

NPAFC
DOCUMENT

Ser. No. 169

Rev. No. _____

Some abnormalities in salmon noted during their
marine period of life.

V. I. Shershneva

Kamchatka Research Institute of Fisheries and Oceanography,
KamchatNIRO, 683602, Petropavlovsk -Kamchatskii, RUSSIA

Submitted to the North Pacific Anadromous Fish Commission

by the

Russian National Section

October 1995

This paper may be cited in the following manner:

Shershneva, V. I. 1995. Some abnormalities in salmon noted during their marine period of life. NPAFC Document No. xx, xx p. Available from: Kamchatka Research Institute of Fisheries and Oceanography, KamchatNIRO, 683602, Naberzhnaya 18, Petropavlovsk -Kamchatskii, RUSSIA.

Abstract

In the years 1989 and 1994, observations on 6356 samples of 5 salmon species (pink, chum, sockeye, coho, and chinook) from the Sea of Okhotsk and in the northwestern the Pacific Ocean were made during the feeding and prespawning migrations. In some cases, endoparasite invasions (Nematodes, Cestodes) in sockeye, chum, and chinook salmon were observed. These included injuries to the skin, absence of the ventral and parts of the caudal fin, and deviations in gonadal development were noted.

Introduction

The first observations on abnormalities noted in salmon during their feeding and prespawning migrations in the Sea of Okhotsk were obtained in July-August 1989 (Shershneva and Shisterov, 1989). Pink, chum, and sockeye salmon with skin injuries and tumours in the peritoneal cavity were found, as well as individuals missing parts of the ventral and caudal fins or with abnormal gonadal development. In addition, some cases of infection by endoparasites (helminth) were found.

Similar observations were continued in July-September of 1994 in the northwestern Pacific Ocean and the Sea of Okhotsk (Shershneva and Urusova, 1994). There was an increase in the number of salmon (pink, chum, sockeye, coho, and chinook) with abnormal conditions and helminth invasions in 1994 in contrast with 1989.

This report contains the descriptions of abnormal conditions in different salmon species.

Methods

All samples were collected through marine expeditions to the Sea of Okhotsk (the district of Forth Kuril Strait) in July-August 1989 and in the northwestern Pacific Ocean and Sea of Okhotsk in July-September 1994 (fig. 1,2). Sampling was made by 55 and 60 mm mesh drift gillnets.

The presence of helminths in the abdominal cavity, skin lesions, abnormal conditions in gonadal development, etc., was noted visually. Species identification of parasites was not carried out. In some cases the number of nematodes in the abdominal cavity of sockeye was counted.

Biological analysis involved five salmon species: 1782 specimens in 1989, and 4574 specimens in 1994 (table 1).

Table 1. *Sample sizes for collected material.*

<i>Species</i>	<i>Sea of Okhotsk</i>		<i>Pacific Ocean</i>	<i>Total</i>
	<i>1989</i>	<i>1994</i>	<i>1994</i>	
<i>Pink</i>	351	209	829	1389
<i>Chum</i>	524	325	874	1723
<i>Sockeye</i>	557	305	1388	2250
<i>Coho</i>	350	457	55	862
<i>Chinook</i>		17	115	132

Results

Endoparasite infection of salmons

Helminth species were not identified, and only the presence of parasites in the body of salmon was recorded. In 1989, the prevalence of cestode infection in chum from the Sea of Okhotsk was 4.8%, but in 1994 it was only 2.2%. In the Pacific Ocean, the prevalence in chum was three times higher in 1994 (6.9%).

The prevalence of cestode infection in chinook caught in the Pacific Ocean in 1994, was high (48.7%) compared with in the Sea of Okhotsk (6.3%).

In the Sea of Okhotsk in 1994 nematode infection of sockeye was somewhat higher than in 1989 (13.7% and 0.5%, respectively). In the Pacific Ocean the prevalence was lower (0.6%). *Philonema oncorhynchi* infections in sockeye were discovered in all localities. Determination of the presence of this nematode in the abdominal cavity

seemed easy visually, because the main sign of this type of infection is visceral adhesions (Laiman, 1934; Mamaev et al., 1956; Konovalov, 1971; Karmanova, 1991).

