

REPORT

to Contract Agreement No. 01/2024 dated March 11, 2024.

on the topic: **“1. Collection and analysis of biological and statistical data on the reproduction of Pink Salmon and Chum Salmon on Kunashir Island”.**

Prepared by:



T.G. Tochilina

Moscow 2024

Contents

Introduction	3
1. Research goal and initial data	3
2. Methodology and data collection	3
3. Spawning grounds survey on Kunashir Island.....	5
3.1. Petrova River	5
3.2. Treugolny Stream	7
3.3. Andreevka River	8
3.4. Ilyushina River	10
3.5. Tropinka River.....	11
4. Chum and Pink Salmon stock status on Kunashir island.....	15
4.1. Pink salmon	15
4.2. Chum salmon	16
4.3. Artificial reproduction on Kunashir Island	22
5. Pacific Salmon fisheries on Kunashir Island	25
5.1. Pink salmon	28
5.2. Chum salmon	28
6. Fishing pressure and fishing efforts when catching Chum Salmon with trap nets	32
7. Chum Salmon growth rate	33
Conclusions	35
References.....	36

Introduction

Pacific Salmon (*Oncorhynchus* spp.), including Pink Salmon (*O. gorbuscha*) and Chum Salmon (*O. keta*) are the most important fisheries in the coastal waters of the Russian Far East. These species play a vital role in ecosystems and serve as a socio-economic staple, providing for commercial fisheries, traditional fisheries and amateur fishing.

The hydrographic and ecological conditions of Kunashir Island create unique conditions for local salmon stocks. However, the sustainability of these populations depends on many factors, including natural reproduction, anthropogenic impact and climate change. Scientific studies in recent years carried out in other areas of the Sakhalin Region and the Kuril Islands have shown significant fluctuations in salmon stock abundance due to both natural cycles and human activity (Shuntov et al., 2023; Kaev et al., 2022).

Artificial reproduction of Pacific Salmon at salmon hatcheries remains a key and effective measure to maintain its stocks. However, the data for the period of 2022–2024 emphasize the need to consider the genetic and ecological impacts of this activity.

Fishing pressure, along with illegal fishing, also remains an important factor limiting salmon reproduction. Recent studies have emphasized that successful stock management requires the integration of data on biology, population structure, and spawning run dynamics (Makoedov and Zhivoglyadov, 2023). It is important to apply comprehensive approaches, including genetic analysis, assessment of fishing pressure, and escapement monitoring in spawning grounds.

1. Research goal and initial data

The goal of this research study is to continue collecting and analyzing biological and statistical data on “wild” and “hatchery” stock of Kunashir Pink and Chum Salmon. The research objectives include analyzing the impact of natural and anthropogenic factors on stock status, assessing the role of artificial reproduction and developing recommendations to optimize fishing activities.

This work is based on field studies conducted both in 2024 and in 2022–2023, as well as data from scientific publications and archival materials on the dynamics of Pacific Salmon stocks on the Kuril Islands.

The collected data can be used to study the characteristics of biology, population dynamics and structure of Pink Salmon and Chum Salmon stocks on Kunashir Island, and to develop best management measures to ensure the sustainable fishing in the survey area.

2. Methodology and data collection

The work was carried out in accordance with the contract of the PCF Yuzhno-Kurilsky Ryibokombinat Co., Ltd. (hereinafter – YKRK) on the topic: “Collection and analysis of biostatistical data on Pink and Chum Salmon fisheries on Kunashir Island”.

Field works were carried out on Kunashir Island from October 1 to November 10, 2024. To collect statistical information, we used the following data:

- on catch with trap nets at the coastal area;
- on catch of hatchery-origin Chum Salmon at Lagunnoye Lake Salmon Hatchery and Ricorda River Salmon Hatchery;
- on the number of Pink and Chum Salmon spawners in the natural spawning grounds of Kunashir Island from the South Kuril department of the Federal State Budgetary Institution “Glavrybvod” (FSBI “Glavrybvod”).

Biological data for Chum Salmon analysis were collected from different sites such as:

- trap nets at the YKRK territory;
- egg collecting station on the Pervukhina River at the Lagunnoye Lake Salmon Hatchery;
- Ilyushina and Sernovodka Rivers within the territory of the South Kuril department of the Federal State Budgetary Institution “Glavrybvod”

According to generally accepted methods (Pravdin, 1966) the following parameters were measured (symbols used in further descriptions are given in parentheses): fork length (FL), standard length (SL), total weight (TW), eviscerated weight (EW), weight of gonads (GW). If possible, scales were taken in a strictly defined place in accordance with McLellan's methodological manual (McLellan...) – from the second to fourth row above the lateral line, between the dorsal and anal fins. All biological data collected during the field work were sent to the Sakhalin branch of the Federal State Budgetary Institution “VNIRO” (SakhNIRO), which is engaged in assessing the stock of Pacific Salmon in the Sakhalin Region. After each bioassay the age was determined from scales using the stereoscopic microscope (binocular) MBS-10.

Table 1 – Number of bioassays on Chum Salmon and samples selected for it in 2024.

Water body	Number of bioassays	Number of scale samples, pcs.	Scales examined for age, pcs.	Number of otolith samples, pairs
Pervukhina River	3	300	300	300
Pervukhina Bay	3	300	300	300
Ilyushina River	1	30	30	-
Sernovodka River	4	97	97	-

In addition to our own data, this report uses fishery data as well as other information obtained from the YKRK and the South Kuril Department of FSBI “Glavrybvod” (SakhRybVod).

The Author of this report expresses gratitude to the management and employees of the YKRK for funding, organizing accommodation, transport and timely provision of necessary information.

3. Spawning grounds survey on Kunashir Island

In 2024, the author of this report participated in the survey of 8 watercourses on Kunashir Island (Fig. 1). Since the Sernovodka, Khlebrikova and Sennaya rivers were covered in 2023 report, this report provides a description of other 5 watercourses (the Tropinka, Ilyushina, Petrova, Andreevka Rivers and the Treugolny Stream).



