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**PRELIMINARY RESULTS OF STUDYING PACIFIC SALMON  
(*ONCORHYNCHUS*) OF THE URUP ISLAND**

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## Abstract

In this paper the results of studying peculiarities of the Urup Island Pacific salmon reproduction in 2000-2001 are presented. The data on abundance and biological peculiarities of investigated species are given.

## Introduction

Salmonid fish of the largest islands of the Great Kuril Ridge (Kunashir and Iturup) have been put into fishery for more than a century. As for salmon of the Urup Island (a third by size island of the Great Kuril Ridge), they are not being exploited by fisheries because of the poor study of their stock. First, this island was surveyed by the staff of SakhNIRO and Sakhalinrybvod in 1974 and 1982.

These expeditions have found vast spawning areas occurring in the island's water bodies, and great numbers of pink, sockeye, chum salmon, and char from the genus *Salvelinus* spawning in those water bodies. The total spawning area of lakes and rivers on the island was estimated as 350000 m<sup>2</sup>, and the possible catch of salmon (pink) as 1500 tons. A systematic study of the Urup Island was started in 1999 and continued up to 2001. The research workers of VNIRO, SakhNIRO, and Sakhalinrybvod have conducted this study under the technical assistance of ZAO "KUK". In 2002 the works were not conducted due to some organizational causes, however, they should be continued in 2003. The aim of investigations is the assessment of stock abundance of Pacific salmon spawning in rivers of the island's Okhotsk Sea coast, and elaboration of recommendations on the rational fishery of prespawning aggregations. In this paper the results of the 2000-2001 works are elucidated.

## Material and methods

Results and analysis are based on materials collected by authors on the Urup Island during June-October 2000-2001.

For two years, a total of 15 water bodies along the Okhotsk and Pacific coasts of the island have been investigated (Fig. 1); 4 water bodies (rivers Bystraya, Obzhitaya, Rybnaya, and a lake-river system Tokotan) were inspected not less than two times every year (Table 1).

The gear included six test nets of 16?16 mm, 25?25 mm, 45?45 mm, 50?50 mm, 60?60 mm, and 70?70 mm mesh. A drag net (20 m long, 3.0 m in wall height, 3.0 m in codend length, 45 mm in netting wings and 20 mm in codend) was used for fishing in the mouth and lower course of rivers, and in the Tokotan Lake. In addition, a fingerling seine (3 m long, mesh of 10?10 mm in wings and 5?5 mm in codend) was used for fishing in water bodies.

Materials have been collected since June through October according to the accepted methods (Pravdin, 1966). Analyses were done every week; lengths AC and AD, body and gonad weights were determined in each case. In order to identify the age of chum, sockeye, and coho salmon we sampled otoliths and scales. A total of 932 pink, 158 chum, 203 sockeye, and 20 coho salmon were taken for biological analysis.

The dates of sockeye, pink, chum, coho salmon, and char spawning migrations were elucidated both by observations directly on spawning grounds and by analysis of the dynamics in catches by means of the test nets.

Identification of fish age was conducted by the staff of VNIRO Laboratory of fish growth study. Statistic data processing was done with the help of the program MS Excel 2000.

## Results

### Ichthyofauna composition

Earlier, from 6 to 10 species (Water biological resources of the Urup Island, 2000, Shedko, 2002) have been found in the island water bodies. Our catches included 10 fish species.

#### **Genus *Oncorhynchus*** (Pacific salmon)

*Oncorhynchus gorbuscha* (Brevoort) – pink salmon

*Oncorhynchus keta* (Walbaum) – chum salmon

*Oncorhynchus nerka* (Walbaum) – sockeye salmon

*Oncorhynchus kisutch* (Walbaum) – coho salmon

*Oncorhynchus tshawytscha* (Walbaum) – chinook salmon

#### **Genus *Salvelinus*** (char)

*Salvelinus leucomaenis* (Pallas) – Sakhalin char

*Salvelinus malma krascheninnikovi* (Taranetz) – southern malma

*Salvelinus curilus* (Pallas) – freshwater malma

#### **Genus *Gasterosteus*** (stickleback)

*Gasterosteus aculeatus* L. – threespine stickleback

#### **Genus *Pungitius*** (stickleback)

*Pungitius* sp.

We need to note that in the Tokotan lake-river system we have found chinook salmon being unmentioned in the reports of other expeditions, but we have not found masu salmon, which are supposed to occur in the island rivers by the data of previous researchers (Water biological resources of the Urup Island, 2000).