Lesions of the skin and visceral organs.

When the skin of the caught salmon was examined, ulcers of 5 and 10 cm in diameter were discovered on two pink salmon on the left side of the body above the abdominal fin (see appendix, N 853 - 1989; N 1341 - 1994). The margins of the ulcers were necrotic and elevated above the skin surface.

The cavity of the ulcer extended about 2 cm down the corium and was filled by a serous mass. In the posterior one-third of the right-side of the body of a sockeye salmon (N 1659 - 1989), a soft 12-14 cm tumour was found under the skin. After cutting into the tumour, a pinkish-white liquid squirted out (200 ml). There were only gray-yellowish clots instead of muscles under the skin. The muscle tissue was totally destroyed and the spine and skeletal bones were stripped. Visceral organs were covered with a whitish-yellow coating, similar to curd clots.

After cutting the abdominal cavity of a chum salmon (N 4327 - 1994) a dense bean-shaped tumour, consisting of a pinkish homogenous mesodermal tissue was discovered in the center of the kidney.

Gonadal Abnormalities of Salmon.

Examination of gonad condition showed the absence of the right gonad in some adult males in all species. Only a rudiment of the gonad remained. The size of the left gonad was only one-third (5-7 cm) normal size in pink, and two-thirds (10-12 cm) normal size in chum and sockeye salmon. The frequency of such abnormalities in pink salmon males was 0.24% and 2.9% in 1989 and 1994, respectively, 0.23% in male chum salmon in 1994, and 0.15% and 0.33% in male sockeye salmon in 1989 and 1994, respectively.

The weight of the abnormal gonads in pink salmon varied from 10 - 35 g (average weight >100 g); from 40 to 60 g in sockeye salmon (average weight > 150 g) and from 48 - 100 g in chum salmon (average weight > 200g)(NN 1001, 725 - 1989; NN 956,2073, 3772, 3775, 3790, 3808, 3853, 3880,3897 - 1994).

Deviations noted in the gonadal development of sockeye, pink, and chum salmon females differed: abnormal oocytes and ovaries, and the absence of the right gonad. Abnormal

oocytes were distributed in the mesodermal tissue of the gonads as whitish spots (about 1 mm diameter). Sometimes there were small abnormal oocytes and 20-30 normal ones in the ovary (NN 908, 1244 - 1989; NN 2321, 3783, 3791 - 1994). Abnormal ovaries were noted in 0.28% of pink salmon caught in 1989, and in 0.96%; of females caught in 1994. The proportion was very similar for chum salmon caught in 1989 and 1994, 0.19% and 0.11%, respectively. Three females sockeye salmon collected in 1994 (0,14%) had left developed ovaries (60 g, 140 g and 185 g; NN 898, 2095, 2529).

Age and Scale Structure Abnormalities.

In the northwestern Pacific Ocean, a 2 yr old male of pink salmon with body length and weight of 61cm and 2800g was caught in 1994 (N 2219). There were two reproductive males of coho caught in 1994 at age 2.2+ (N 4162, N 4237), which had spent only 3-4 months at sea (age estimated by V. Karpenko). In one sockeye caught in 1994 (N 4558), about ten scales of twice the normal dimension were distributed vertically from the dorsal to the anal fin. Microscopic examination showed that the increase in size was caused by the union of two scales into one with two foci. The age of this fish was estimated by A. Dekshstein as 5.1+ years.

Fin Injuries in Sockeye Salmon.

