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# **Salmon Stock Assessment in the North Pacific Ocean, 2008**

by

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# Salmon Stock Assessment in the North Pacific Ocean, 2008

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## ABSTRACT

Results of annual research cruises on salmon stock assessment conducted by Japan in the summer of 2008 were summarized. Three Japanese salmon research vessels (*Oshoro maru*, *Kaiun maru* and *Wakatake maru*) conducted oceanographic observations, 38 gillnet (1,873 tans) , 39 longline (935 hachi) and 20 hook and lines fishing operations in the western, central, eastern North Pacific, and the central Bering Sea from May to early August. Mean sea surface temperature and abundance of Pacific salmon in 2008 are compared to those from 1992 to 2007. Mean sea surface temperature at gillnet research stations in 2008 were close to the mean SST of 1992-2007. A total of 8,321 salmonids was caught using drift gillnets, longlines, hook and line, and trawl including 5,608 chum (67.4%), 1,385 pink (16.6%), 932 sockeye (11.2%), 282 coho (3.4 %), 87 chinook salmon (1.05%), 25 steelhead trout (0.3%) and 2 Dolly varden charr (0.02%). Mean CPUE of sockeye salmon in the summer of 2008 was lower than 2005 and 2006 years, but middle level in 1992-2007. Mean CPUE of chum salmon in 2007 was rather low level in the 1992-2008 even-years in the Bering Sea. Mean CPUE of pink salmon in 2007 was moderate level for odd-years in 1992-2008.

## INTRODUCTION

The Japanese high-seas salmon research has been conducted since 1952. We have used research driftnet as standard gear (Takagi 1975), and we have accumulated biological and oceanographic data in the North Pacific Ocean and Bering Sea during summer for salmon stock assessment. This report summarizes the oceanographic condition, and abundance of salmon in the summer of 2008 comparing the results with the archival data from 1992 to 2007.

## MATERIALS AND METHODS

Three Japanese salmon research vessels (*Oshoro maru*, *Kaiun maru* and *Wakatake maru*) conducted oceanographic observations, 38 gillnet (1,873 tans) , 39 longline (935 hachi) and 20 hook and lines fishing operations in the western, central, eastern North Pacific, and the central Bering Sea from May to early August in 2008 (Fig. 1). We divided the research area in 4 regions traditionally: 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). In summer of 2007, we have not done research operation in the eastern North Pacific. 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 (SST) at gillnet stations of Japanese salmon researches was 12.6°C in the central North Pacific, 7.3°C in the Bering Sea in the summer of 2008 (Table 1). These were close to means in 1992-2007. In the Western North Pacific, mean SST in 2006, 2007 and 2008 were rather higher than that of 1992-2005. This result was caused by location change of research stations of the *Kaiun maru* survey.

### Salmonid and Non-Salmonid Catches

A total of 8,321 salmonids was caught using drift gillnets, longlines, hook and line, and trawl including 5,608 chum (67.4%), 1,385 pink (16.7%), 932 sockeye (11.2%), 282 coho (3.4%), 87 chinook salmon (1.05%), 25 steelhead trout (0.3%) and 2 Dolly varden charr (0.02%, Table 2). Non-salmonid, including 4,908 Pacific saury (*Cololabis saira*), 3,893 neon flying squid (*Ommastrephes bartrami*), and 1,211 Pacific pomfret (*Brama japonica*) were also caught in 2008 surveys.

### Salmon Abundance

Mean CPUE of sockeye salmon in the summer of 2008 was middle level in 1992-2008, in the Bering Sea (Fig. 2). Sockeye salmon are mainly distributed in the Bering Sea and the eastern North Pacific in summer. In 2008, mean CPUE of sockeye salmon in the Bering Sea (38.3) was 86% of the mean in 1992-2007 (44.6).

Mean CPUE of chum salmon in 2008 (122.2) was middle level during 1992-2007 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. Among even years, chum CPUE in 2008 was the lowest in the Bering Sea.

In the Bering Sea, pink salmon CPUE is higher in odd years than in even years. Mean CPUE of pink salmon in 2008 (21.8) was higher than the mean for even-years CPUE (7.7) in 1992-2006 in the Bering Sea (Fig. 4).

Trend of mean CPUE of coho salmon showed a decrease from 1998 to 2003, however mean CPUE of coho salmon in the central North Pacific have turned to increase since 2004, and mean CPUE of 2007 was 2nd highest in recent 15 years, but the CPUE in 2008 was lower than that of in 2007 (Fig. 5). Coho salmon are mainly distributed in the western, central, and eastern North Pacific. The mean CPUE in the western North Pacific was still a low level in 2008.