### **Pink salmon**

The most abundant species of Pacific salmon spawning in the water bodies of the Okhotsk coast of the Urup Island is pink salmon. This species enters practically all rivers of the Okhotsk Sea coast and major rivers of the Pacific side of the island (Water biological resources of the Urup Island, 2000). The highest density of pink salmon was recorded on the spawning grounds of rivers Rybnaya (up to 300-400 ind./100 m<sup>2</sup>) and Obzhitaya (up to 200 ind./100 m<sup>2</sup>). In the surveyed rivers of the Pacific coast the pink salmon density and their abundance were significantly lower (Table 2).

In 2001 a spawning migration of this species began in late June, that coincided with the dates of the Iturup Island pink salmon entering the rivers (Water biological resources of the Urup Island, 2000), and was a little ahead of the beginning of the North Kuril pink spawning run (Water biological resources of the North Kuril Islands, 2000). Based on the 2000 observations, pink salmon enter the Tokotan lake-river system up to the late October – early November. In general, a pink salmon spawning migration to the water bodies of Urup Island (like the adjoining Iturup Island) is distinguished by its great duration (4-4,5 months) (Water biological resources of the Urup Island, 2000). A percentage ratio between females and males appreciably change during the pink spawning migration. At the beginning of the run (July) males prevailed, in September the sex ratio was close to 1:1, in October the number of females moving to spawning grounds declined again (Fig. 2). Pink salmon spawners from the river mouths and Tokotan Lake catches were at III-IV stages of maturity, reaching the V stage on spawning grounds of Shabalin and Tokotan rivers (Table 3).

Some biological indices of the Urup pink salmon are given in Table 4.

### **Chum salmon**

Chum salmon occupies the second place by abundance among salmon from the Okhotsk coast of the Urup Island. The most abundant chum occurs in the Tokotan Lake System; in the rest water bodies the representatives of this species occurred sporadically in the survey period. In 2001, the beginning of chum salmon entrance into the basin of Tokotan Lake took place in the first 10-day of August. Judging from the 2000 observations, chum salmon spawning migration continues to the end of October and completes, probably, in November. A total number of chum spawners counted on spawning grounds of the Tokotan Lake system (Tokotan Lake and Shabalin River) in October 2000 was 5775 individuals. Majority of spawners, when entering the Tokotan Brook, are at IV stage of maturity, reaching the V stage on spawning grounds (Table 5).

Some biological indices of the Urup chum salmon are given in Table 6.

In 2000-2001, age 4+ fish prevailed, the second place was occupied by the age 5+ group, and the third place belonged to spawners at age 3+ (Table 7).

### **Sockeye salmon**

The third place by abundance among salmon of the Okhotsk coast is occupied by sockeye salmon spawning exclusively on spawning grounds of the Tokotan Lake (specimens of this species enter the rivers sporadically). Its total number on the Tokotan Lake spawning grounds did not exceed 3630 fish in 2000. The first specimens of sockeye salmon began to occur in the Tokotan Brook in late first – early second 10-day of July (Table 7). Judging from results of the 2000 investigations, the run of sockeye salmon as well as of other Urup Island salmon species is very extended. Individual fish, having silver color, occur in the Tokotan Brook during October and even after the beginning of often floods and completion of sockeye mass spawning on the Tokotan Lake spawning grounds.

Some biological indices of the Urup sockeye salmon are given in Table 8.

The dominant age groups among sockeye spawners both in 2000 and in 2001 were age 4+ fish. The second place was occupied by age 5+ spawners. Specimens lived 2 years in fresh waters and 2 years in sea made up the highest percent among spawners entered for spawning in 2000 and 2001.

### **Coho salmon**

Coho salmon entrance into the Tokotan Lake system was recorded in the first 10-day of September. From catches this species occupied the fourth place by abundance among the Urup Island Pacific salmon; in rivers it was found sporadically. Evidently, the main approaches of spawners of this species occur later (perhaps, in November-December).

Majority of spawners (70%) before entering the Tokotan Brook were at III-IV stages of maturity.

Some biological indices of the Urup coho salmon are given in Table 9.

Majority of coho salmon enter the Tokotan system for spawning at the age of three years old (males – 80%, females – 62% of the total number).

In addition to pink, chum, sockeye, and coho salmon, the sporadic chinook specimens have been found in the Urup Island water bodies.

## **Brief results**

1. The most abundant populations of the Urup Island Pacific salmon reproduce in rivers of the Okhotsk coast of the island: Otkrytiy Roadstead (water bodies of the Tokotan Lake basin),

Smugliy Bay (Rybnaya River), Nataliya Bay (rivers Obzhitaya and Kruchinushka), Novokurilskaya Bight (Bystraya River).