In two sockeye salmon caught in the Sea of Okhotsk (N 981, 1052), the extreme lower part of the caudal fin was cut. Similar cuts were seen in two sockeye caught in the Sea of Okhotsk in 1994 (N2770, 3417). Left ventral fins were missing in nine sockeye salmon (NN1322, 1722, 1723, 1760, 1824, 1981, 2115, 2529, 2534) caught in the Pacific Ocean and in two sockeye salmon (NN3856, 3937) caught in the Sea of Okhotsk. The scarred sites were identical, and had similar shape and dimension. It seems likely that the absence of the left ventral fin resulted from a specific trauma during the very early ontogeny, (for example, fin clipping), but fin clipping of sockeye salmon is not carried out in the Far East (V. Davydov, KamchatRybVod). It is known, however, that finclipping of the left ventral fin in juvenile of pink and chum is common in British Columbia hatcheries (Perry and Bailey, 1990).

Conclusions.

These data demonstrate the differences in endoparasite infections of salmon between years. High prevalences of helminth infections were found in chinook salmon (48,7%) caught in the Pacific Ocean. The prevalence of cestode infection in chum salmon increased from 4,8% in 1989 to 6,9% in 1994, while the prevalence of nematode

infections in sockeye increased from 0.5% in 1989 to 13.7% in 1994. The proportion of pink salmon males with only left gonads increased from 0.24% in 1989 to 2.9% in 1994, and in sockeye salmon it increased from 0.15% in 1989 to 0.33% in 1994. The prevalence in chum salmon was 0.23% in 1994.

The proportion of pink females with abnormal oocytes and ovaries increased from 0.28% in 1989 to 0.96% in 1994, while in chum salmon it remained more or less constant (0.19% in 1989 and 0.11% in 1994). In 1994, the proportion of sockeye females with abnormal ovaries was 0.14%. The described deviations in gonadal development are probably not rare, but I do not know of any confirming reports.

Cases of abnormal conditions (helminth infections, trauma, abnormal gonadal development, etc.), noted in salmon during their feeding or prespawning migrations, are of great interest for future investigations.

References..

Karmanova, I. V. 1991. Some aspects of investigations of Pacific salmon parasites of Kamchatka. In: Invest. Biol. And Dynamic Commercial Fishes of Kamchatka Shelf. V. 1 (II): 82-94.

Konovalov, S. M. 1971. Differentiation of local stocks sockeye. Leningrad, Nauka, 229 p.

Liaman, E. M. 1934. Fish diseases caused by parasite worms (helmitoses of fishes). Moscow - Leningrad, Snabtechnizdat, 135p.

Perry, E., D. Bailey. 1991. Estimation of hatchery reproduction of chum and pink salmon, British Columbia. In: Internal Report, TINRO, Vladivostok, p.101-103.

Shershneva, V. I., Shisterov, M. V. 1989. Report of cruise in the east Okhotsk Sea and near Kuril Island area of Pacific ocean in 1989, July 8 - November 10. Petropavlovsk-Kamchatskii, 20 p.

Shershneva, V. I., and L.F. Urusova. 1994. Cruise report on program of scientific investigation of anadromous migration of Pacific salmon in the northwestern Pacific ocean and eastern Okhotsk Sea. Petropavlovsk-Kamchatskii, 25 p.

Mamaev Y.L., Parukhin A.M., Baeva O.M., and Oshmarin P.G. 1959. Helminths of Far East salmon according to question on local stocks and migrations these fishes. DVF SO AN USSR, TINRO, 73 p.