Chinook salmon are mainly distributed in the Bering Sea in summer and their CPUE in 2008 was lower than mean in 1992-2007, but higher than in 2007 (Fig. 6). Steelhead trout are mainly distributed in the eastern North Pacific, but we could not get data in this water. The mean CPUEs in the other waters in 2008 were still low level in 1992-2007 (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.

## REFERENCES

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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 1992-2008.

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)
2005	10.3	± 4.74 (7)	10.8	± 4.02 (39)	7.9	± 0.53 (10)	11.6	± 0.74 (3)
2006	15.3	± 7.38 (20)	12.2	± 3.77 (15)	7.2	± 0.30 (5)	9.6	(1)
2007	17.4	± 5.60 (16)	12.6	± 4.03 (15)	7.3	± 0.66 (14)		
92-07	11.6	± 5.11 (316)	11.9	± 3.96 (424)	7.5	± 0.89 (179)		
2008	18.2	± 7.39 (15)	12.7	± 3.67 (16)	7.4	± 0.61 (14)		

Table 2. Numbers of salmonids and other organisms caught by the Japanese salmon research vessels (excluding *Hokko-maru*) in summer of 2008

Region	RV	Gear	Date	No. of operation	Tan/hachi	Sockeye	Chum	Pink	Coho	Chinook	Steelhead	Dolly varden	Flyingsquid	Other squid	Pacific Pomfret	Saury	Lancet fish	Sharks	Atka mackerele	Walley fishes	Other fishes	Sea Birds	Mammals	
Western North Pacific	<i>Oshoro maru</i>	Research	May 11-16	4	120	0	89	630	0	0	0	0	5	26	19	0	0	1	0	0	4	7	0	
Commercial		May 11-16	4	48	0	179	6	11	0	0	0	0	0	0	14	0	0	0	0	0	0	1	0	
Small-mesh		May 11-16	4	28	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	15	0	0
Central North Pacific	<i>Kaiun maru</i>	Research	Jul 20-Aug01	11	330	0	0	0	0	0	0	0	2437	166	283	30	6	23	0	0	676	0	1	
		Commercial	Jul 20-Aug01	11	176	0	4	0	0	0	0	0	0	29	6	41	0	0	6	0	0	145	0	0
		Small-mesh	Jul 20-Aug01	11	44	0	0	0	0	0	0	0	0	73	21	2	141	0	0	0	0	614	0	0
Subtotal						0	272	636	11	0	0	0	2544	219	359	171	6	30	0	0	1454	8	1	
Central North Pacific	<i>Wakatake maru</i>	Research	June14-21	8	240	0	237	37	83	3	6	0	58	67	114	607	0	13	0	0	30	5	1	
		Commercial	June14-21	8	152	1	12	27	64	2	9	0	0	183	1	93	0	1	14	0	0	0	1	0
	<i>Kaiun maru</i>	Long-line	June13-23	11	330	12	158	14	90	1	9	0	0	0	1	43	0	1	3	0	0	0	0	0
		Research	Jul 09-15	7	210	0	18	0	16	0	1	0	0	915	179	343	1255	0	12	0	0	106	4	0
	<i>Kaiun maru</i>	Commercial	Jul 09-15	7	112	0	8	0	18	0	0	0	0	176	4	181	0	0	19	0	0	48	0	0
		Small-mesh	Jul 09-15	7	28	0	0	0	0	0	0	0	0	10	16	6	2874	2	2	0	0	2	1	0
	<i>Oshoro maru</i>	Research	Jun 09-10	1	30	0	0	0	0	0	0	0	0	2	0	69	0	0	8	0	0	1	0	0
		Commercial	Jun 09-10	1	12	0	0	0	0	0	0	0	0	5	0	3	0	0	5	0	0	0	0	0
		Small-mesh	Jun 09-10	1	7	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
		Long-line	Jun 09-10	1	10	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
Subtotal	Hook and line	Jun 09-10	2	0	0	7	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Subtotal						13	440	87	271	6	25	0	1349	268	852	4737	4	77	0	0	187	11	1
Bering Sea and Chukchi Sea	<i>Wakatake maru</i>	Research	Jun 29-Jul 12	14	420	536	1711	306	0	41	0	0	0	3	0	0	0	0	203	1	4	29	0	
Commercial		Jun 29-Jul 12	14	266	253	1582	274	0	20	0	2	0	0	0	0	0	0	2	0	2	1	31	0	
Long-line		Jun 24-Jul 12	17	510	60	1566	48	0	20	0	0	0	0	0	0	0	1	0	29	0	1	2	0	
Subtotal	<i>Oshoro maru</i>	Long-line	Jun 15-Jul 04	10	85	1	2	0	0	0	0	0	0	0	0	0	0	1	0	0	33	0	0	
	Hook and line	Jul 12-Jul 22	18		69	35	34	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Subtotal						919	4896	662	0	81	0	2	0	3	0	0	1	3	232	3	39	62	0	
Total						932	5608	1385	282	87	25	2	3893	490	1211	4908	11	110	232	3	1680	81	2	