2. Abundance of the commercial salmon species spawning in the largest water bodies of the Okhotsk coast of the Urup Island was well determined. The most abundant species in the island rivers was pink salmon (its number varied from 720,8 thousand ind. to 1033 thousand ind.), the second place was occupied by chum salmon (its number did not exceed 6 thousand ind.), and sockeye salmon was on the third place (counted about 4 thousand ind.). The rest salmon species (coho and chinook) are not abundant and commercially unimportant.

### References

1. Pravdin I.D. 1966. Manual on fish study (mainly freshwater species). - Moscow: Pischevaya promyshlennost. – 4<sup>th</sup> Edition. - 376 p. (In Russian)
2. Shedko S.V. 2002. Review of freshwater ichthyofauna. In: Flora and fauna of Kuril Islands: Materials of International Kuril Project.- Vladivostok: Dalnauka.- 163 p. (In Russian)
3. Water biological resources of the North Kuril Islands. 2000. Moscow: VNIRO Publisher. – 163 p. (In Russian)
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**Table 1**

Water bodies of Urup Island surveyed in 2000-2001

Name of water body	Number of surveys	
	2000	2001
<i>Okhotsk coast of Urup Island</i>		
Tokotan lake-river system	7	9
r. Rybnaya	3	3
r. Kruchinushka	1	-
r. Obzhitaya	2	2
r. Bystraya	1	3
r. Veselaya	1	-
b. Shipovnikoviy	1	-
b. Bezdolniy	-	1
Waterfall 500 m to the north of Cape Neschastye	-	2
b. Okhotnichiy	1	-
b. Doroshenko	2	-
b. Bezymyaniy	1	-
r. Burlivaya	-	1
<i>Pacific coast of Urup Island</i>		
r. Lopukhovaya	-	1
b. Putaniy	-	1
r. Banka	-	1

**Table 2**

Areas of spawning grounds and numbers of pink salmon spawners in the largest water bodies of the Okhotsk coast of Urup Island in 2000-2001

Water body	Spawning ground, m <sup>2</sup>	Density, ind./ 100 m <sup>2</sup>	Number of fish, thousand ind., 2000	Number of fish, thousand ind., 2001
Otkrytiy Roadstead r. Shabalin, l. Tokotan	44 000	10-120	88.0	30.8
Smugliy Bay r. Rybnaya	120 000	10-300	240.0	520.0
Nataliya Bay r. Obzhitaya	12 600	100-200	50.0	150.0
Novokurilskaya Bight r. Bystraya	20 000	10-100	48.0	20.0
Barkhatniy Bay r. Lopukhovaya	30000	10-30	-	9.0
Barkhatniy Bay b. Putaniy	14000	10-30	-	4.2

**Table 3**

Distribution of pink salmon of the Okhotsk coast of Urup Island by stages of maturity, 2001

Period	Sex	Stage of maturity, %						Total, ind.
		II	III	III-IV	IV	IV-V	VI	
04.07-31.07	Female	0	3	3	92	2	0	64
	Male	0	59	21	20	0	0	131
01.08-15.08	Female	0	0	20	75	5	0	20
	Male	1	36	43	21	0	0	77
16.08-04.09	Female	0	24	33	32	2	9	93
	Male	0	45	34	19	1	1	94

**Table 4**

Some biological indices of the Urup Island pink spawners in 2000-2001

Index	Number of fish	All specimens	Females	Males
		349	119	230
<b>2000</b>				
<b>Body length (cm)</b>	Average	46.6	47.7	48.4
	Min-Max	39.0-62.0	39.0-62.0	40.0-62.0
<b>Absolute fecundity (egg)</b>	Average	-	1420.9	-
	Min-Max	-	558.0-3348.0	-
<b>2001</b>				
	<b>Number of fish</b>	480	179	301
<b>Body length (cm)</b>	Average	49.0	48.0	49.6
	Min-Max	38.0-62.0	41.0-59.0	38.0-62.0
<b>Body weight (g)</b>	Average	1535.0	1387.6	1608.9
	Min-Max	590.0-2980.0	700.0-2050.0	590.0-2980.0
<b>Absolute fecundity (egg)</b>	Average	-	1652.0	-
	Min-Max	-	960.0-2280.0	-

**Table 5**

Distribution of chum salmon by stages of maturity from August 5 to September 9, 2001

Period	Sex	Stage of maturity, %			Total fish
		III	III-IV	IV	
05.08-09.09	Female	0	5	95	20
	Male	20	47	33	30