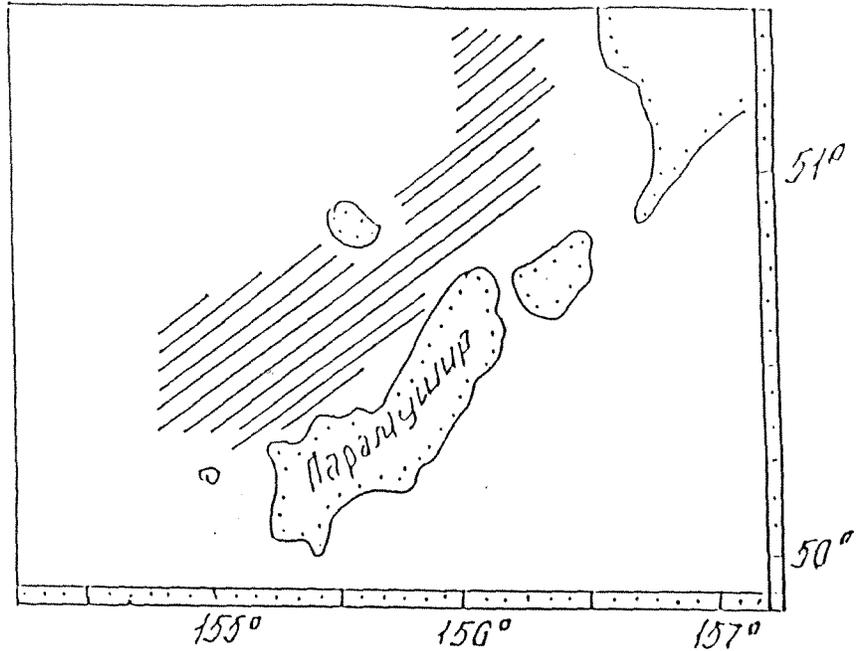


Figure 1. Area of investigations in the Okhotsk sea, 1989, July-August

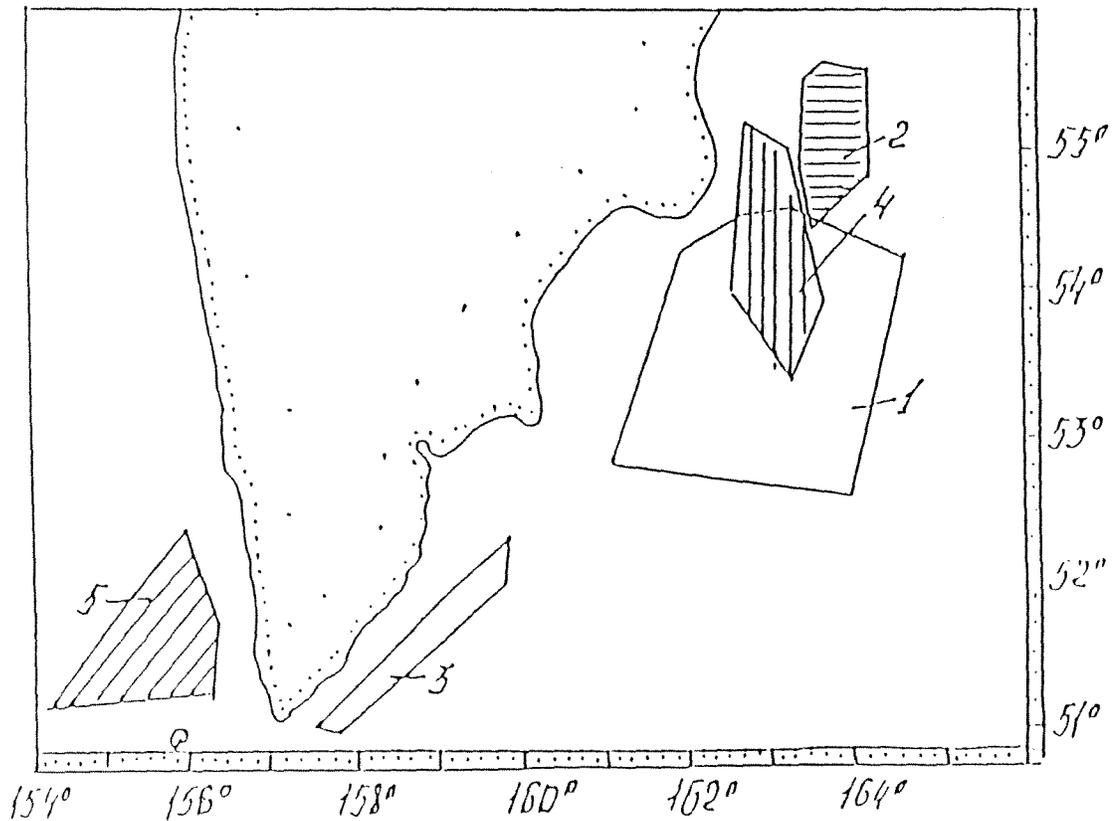


Figure 2. Area of investigations in the northwest Pacific and Okhotsk sea, 1994, July-September