Fig. 1. Watercourses of Kunashir Island, surveyed in 2024.

3.1. Petrova River

Petrova River. The river flows in the central part of Kunashir Island and flows into the South Kuril Strait. The catchment area is 8.6 km², the length of the main channel is 3.5 km. The river has 6 tributaries, 2 of them are first-order tributaries with spawning grounds for Chum and Pink Salmon.

Lower reaches. The river was inspected from the mouth to the left tributary on October 18, 2024. The water temperature in the mouth was 9.5 °C (Fig. 2).



A)



B)

Fig. 2. A) –The mouth of the Petrova River; B) Tatiana Tochilina with the employees from the South Kuril Department of Ichthyology during the survey of Petrova River.

A dead male Chum Salmon was found at the river mouth (Fig. 3). Due to the low water flow during low tide, the male was unable to escape through the shallow section of the river mouth and died.



Fig. 3. A dead Chum Salmon male at the mouth of the Petrova River

The Petrova River has one channel. There are riffles with slight slopes in the lower reaches of the river. The width of the channel in this section is 1.5-3.5 m. Accumulations of filamentous algae are found on the river bottom. The river floodplain is an open area, swampy in some places (Fig. 4). There is no woody vegetation. The Otradnoye settlement is located on the right slope of the river valley. The floodplain is used for cattle grazing. The water flow measured in October 2024, 100 m from the mouth of the river, was $0.33 \text{ m}^3 / \text{s}$.



Fig. 4. Lower reaches of the Petrova River

Middle reaches. The survey was conducted on October 30, 2024. The channel of the river is meandering along the entire length of the section. The river slope has no sharp drops in gradient. The valley of the section is a swampy lowland, 25-50 m wide, overgrown with alder and willow. The floodplain slopes are overgrown with coniferous forest. The main spawning grounds of Chum Salmon and Pink Salmon are located in this section. Springs are found. The soil is represented by small and medium-sized pebbles. The condition of the spawning grounds is good. The water temperature was 8.4 °C (Fig. 5).



Fig. 5. Middle reaches of the Petrova River

The total spawning area in the Petrova River basin is 3,852 m², including 3,737 m² are Pink Salmon spawning grounds and 115 m² are Chum Salmon spawning grounds.

The ichthyofauna is represented by Pink Salmon, Chum Salmon, White-spotted Char (kundzha), river Dolly Varden trout and Sakhalin Sculpin.

No Chum Salmon spawners were found during the survey of the Petrova River. According to the survey data, Pink Salmon and Chum Salmon enter the river, however, poaching pressure is high due to the proximity of settlements.

3.2. Treugolny Stream

Treugolny Stream. The inspection was conducted on October 25, 2024. The stream is 3.5 km long and flows into Serebryanoye Lake in its northeastern part. The total area of Pink and Chum Salmon spawning grounds in the stream is about 1,543 m², with 1,033 m² for Pink Salmon, and 510 m² for Chum Salmon. Basically, they are located in the lower reaches of the main channel and in the left tributary. (Fig. 6).

There is a limnocrene in the left tributary – it is a type of freshwater source, a small water body supplied by springs. Its area is about 380 m², the average depth is 65 cm, and the

maximum depth is 80 cm (Fig. 7). At the time of the survey, the water temperature in the stream was 8.5 °C, in the limnocrene – 9.5 °C.



Fig. 6. The mouth of the Treugolny stream



Fig. 7. Limnocrene of the Treugolny stream



Fig. 8. Potential spawning ground for Chum Salmon in the limnocrene



Fig. 9. Spawning grounds of the Treugolny stream

The channel connecting the limnocrene with the main channel does not exceed 10 m in length, 1 m in width, and its depth is no more than 30 cm.

The rivers and streams of the Lake Serebryanoye basin together provide approximately 8,635 m² of favorable spawning areas (Fig. 9). It is reasonable to use these watercourses as natural spawning grounds.

3.3. *Andreevka River*

Andreyevka River. The survey was conducted on October 28, 2024. The river originates from the slope of Vorobyova Mountain and flows into the South Kuril Strait. The river is 7.5 km long, 6 m wide and 0.3-0.4 m deep. (Fig. 10)

150 m above the river mouth there is a small waterfall less than 1 m high, which does not present an obstacle for Chum Salmon spawners (Fig. 11). To the left of the waterfall there is a spawning ground of approximately 100 m². At the time of the survey on October 28, 2024, single Chum Salmon spawners were observed to enter the spawning ground. Water temperature was 10.0 C⁰.



Fig. 10. Lower reaches of the Andreevka River



Fig. 11. Waterfall and spawning ground on the Andreevka River



Fig. 12. Spawning grounds and single specimens of Chum Salmon that had just spawned on the Andreevka River

Above the waterfall, the river bottom consists of rocks, but there are also spawning grounds with small and medium-sized pebbles. The area of the spawning grounds is small and is approximately 150-200 m². The condition of the spawning grounds is good (Fig. 12).

The river basin is 100% forested and consists of various tree species (spruce, birch, alder, rowan, oak). The river banks are densely overgrown with Kuril bamboo, butterbur, fern, etc. The ichthyofauna is represented by species such as Pink Salmon, Chum Salmon, Dolly Varden trout, White-spotted Char. Rainbow Smelt comes to spawn in spring.

400 m from the river mouth there is a second waterfall, which presents an obstacle for Chum Salmon.

3.4. Ilyushina River

Ilyushina River. The survey was conducted on November 02, 2024. The river is located in the central part of the Pacific coast of Kunashir Island and is a fairly large watercourse on the island scale. The length of the main channel is 9.3 km, the catchment area is 29.5 km². It originates from the slopes of Gerasimov Mountain (842 m) at an altitude of 190 m and flows into the South Kuril Strait (Fig. 13). The water temperature on the inspection day was 10.5 °C.