**Table 6**

Some biological indices of the Tokotan basin chum spawners in 2000-2001

Index	Number of fish	All specimens	Female	Male
		158	75	83
Body length (cm)	Average	67.2	65.5	69.1
	Min-Max	44.0-81.0	55.0 -74.0	44.0-81.0
Body weight (g)	Average	4463.0	4026.0	4755.3
	Min-Max	2280.0-6500.0	2420.0-5100.0	2280.0-6500.0
Absolute fecundity (egg)	Average	-	2639.9	-
	Min-Max	-	1493.0-3600.0	-

**Table 7**

Distribution pattern of sockeye salmon, entered the Tokotan Lake, by stages of maturity

Period	Sex	Stage of maturity, %			Total
		III	III-IV	IV	
11.07-31.07	female	57	14	29	14
	male	89	0	11	8
01.08-15.08	female	27	47	26	15
	male	88	12	0	8
16.08-06.09	female	75	25	0	12
	male	88	12	0	8

**Table 8**

Some biological indices of the Tokotan basin sockeye spawners in 2000-2001

<b>Index</b>	<b>Total number</b>	<b>All specimens</b>	<b>Females</b>	<b>Males</b>
		207	102	105
Length AC, cm	Average	56.45	54.8	58.1
	Min-Max	45.0-69.5	47.0-65.0	45.0-69.5
Body weight (g)	Average	2615.6	2434.1	2837.8
	Min-Max	1600.0-3980.0	1600.0-3360.0	1900.0-3980.0
Absolute fecundity (egg)	Average	-	2229.6	-
	Min-Max	-	1295.0-4125.0	-

**Table 9**

Biological indices of the Tokotan basin coho spawners in 2001

<b>Index</b>	<b>Total number</b>	<b>All specimens</b>	<b>Females</b>	<b>Males</b>
		20	13	7
Length AC, cm	Average	64.7	64.3	65.7
	Min-Max	61.0-69.0	61.0-69.0	63.5-69.0
Body weight (g)	Average	3505.6	3370.0	3858.0
	Min-Max	2650.0-4220.0	2650.0-4000.0	3470.0-4220.0
Absolute fecundity (egg)	Average	-	4620.0	-
	Min-Max	-	3134.0-6102.0	-

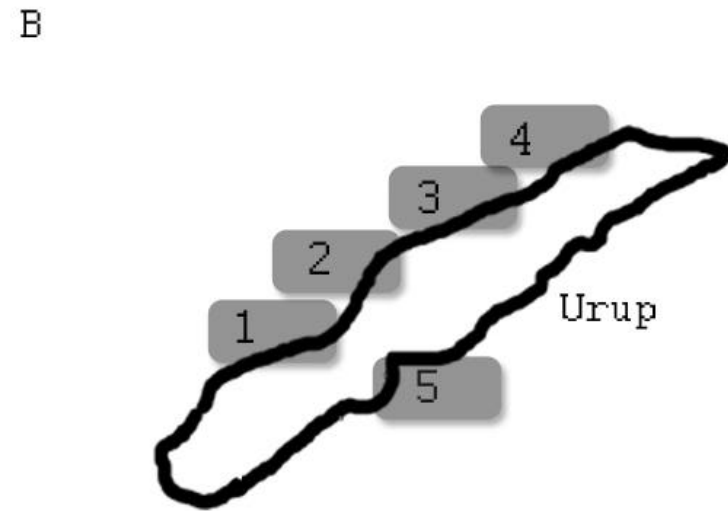
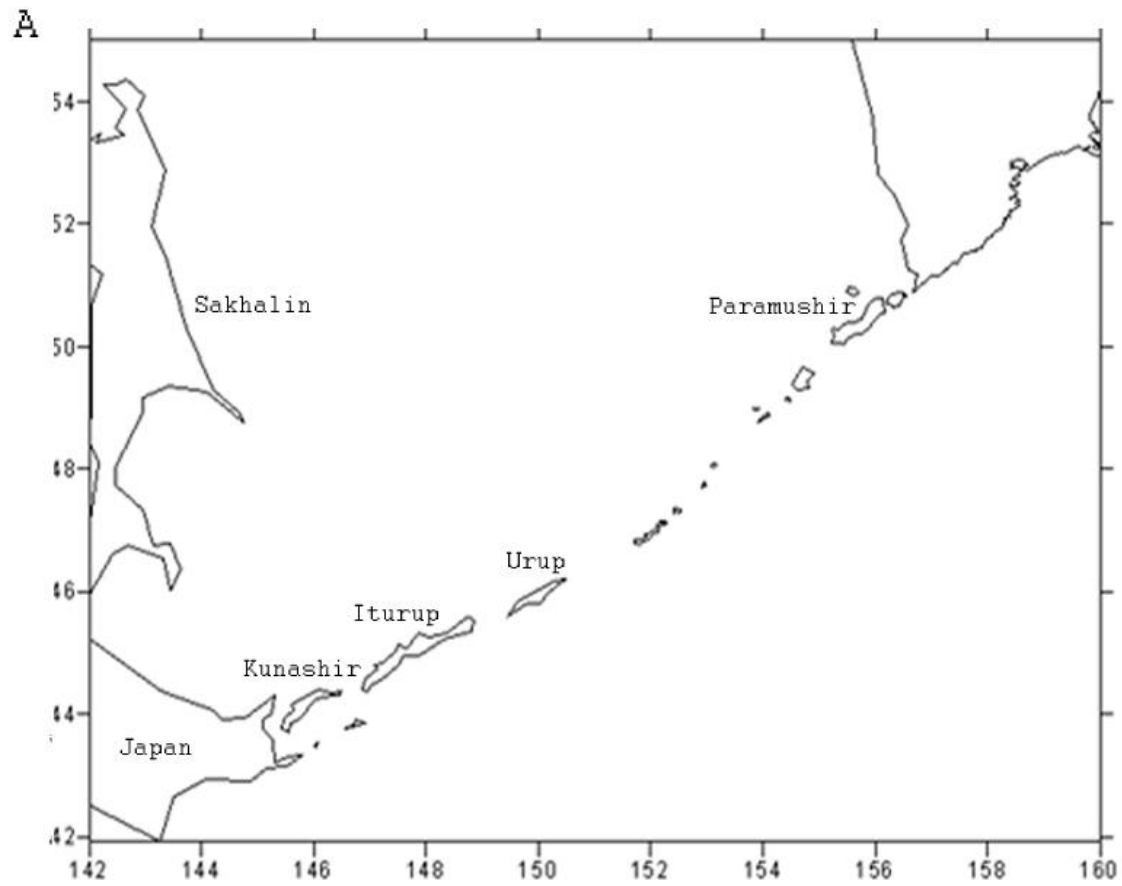