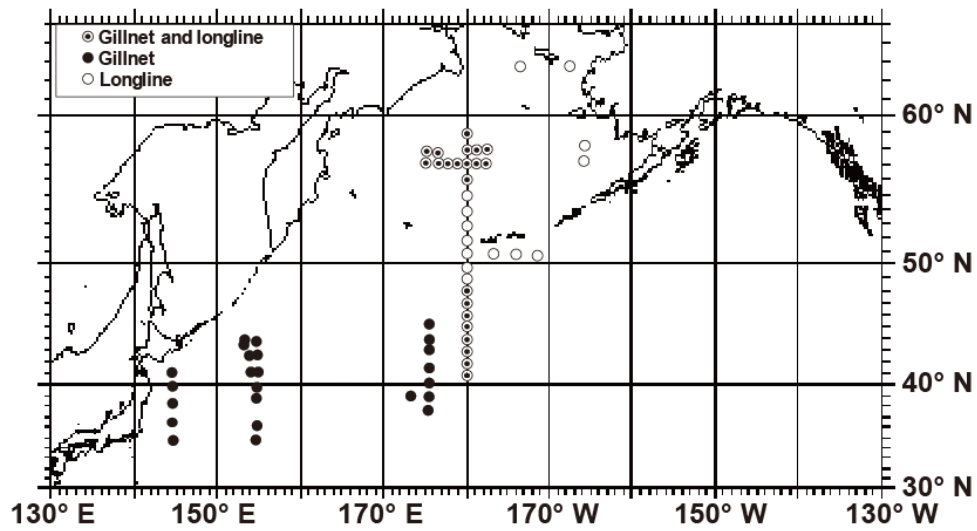


Fig. 1. Sampling locations for Japanese salmon research vessels in the North Pacific Ocean from May to August of 2008.

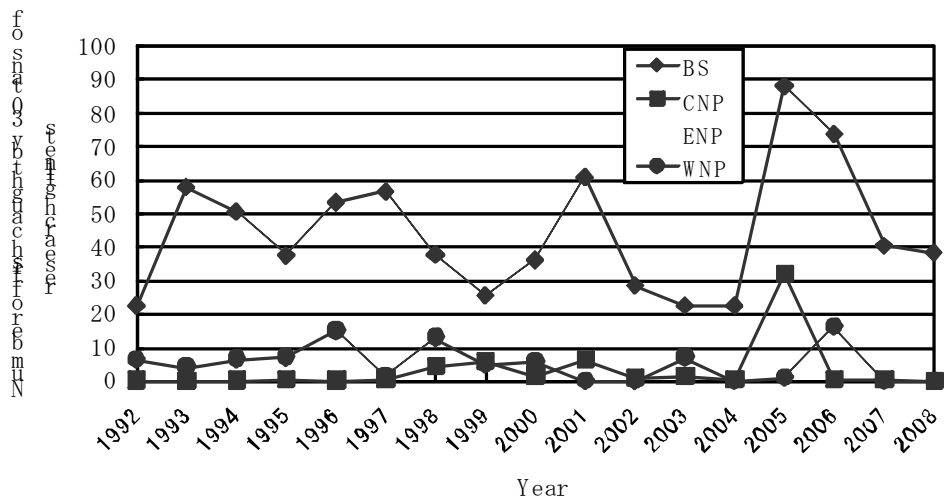


Fig. 2. Number of sockeye salmon caught by 30 tans of research gillnets in summer of 1992-2008 in the North Pacific Ocean.

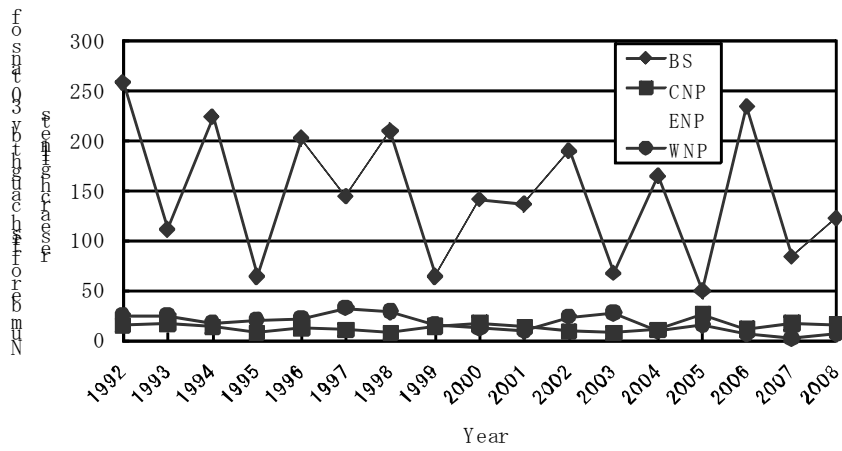


Fig. 3. Number of chum salmon caught by 30 tans of research gillnets in summer of 1992-2008 in the North Pacific Ocean.