Fig.13. Mouth of the Ilyushin River



Fig. 14. Measuring water temperature in the Ilyushina River

The river flows from the north-east to the south-west. 2.5 km on the right side from the mouth, the Khvoyny stream flows into the Ilyushina River, originating from the Dokuchaev Ridge at an altitude of 360 m. Three more streams of 4.5 and 6.0 km long flow into the Khvoyny stream. At the mouth, the Ilyushina River is up to 20 m wide. Before flowing into the ocean, the river flows along a sand spit, where it stormy waves often change its direction. Above the littoral zone, the bed soil is rocky, represented by boulders and pebbles of all sizes. The depth on the riffles is 10-12 cm, on the stream pool up to 1.0 m. The river is home mainly for Pink Salmon spawning grounds. Their greatest concentration is registered in the middle reaches. Spawning grounds of Chum Salmon are found occasionally in sections of the river up to 2,200 m, occupying up to 10-15% of the bottom area. Spawning grounds are favorable, the soil consists of small and medium-sized pebbles with an admixture of sand (Fig. 15).



Fig. 15. Sections of the Ilyushina River with Chum Salmon spawning grounds
On the survey day, Chum Salmon spawners (both alive and already dead after spawning) were recorded at the spawning grounds (Fig. 16).



Fig.16. Dead Chum Salmon spawners that had just spawned on the Ilyushin River

Along the banks there are sand and pebble spits up to 40 m long, there is no two-sided floodplain, but it is located either on the right or left bank. The banks are stony and sandy, the soil layer is poorly developed. The vegetation is represented by large forbs, alder, willow. Coniferous forest is seen upstream. The river rapids that are present in the riverbed do not interfere with the salmon escapement to the spawning grounds.

The Ilyushina River is an important natural resource for fisheries. Pink Salmon, Chum Salmon and occasionally Masu Salmon come here to spawn. The Rainbow Smelt is one of the species that spawn in spring. The White-spotted Char reproduces and constantly lives in the river. Pink Salmon spawning grounds are located along the entire length of the riverbed and in the Khvoyny tributary.

The spawning area of the river basin is 25,000 m², including 17,000 m² is in the main channel and 7,000 m² in the Khvoyny tributary. The spawning area of Chum Salmon in the Ilyushin River is 4,000 m² and the spawning area of Pink Salmon is 21,000 m².

3.5. Tropinka River

Tropinka River. The survey was conducted on November 08, 2024. The survey of the Tropinka River was attended by the head of the South Kuril Ichthyology Department of FSBI “Glavrybvod” and the head of the Kuril Interdistrict Department of State Control, Supervision and Protection of Aquatic Biological Resources and their Habitat.

The Tropinka River originates from the western slopes of the Dokuchaev Ridge and flows into the Kunashir Strait of the Sea of Okhotsk. The main channel is 2.3 km long, the catchment area is 10.5 km². The water temperature in the Tropinka River at the time of the survey was 6.2 °C.

Based on the nature of the current, the landform and the condition of spawning grounds, the river basin can be divided into two sections:

1st section from the mouth to 0.6 km upstream (Fig. 17).



Fig. 17. Mouth section of the Tropinka River

The river valley is 80 to 350 m wide with steep slopes covered with mixed forest, predominately with coniferous species. The floodplain is overgrown with tall grass and low alder, willow. The riverbed has no steep turns and steadily flows along the left steep slope. The river soil is represented by medium and large-sized pebbles and stones up to 30 cm. There is only one hole measuring 25 x 6 m and about 1 m deep in the river mouth. The current velocity is from 0.5 to 0.8 m/sec, the average width of the channel is about 2.0 m, the depth is from 0.1 to 0.3 m. The total spawning area of Pacific Salmon is 815 m², with 465 m² for Pink Salmon and 350 m² for Chum Salmon (Fig. 18). Chum Salmon spawners were found in the lower reaches of the river moving upstream.





Fig. 18. Lower reaches of the Tropinka River

2nd section from 0.6 km to the river head. The river flows through a valley up to 70 m wide, with high, forested slopes, having a pronounced mountain character: the current velocity reaches 1.0 m / s, the height differences on the riffles are up to 0.5 m, the proportion of large boulders increases. The average width of the channel is 1.5 m, the depth is from 0.1 to 0.4 m. Spawning grounds are found sporadically. The river bed meanders, the river floodplain is overgrown with alder, willow and tall grass. 2 km from the mouth there is an outflux of groundwater with a good spawning substrate of about 25 m². The total spawning ground of Pacific Salmon in this section is 532 m², including 507 m² for Pink Salmon, 25 m² for Chum Salmon (Fig. 19).



Fig. 19. Middles reaches of the Tropinka river.

In the middle reaches of the river, live and dead Chum Salmon spawners were found in the spawning ground (Fig. 20).



Fig. 20. Live and dead Chum Salmon spawners after spawning in the Tropinka River

The ichthyofauna of the river includes representatives of 7 species, 4 families. These are the Far Eastern brook lamprey, Dolly Varden trout, Sakhalin Sculpin, Amur Stickleback, Chum Salmon and Pink Salmon. Pink Salmon is a predominant species.

A fish hatchery belonging to Island Fish Invest LLC with a capacity of 10 million of Pacific Salmon juveniles (Chum Salmon, Pink Salmon) is under construction in the lower reaches of the Tropinka River (Fig. 21). The release of juvenile Pacific salmon to the Tropinka River began in 2022. In 2024, 2.92 million juvenile Chum Salmon were released.



Fig. 21. Salmon hatchery in the Tropinka River

4. Chum and Pink Salmon stock status on Kunashir Island

4.1. Pink salmon

The Pink Salmon population in the Southern Kurils in 2024 continues the trend of previous years (both in even and odd-year generations) and demonstrates unstable indicators. The data indicate a lower return of Pink Salmon compared to the forecast data. Many experts believe that these are the consequences of climate change, leading to the changes in temperature conditions in the Pacific Ocean and adjacent seas, as well as changes in traditional migration routes.

In recent years, Pink Salmon runs on Kunashir Island have been extremely low, with only a few counted spawners in some rivers. In 2024, Pink Salmon spawners were not found at all in most of the surveyed watercourses (Table 2).