Fig. 1. A map of study region

A - Kuril Ridge

B - Urup Island

1 - *Otkrytiy Roadstead*;

2 - *Smugliy Bay*;

3 - *Nataliya Bay*;

4 - *Novokuril'skaya Bight*;

5 - *Barkhatniy Bay*

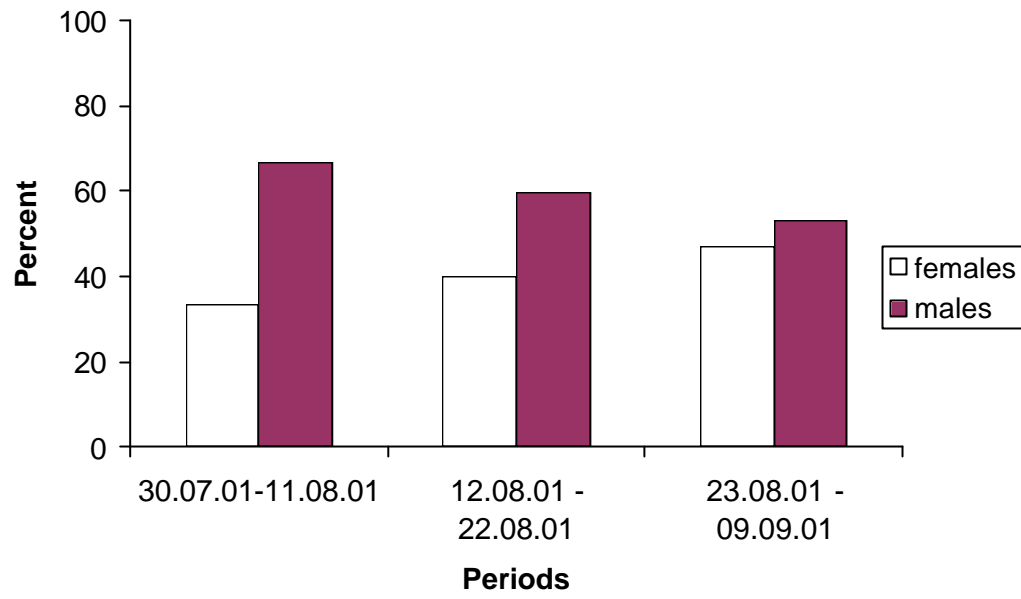


Fig. 2. Dynamics of sex ratio of the Tokotan lake-river pink salmon of 2001