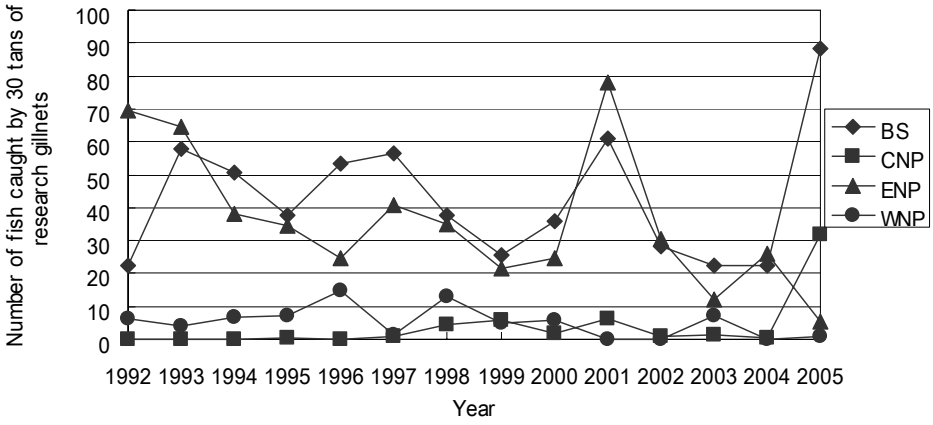

Fig. 2. Number of sockeye salmon caught by 30 tans of research gillnets in summer of 1992-2005 in the North Pacific Ocean.

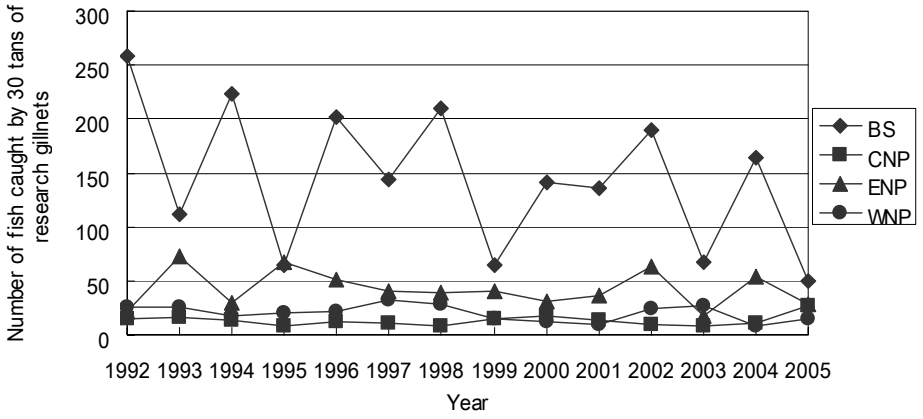

Fig. 3. Number of chum salmon caught by 30 tans of research gillnets in summer of 1992-2005 in the North Pacific Ocean.

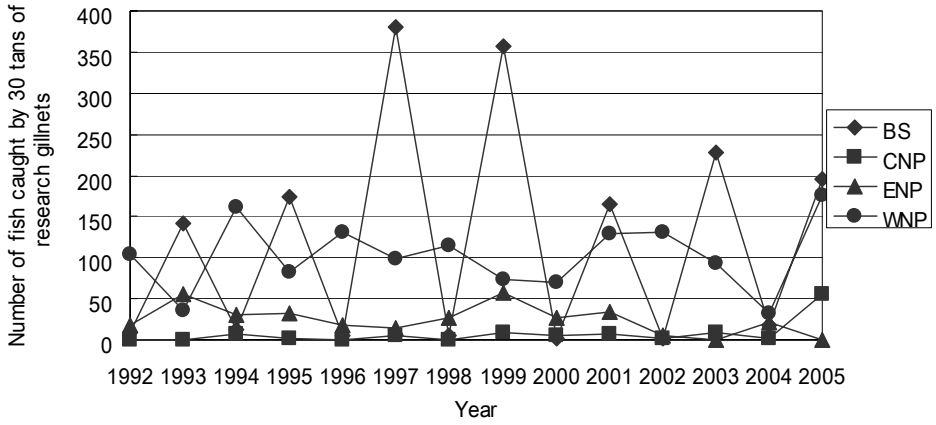

Fig. 4. Number of pink salmon caught by 30 tans of research gillnets in summer of 1992-2005 in the North Pacific Ocean.