Table 2. The escapement of Pink and Chum Salmon spawners in the surveyed spawning rivers of Kunashir Island in 2024. Data provided by the South Kuril department of the FSBI “Glavrybvod” and calculated according to the standard 2 fish/m²

River	Survey date	T water, °C	Area of the spawning ground, m ²	Number of spawners, fish.	Escapement, %
Serebryanka	Sept 06, 2024	19.9	700	0	0.0
Luchevoy	Aug 22, 2024	17	4,294	0	0.0
Belozerskaya	Sept 05, 2024	19	1,440	0	0.0
Vodopadny Stream	Sept 16, 2024	12.5	620 (to the waterfall)	0	0.0
2 nd Dachny Stream	Aug 09, 2024	15	170	0	0.0
Asin Stream	Aug 14, 2024	16.5	2,750	0	0.0
Asin Stream	Aug 30, 2024	13.6	2,750	0	0.0
Polynova	Aug 16, 2024	14	3,760	300	0.0
Golovnina	Sept 05, 2024	20	3,620	0	0.0
Prozrachny Stream	Sept 16, 2024	12	8,160	0	0.0
Ilyushina	Aug 07, 2024	13	21,000	30	0.07
Ilyushina	Sept 13, 2024	12.3	21,000	147 alive, 3 dead	0.4
Ilyushina	Sept 20, 2024	12	21,000	180 alive, 20 dead	0.5
TOTAL:			46,514	500	0.54

Note: the escapement rate of the Ilyushin river was calculated based on the latest survey date (September 20, 2024).

The Ilyushina River is an index river, which has been monitored for many years. The survey conducted on August 7, 2024 showed the start of the Pink Salmon run in this river. The survey on September 13 – the initial stage of spawning. The survey on September 20 – the peak spawning of those few spawners that were counted in the river.

There was no Pink Salmon fishing on Kunashir Island in 2024. Due to the extremely low abundance of Pink Salmon, no catch of this species for scientific purposes or biological analysis was carried out in 2024.

Given the low Pink Salmon runs, as in the previous year, the Anadromous Fish Commission decided to introduce passing days from August 28 to September 10, which essentially meant a complete suspension of Pink Salmon fishing. However, the situation did not improve, and the Pink Salmon escapement in the rivers of Kunashir Island remained at an extremely low level.

It should be noted that Pink Salmon fishing on Iturup Island was also extremely low. According to VNIRO for the South Kuril fishing zone, which includes Kunashir Island, only 2,444

metric tons out of the allowable 10,142 metric tons on Iturup Island, were caught (<http://vniro.ru/ru/nauchnaya-deyatelnost/lososevaya-putina>), which amounted to 24.1% of the forecast volume. Thus, the situation of the previous 2023 was repeated: the allowable catch volume for the South Kuril fishing zone was 10,927 metric tons, but only 1,889.9 metric tons were caught on Iturup, which amounted to 17.3% of the forecast.

4.2. Chum salmon

Chum Salmon is the second most abundant among *Oncorhynchus* salmon after Pink Salmon in the rivers of Kunashir Island. Currently the Pink Salmon runs are low and Chum Salmon prevails in the natural spawning grounds. It is represented by two ecotypes: lake and river (small river ecotype). Chum Salmon are distributed almost everywhere. According to Kaev (2007), such distribution is probably facilitated by deep circulation and intensive groundwater outflow into the bed of rivers and lakes.

Chum Salmon also enter very small streams, and in some of them spawning grounds are located in the tidal zone.

A delayed Chum Salmon run compared to that of the previous years before 2013 continued to prevail in 2024. Individual Chum Salmon spawners appeared in the rivers in September. Thus, according to the data on the Chum Salmon escapement rate in the spawning grounds dated September 27, 2024, 150 spawners were recorded in the Ilyushina River.

The peak run of Chum Salmon in most rivers occurred in mid-October. By the beginning of November, the intensity of salmon run had sharply weakened. But according to surveys of local residents, single spawners of Chum Salmon continue to enter some rivers of the island until January.

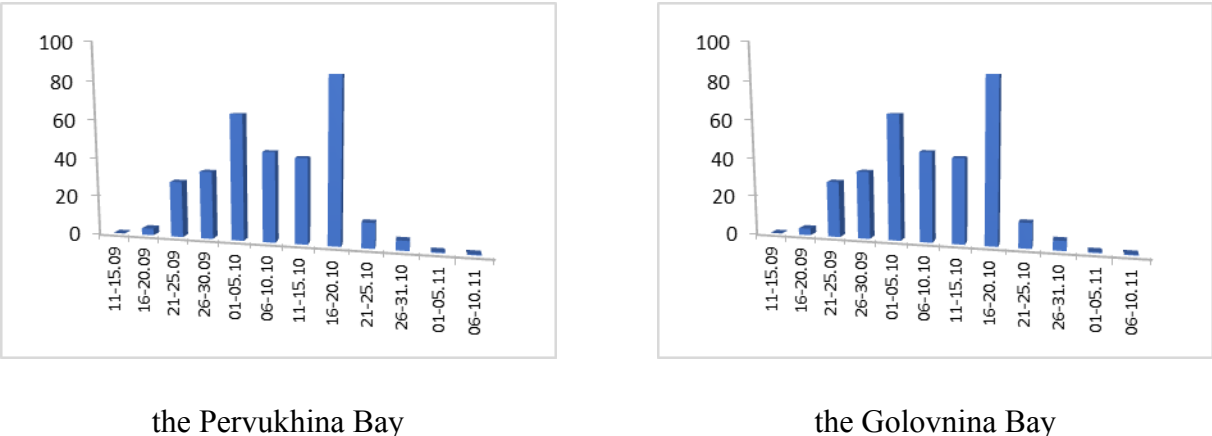


Fig. 22. Chum Salmon catch with trap nets by YKRRK in 2024.