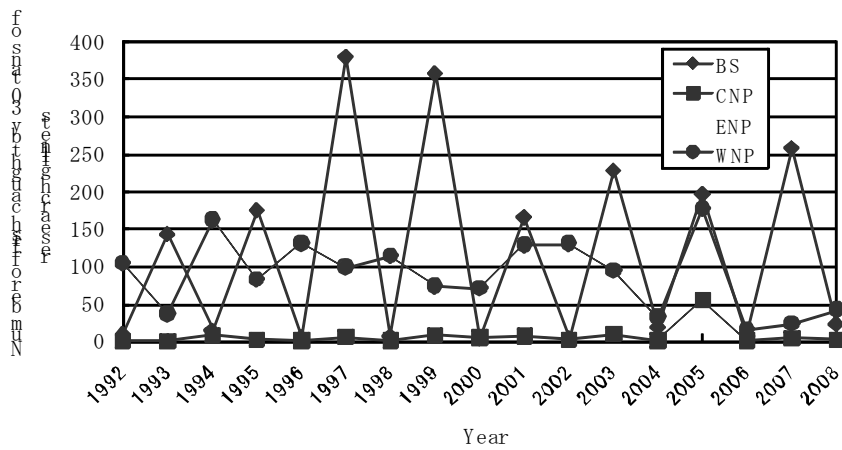


Fig. 4. Number of pink salmon caught by 30 tans of research gillnets in summer of 1992-2008 in the North Pacific Ocean.

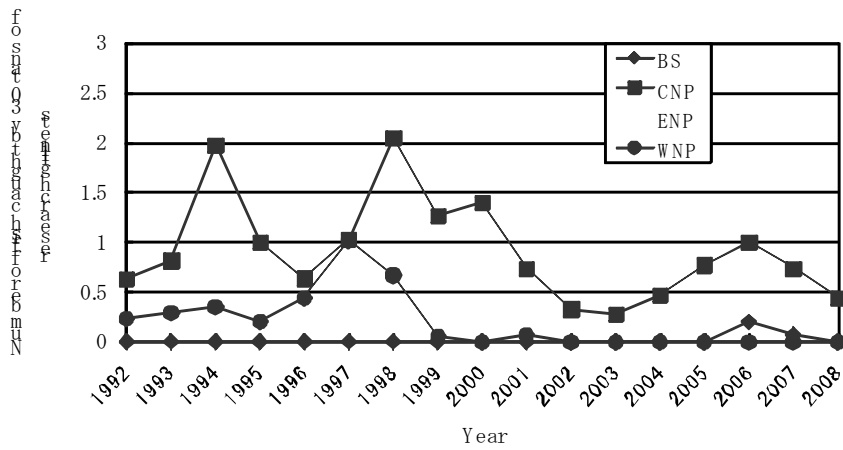


Fig. 7. Number of steelhead trout caught by 30 tans of research gillnets in summer of 1992-2008 in the North Pacific Ocean.

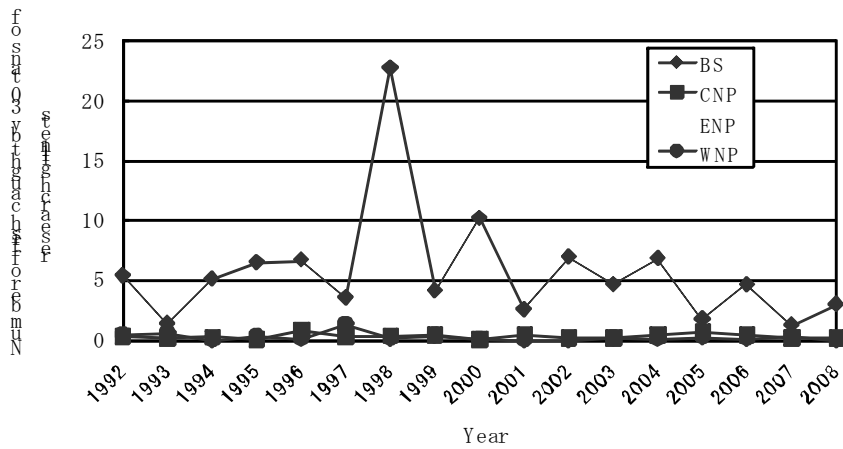


Fig. 6. Number of chinook salmon caught by 30 tans of research gillnets in summer of 1992-2008 in the North Pacific Ocean.