1 - gillnet sets NW 1-23 ; 2 - NW 24-35 ; 3 - NW 36-44,
4 - NW 45-51 ; 5 - NW 52-70

Appendix

Qualitative parameters of salmon in the Sea of Okhotsk and northwestern Pacific Ocean (1989 - drift gillnet. NN 14-36; 1994 - NN 11-78).

No.	Species	Sample Number	Length (cm)	Wt. (g)	Sex	Gonad Wt. (g)	Date	Latitude	Longitude
14	Sockeye	728	57.0	2750	M	48	28/07/89	50°24	155°12
17	Pink	853	50.0	1300	F	136	01/08/89	50°24	155°12
18	Chum	908	61.0	3100	F	110	02/08/89	50°24	155°11
19	Sockeye	981	61.0	2750	F	202	03/08/89	50°27	155°13
20	Sockeye	1052	61.5	2800	F	188	04/08/89	50°28	155°09
20	Pink	1001	48.0	1050	M	18			
26	Pink	1244	43.0	1000	F	36	12/08/89	50°28	155°09
36	Sockeye	1659	58.0	2700	M	50	24/08/89	50°29	155°06
11	Sockeye	898	54.0	2200	F	60	17/06/94	54°25	163°12
	Pink	956	45.0	1200	M	35			
17	Sockeye	1322	54.0	2000	F	125	23/06/94	54°15	163°35
24	Sockeye	1722	58.0	2800	F	25	02/07/94	55°08	163°28
	Sockeye	1723	58.0	2900	M	40			
25	Sockeye	1760	64.0	4100	M	40	03/07/94	55°07	163°27
26	Sockeye	1824	55.0	2300	F	145	04/07/94	55°18	164°00
28	Sockeye	1981	54.0	2300	F	120	06/07/94	55°25	164°00
	Chum	2073	57.0	3200	M	100			
30	Sockeye	2095	61.0	3100	F	140	08/07/94	55°27	163°25
	Sockeye	2115	59.0	2600	M	55			
	Pink	2219	61.0	2800	M	100			
31	Chum	2321	62.0	3000	F	2	09/07/94	55°27	163°38
35	Sockeye	2529	56.0	2500	F	185	13/07/94	54°44	163°50
	Sockeye	2534	48.0	1500	M	5			
41	Sockeye	2770	58.0	3000	M	75	30/07/94	51°04	157°40
58	Sockeye	3417	57.0	2800	F	100	19/08/94	51°20	155°20
	Pink	3471	49.0	1500	F	170			
61	Pink	3772	48.0	1000	M	15	22/08/94	51°20	155°40
	Pink	3775	44.0	950	M	25			
62	Pink	3783	44.0	1100	F	15	23/08/94	51°30	155°40
	Pink	3790	54.0	2100	M	25			
	Pink	3791	51.0	1600	F	30			
	Pink	3808	47.0	1300	M	25			
	Sockeye	3853	57.0	2400	M	30			
	Sockeye	3856	59.0	2900	F	120			
65	Pink	3880	45.0	1000	M	10	26/08/94	51°05	155°09
	Pink	3897	49.0	1100	M	25			
	Sockeye	3937	60.0	3000	M	40			
69	Coho	4162	32.0	600	M	40	30/08/94	51°08	155°25
71	Coho	4237	32.0	550	M	45	01/09/94	51°20	155°15
72	Chum	4327	59.0	2900	M	5	02/09/94	51°10	155°10
78	Sockeye	4558	53.0	2200	M	5	09/09/94	51°28	155°30