According to the data on Chum Salmon catches with trap nets in the 65-18-18 fishing parcel (Pacific coast, Golovnina Bay) and in the 65-18-08 fishing parcel (Sea of Okhotsk coast, Pervukhin Bay) (Fig. 22), two peak runs of Chum Salmon were observed in 2024. Moreover, the peaks of salmon runs on the Sea of Okhotsk coast were approximately 10 days later than that of on the Pacific side of the island (Table 3).

Table 3. Dates of Chum Salmon runs on Kunashir Island in 2024.

Fishing parcel	Start of the salmon run			Peak run		
	First dates	Peak	End	First dates	Peak	End
Fishing parcel 65-18-18 (Pacific Ocean Coast, Golovnina Bay)	Sept 16	Sept 21 – 25	Sept 30	Oct 01	Oct 06 – 10	Oct 25
RPU 65-18-08 (Okhotsk Sea Coast, Pervukhina Bay)	Sept 16	Oct 01-05	Oct 10	Oct 11	Oct 16 – 20	Nov 10

Most likely, fishing does not happen at the end of the run and is not reflected in the graphs, since the trap nets are removed earlier: October 25, 2024 on the Pacific coast, November 11, 2024 on the Okhotsk Sea coast.

The total spawning area of Chum Salmon on Kunashir Island is 121,000 m². The area of river spawning grounds is 51, 000 m²; the area of lake spawning grounds is 70,000 m. In 2024, the escapement rate in spawning grounds on Kunashir Island remained weak (Table 4).

Table 4. Chum Salmon escapement rate in the spawning grounds on Kunashir Island in 2024 (according to the data provided by the South Kuril department of the FSBI “Glavrybvod” and own observations, calculated according to the standard 1.6 fish/ m²)

Water body	Survey date	Water T in the river, °C	Spawning area, m ²	Number of counted spawners, fish	Escapement, %	Note
Golovnina River	Oct 07	12	700	30	2.7	spawning
Vodopadny Stream	Oct 11	12.5	600 (to the waterfall)	10	1	spawning
Prozrachny Stream	Oct 17	12	200	25	7.8	spawning run
Okunevka (Domaseva) River	Oct 18	12	390 (to the waterfall)	6	0.9	spawning run
Treugolny Stream	Oct 25	8.5 (stream), 9.5 (limnocr ene)	210	20	6	spawning run
Luchevoy Stream	Oct 28	8.2	1755	200	7	spawning
Andreevka River	Oct 29	10	50 (to the first waterfall)	16	20	mass spawning
Petrovka River	Oct 30	8.4	115	0	0	---
Tropinka River	Nov 08	6.2	375	20	3.3	mass spawning is over
Valentina Lake	Nov 08	6	2,700	420	9.8	mass spawning
Peschanoye Lake	Nov 14	7	30,000	2,500	5.2	mass spawning
Serebryanoe Lake	Nov 15	7.2	3,800	80	1.3	mass spawning
Ilyushina river	Sept 27	14	4,000	150	2,3	the start of the spawning run

Water body	Survey date	Water T in the river, °C	Spawning area, m ²	Number of counted spawners, fish	Escapement, %	Note
Ilyushina river	Oct 16	12.6	4,000	670	10.5	mass spawning
Ilyushina river ¹	Nov 02	10.4	4,000	881	13.8	mass spawning run and spawning are over
Lake Lagunnoye ²	Nov17	8.2	25,000	2,894	7.2	
TOTAL:			44,895	4,208	6.35	

Note:

1 - data from the last survey on November 02, 2024 were taken for calculations for the Ilyushina River.

2 – according to the employees of YKRR

The summary monitoring data on the spawning stock of Chum Salmon presented in Table 5 (data from the SakhNIRO report “Fisheries survey of the water bodies of Kunashir Island (Ilyinskoye Lake, Pervukhina River, Lagunnoye Lake) during the spawning run of Pacific Salmon in 2022” (Agreement No. 02-36/2022-NIR dated March 31, 2022 with YKRR) show that since 2016 the escapement rate in the spawning grounds has been at a critical level and is below 30%.

Table 5. Average density and Chum Salmon escapement rate in the spawning grounds from 2016 to 2022.

Year	2015	2016	2017	2018	2019	2020	2021	2022
Total number of surveyed spawning areas, m ²	19,930	17,410	16,770	18,755	6,455	6,455	42,550	37,440
Total number of counted spawners, fish	12,580	5,059	887	4,160	310	574	1,294	2,500
Average density of spawners, fish/m ²	0.63	0.29	0.05	0.22	0.05	0.09	0.03	0.06
Escapement rate (according to the Sakhalinrybvod standard 1.6 fish/m ²), %	39.5	18.2	3.3	13.9	3.0	5.6	1.9	4.2

Taking into account the data on the Chum Salmon escapement in the spawning grounds obtained during the expeditions in 2023 (11.3%) and 2024 (6.35%), the dynamics of escapement changes graphically looks as follows (Fig. 23).