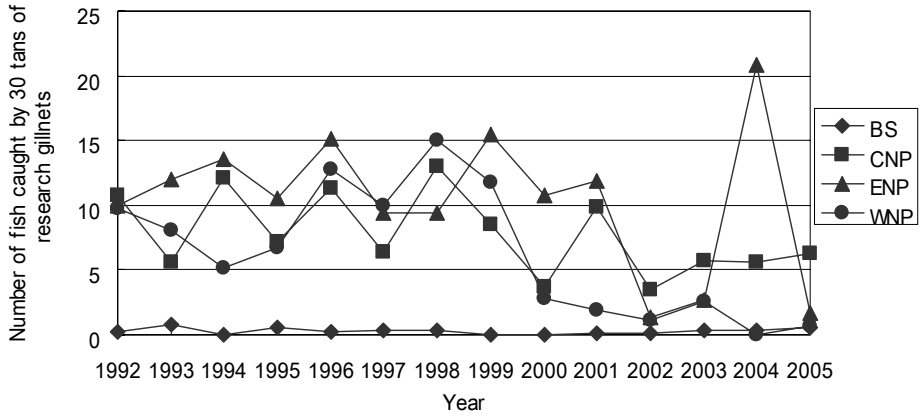

Fig. 5. Number of coho salmon caught by 30 tans of research gillnets in summer of 1992-2005 in the North Pacific Ocean.

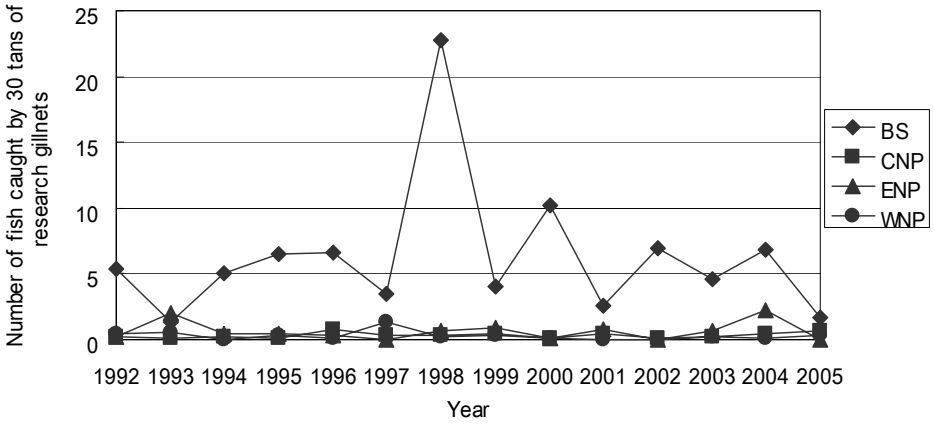

Fig. 6. Number of chinook salmon caught by 30 tans of research gillnets in summer of 1992-2005 in the North Pacific Ocean.

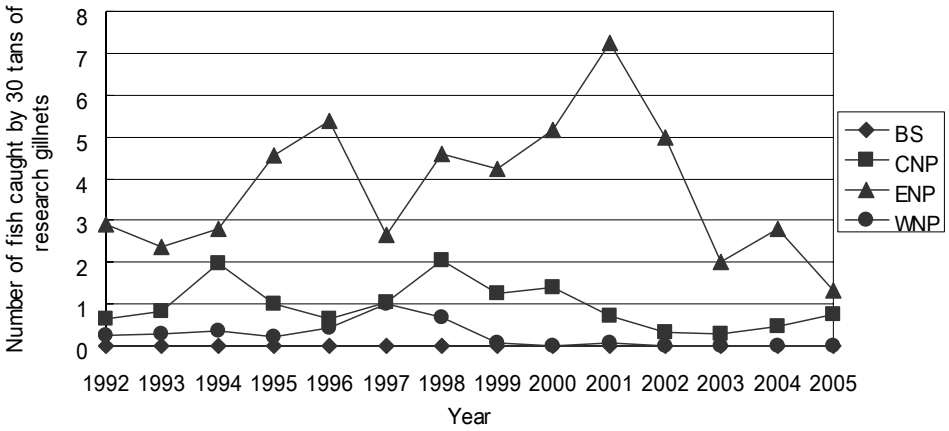

Fig. 7. Number of steelhead trout caught by 30 tans of research gillnets in summer of 1992-2005 in the North Pacific Ocean.