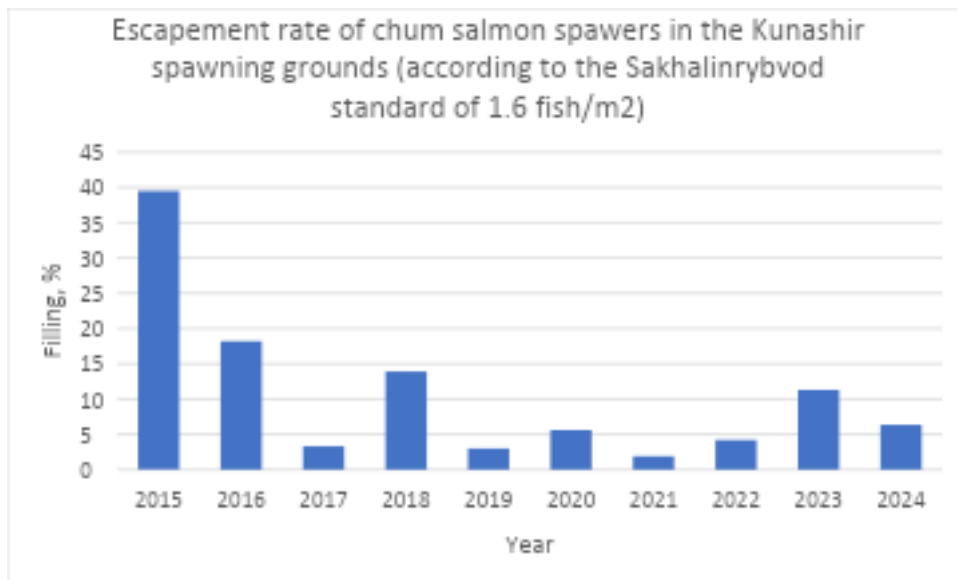


Fig. 23. Chum Salmon escapement in the Kunashir spawning grounds (according to the Sakhalinrybvod standard of 1.6 fish/m² in the period from 2015 to 2024.

As can be seen from the Figure 23, over the past 9 years the Chum Salmon escapement rate in natural spawning grounds of Kunashir Island has remained extremely low and does not even reach 30%.

To assess the biological condition of Chum Salmon spawners, we took:

- 3 samples from coastal trap nets,
- 3 samples from the Pervukhina River (Lagunnoye Lake Salmon Hatchery),
- 1 sample from the Ilyushina River
- 4 samples from the Sernovodka River (Table 6).

The YK RK company provided a workplace in the fish processing workshop to carry out this bioassay.



Fig. 24. Workplace in the fish processing workshop for carrying out Chum Salmon bioassay

Bioassays at the Lagunnoye Lake Salmon Hatchery were carried out both at the hatchery weir and on its territory (Fig. 25).



Fig. 25. Workplaces for conducting bioassays of Chum Salmon at the Lagunnoye Lake Salmon Hatchery

Table 6. Main biological indicators of Chum Salmon on Kunashir Island, 2024.

Date	Water	SL, cm		Weight, g		Absolute Fecundity	Number of fish	
		♂	♀	♂	♀		♀	♂
Oct 02	Pervukhina Bay	58.2	58.5	2,699	2,558	2,226	55	45
Oct 11	Pervukhina Bay	60.2	58	2,849	2,495	2,065	52	48
Oct 21	Pervukhina Bay	58	57.9	2,523	2,517	1,953	60	40
Average of 3 analyses		58.8	58.1	2,682.5	2,522.9	2,086	167	133
Oct 10	Pervukhina River (salmon hatchery)	58.3	57	2,192	2,148	1,768	50	50
Oct 20	Pervukhina River (salmon hatchery)	60.5	58.4	2,577	2,400	1,868	55	45
Nov 10	Pervukhina River (hatchery)	56.5	58.5	2,077	2,447	1,683	87	13
Average of 3 analyses		58.1	57.8	2,250.2	2,289.0	1,799	192	108
Oct 16	Ilyushina River	59	53.3	2,647	2,031	2,095	8	22
Oct 1 –30	Sernovodka River	61.8	59.1	3,312	2,739	1,900	51	46

If we average the weight of females and males, we get the average weight of one fish in 2024 – 2,437.9 g.

Most Chum Salmon spawners enter rivers with developed spawning changes and gonads with IV, IV-V and even V maturity stages. This is explained by the location of spawning grounds in the lower and middle streams of the island's short rivers.

Particular attention was paid to the collection of data to determine the age of Chum Salmon. Scale samples were collected from both the catches with trap nets and from salmon runs to the salmon hatchery.

Tables 7 and 8 summarize the age of Chum Salmon caught by coastal trap nets deployed in Pervukhina Bay (west of Kunashir, Okhotsk Sea coast), as well as in the Ilyushina, Sernovodka and Pervukhina rivers (main river of Lagunnoye Lake Salmon Hatchery).

Table 7. Kunashir Chum Salmon age composition (fish) in 2024.

Date	Water body	2+		3+		4+		5+		Number of fish	
		♀	♂	♀	♂	♀	♂	♀	♂	♀	♂
Oct 02	Pervukhina Bay	4	8	35	43	6	4	0	0	45	55
Oct 11	Pervukhina Bay	6	9	38	36	4	7	0	0	48	52
Oct 21	Pervukhina Bay	1	11	32	34	7	15	0	0	40	60
Oct 10	Pervukhina River (salmon hatchery)	0	0	48	49	2	1	0	0	50	50
Oct 25	Pervukhina River (salmon hatchery)	0	6	40	33	5	16	0	0	45	55
Nov 05	Pervukhina River (salmon hatchery)	1	15	10	67	2	5	0	0	13	87
Oct 16	Ilyushina river	2	2	6	18	-	2	-	-	8	22
Oct 1 -31	Sernovodka river	1	3	37	38	8	9	-	1	46	51

The age composition of Chum Salmon (Kaev, Romasenko, 2017) on Kunashir Island is usually represented by four groups: from 2+ to 5+. However, in 2022, an individual of 5+ years old was found once in the bioassay from the Ilyushina River, but in 2023 individuals of 5+ years old were not found at all. In 2024, one male Chum Salmon of 5+ and of 7,200 g was caught only once in the Sernovodka River. Four- and three-year-olds fish dominate in numbers.

Table 8. Chum Salmon age composition (in %) in 2022-2024.

2022 year					
	2+	3+	4+	5+	Number of fish, %
Ilyushina River	15	73	10	2	100
Pervukhina River (salmon hatchery)	78	21.6	0.4	0	100
Pervukhina Bay	25.5	68	5.5	1	100
2023 year					
	2+	3+	4+	5+	Number of fish, %
Ilyushina River	10	72	18	0	100
Pervukhina River (salmon hatchery)	17	81.5	1.5	0	100
Pervukhina Bay	32	62	6	0	100
2024 year					
	2+	3+	4+	5+	Number of fish, %
Ilyushina River	13	80	7	0	100
Pervukhina River (salmon hatchery)	7	82	1	0	100
Pervukhina Bay	13	73	14	0	100

4.3. Artificial reproduction on Kunashir Island

In 2024, 7 salmon nursery workshops and 66 full-scale operating hatcheries were carrying out commercial aquaculture of Pacific salmon and activities aimed at preserving aquatic bioresources (artificial reproduction) in the Sakhalin Region. Juvenile Pacific Salmon were released in 101 fishery water bodies.

According to preliminary data, the release of juvenile Pacific salmon remained at the level of the previous year and amounted to 1,417.3 million fish. The contribution of the main reproduction areas to the total release of juvenile Pacific salmon is presented in Figure 26.

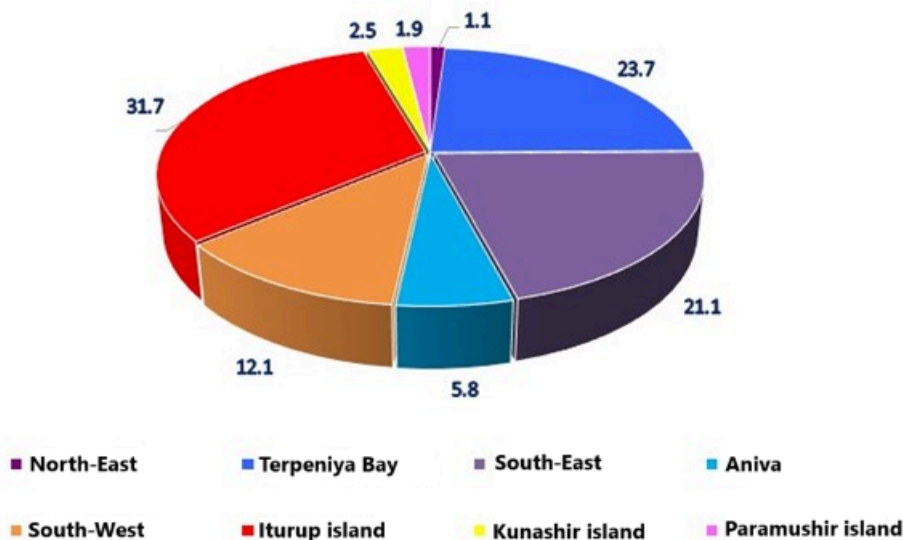


Fig. 26. Share (%) of main reproduction areas in the total release of juvenile Pacific salmon in 2024.

Pink and Chum Salmon are traditionally the main objects of Pacific salmon breeding in the Sakhalin Region. The share of Chum Salmon in the total release of juveniles is steadily growing. Chum salmon, as the most valuable and economically profitable fishery object, is the main target species for breeding. Newly launched salmon hatcheries are initially designed to reproduce this species, and existing salmon hatcheries annually increase Chum Salmon release, thereby significantly changing the ratio of released species. This year, the share of Chum Salmon reproduced both within the framework of artificial reproduction and commercial aquaculture was about 90.0%.

The Southern Kuril Islands and, first of all, Iturup Island literally can be called as one of the most important areas for artificial reproduction of Pacific Salmon not only in the Russian Far East, but throughout the northern Pacific. According to the Sakhalin-Kuril Territorial Administration of the Federal Agency for Fishery (SKTU), there are 22 salmon hatcheries operating in the Southern Kuril Islands in 2024, 20 of which are on Iturup Island and 2 – on Kunashir Island. Another salmon hatchery is under construction on the Tropinka River (Fig. 27).



Fig. 27. Map of Kunashir Island showing the location of fish hatcheries.

The volume of grown juvenile salmon release from Iturup and Kunashir islands in 2024 amounted to 485.637 million fish, with 457.493 million of juvenile Chum Salmon and 28.144 million of juvenile Pink Salmon. Only 7.4% of this total volume belongs to Kunashir Island. However, only Chum Salmon is released on Kunashir Island, which is 7.9% of the total release of this species from both islands. Table 9 summarizes data on juvenile release on these two neighboring islands.

Table 9. Release of juvenile Pacific salmon from Iturup and Kunashir Islands in 2023-2024, million fish.

Species	2023			2024		
	Iturup	Kunashir	Total	Iturup	Kunashir	Total
Pink salmon	152.54	0.0	152.54	28.144	0.0	28.144
Chum salmon	353.103	42.22	395,323	421.472	36.021	457.493
TOTAL	505.643	42.22	547.863	449.616	36.021	485.637

Table 10 presents the release of juveniles by salmon hatcheries into key rivers and other water bodies on Kunashir Island from 2018 to 2024.

Table 10. Release of juvenile Chum Salmon by the salmon hatcheries on Kunashir Island from 2018 to 2024, million fish

Name of the hatchery or water body	Release of juvenile Chum Salmon by year, million fish						
	2018	2019	2020	2021	2022	2023	2024
Lagunnoye Lake Salmon Hatchery	1.5	3.4	10.4	18.5	12.5	19.8	27.747
Prozrachny Stream	0.0	0.0	0.0	0.0	0.0	0.0	0.151
Ilyushina River	0.0	0.0	0.0	0.0	0.0	0.0	0.150

Rikorda River Salmon Hatchery	0.0	0.0	14.2	14.6	14.1	17.9	5.751
Golovnina River	0.0	0.0	0.0	0.0	2.4	0.5	0.1
Khlebnikova River	0.0	0.0	0.0	0.0	0.0	1.0	0.1
Sennaya River	0.0	0.0	0.0	0.0	0.0	1.0	0.1
Tropinka River	0.0	0.0	0.0	0.0	0.5	2.0	2.923
TOTAL:	1.5	3.4	24.6	32.1	29.5	42.2	36.021

The production processes at salmon hatcheries are carried out in compliance with environmental requirements for Chum Salmon breeding. The annual cycle of the salmon hatchery and the main production processes are presented in Table 11.

Table 11. Production schedule of salmon hatcheries on Kunashir Island

	Months											
	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Preparing salmon hatchery for a new season												
Catching chum salmon spawners entering the hatchery fishway												
Egg-take and planting eggs for incubation												
Egg incubation												
Salmon eggs hatching into alevin												
Alevins – pre-feeding												
Fry feeding (rearing)												
Juvenile release												

It should be noted that in 2024, the Lagunnoye Lake Salmon Hatchery and Ricorda River Salmon Hatchery managed to plant 100% eggs from “their” broodstock. In total, the following number of eggs were planted for incubation:

- Lagunnoye Lake Salmon Hatchery – 14.1 million eggs;
- Ricorda River Salmon Hatchery – 9.6 million eggs.

Although egg collection is lower than in 2023, no actions have been taken that harm wild populations:

- all spawners entering the reservoirs were allowed to spawn;
- “wild” salmon was not caught in the key water reservoirs (Lagunnoye Lake and the Rikorda River) or in the spawning grounds of neighboring rivers;
- fertilized eggs were not imported from other fish hatcheries in other areas.

5. Pacific salmon fishing on Kunashir Island

The salmon fishery on Kunashir Island differs from other areas of the Sakhalin Region in that until 2021, the catch here was based only on wild populations. The map for 2006 shows 36 fishing parcels registered on Kunashir Island (Fig. 28).



Fig. 28. Map of fishing parcel location on Kunashir Island in 2006

According to the data from the Ministry of Fisheries of the Sakhalin Region, 21 fishing parcels belonging to 6 companies were registered on Kunashir Island in 2024 (Fig. 29)

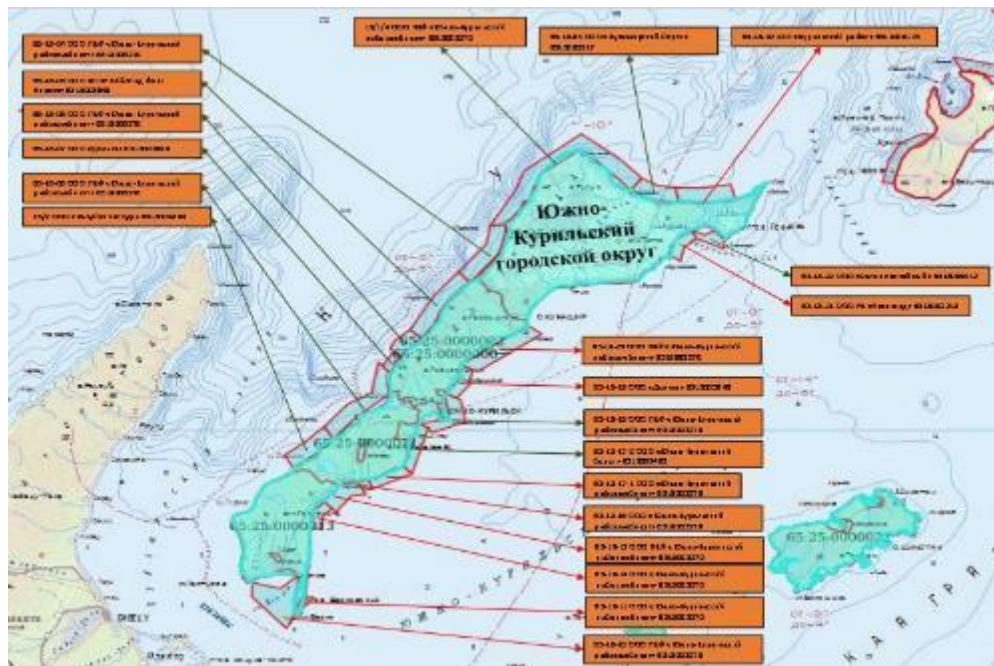


Fig. 29. Map of fishing parcel location on Kunashir Island in 2023

In order to maintain rational fishing of Pacific Salmon, all branches of the VNIRO institute annually prepare Fishery Strategies, which include projected catch volumes, restrictive fishing measures for different areas, as well as recommendations on measures to ensure optimal spawning. SakhNIRO develops such a document for the Sakhalin Region. For the South Kuril fishing zone, which includes Kunashir Island, the projected catch of Pacific salmon (Pink, Chum, Sockeye and Masu salmon) is 22,935 metric tons.

Anadromous Fish Commission (AFC) in the Sakhalin Region set a total catch quota for Pacific salmon in commercial fishery, recreational (amateur) fishing, as well as traditional fishery of the indigenous peoples of the North, Siberia and the Far East of the Russian Federation, in the fishing areas of the Sakhalin Region in 2024 (Commission Protocol No. 9 dated May 06, 2024) (Table 12).

Table 12. Total Pacific salmon catch (in metric tons) in 2024.

Fishing area	Pink salmon	Chum salmon	Sockeye salmon	Coho salmon	Masu salmon
South Kuril zone	9,541.947	11,190.496	10.8	0	0.8

In 2024, commercial fishing quotas for Pacific salmon were allocated to 7 companies: 1,200 metric tons for Pink Salmon and 3,920 metric tons for Chum Salmon. From the total quota, 1,000 metric tons of Pink Salmon and 3,000 metric tons of Chum Salmon were allocated to YKRK (Appendix 7 of the Commission's Protocol No. 23 dated July 18, 2024). According to Appendix 6 of this Protocol, the deployment of trap nets is permitted at 41 sites, including for YKRK - at 24 sites.

Beginning and closing dates of commercial, traditional and recreational (amateur) fishing were:

- from August 01 to September 10 for Pink Salmon;
- from September 11 to November 30 for Chum Salmon.

However, in 2024, both Pink Salmon and Chum Salmon runs to the Southern Kuril Islands turned out to be significantly less than predicted.

According to the Federal State Budgetary Scientific Institution “VNIRO” (VNIRO Analytics as of 21.11.2024.pdf), the total salmon catch in the South Kuril zone was 9,310 metric tons (Fig. 30). The Pink Salmon catch amounted for 2,444 metric tons, which was caught exclusively on Iturup Island. The Chum Salmon catch on two islands was 6,865 tons. Other species of Pacific salmon are not harvested on Kunashir Island.

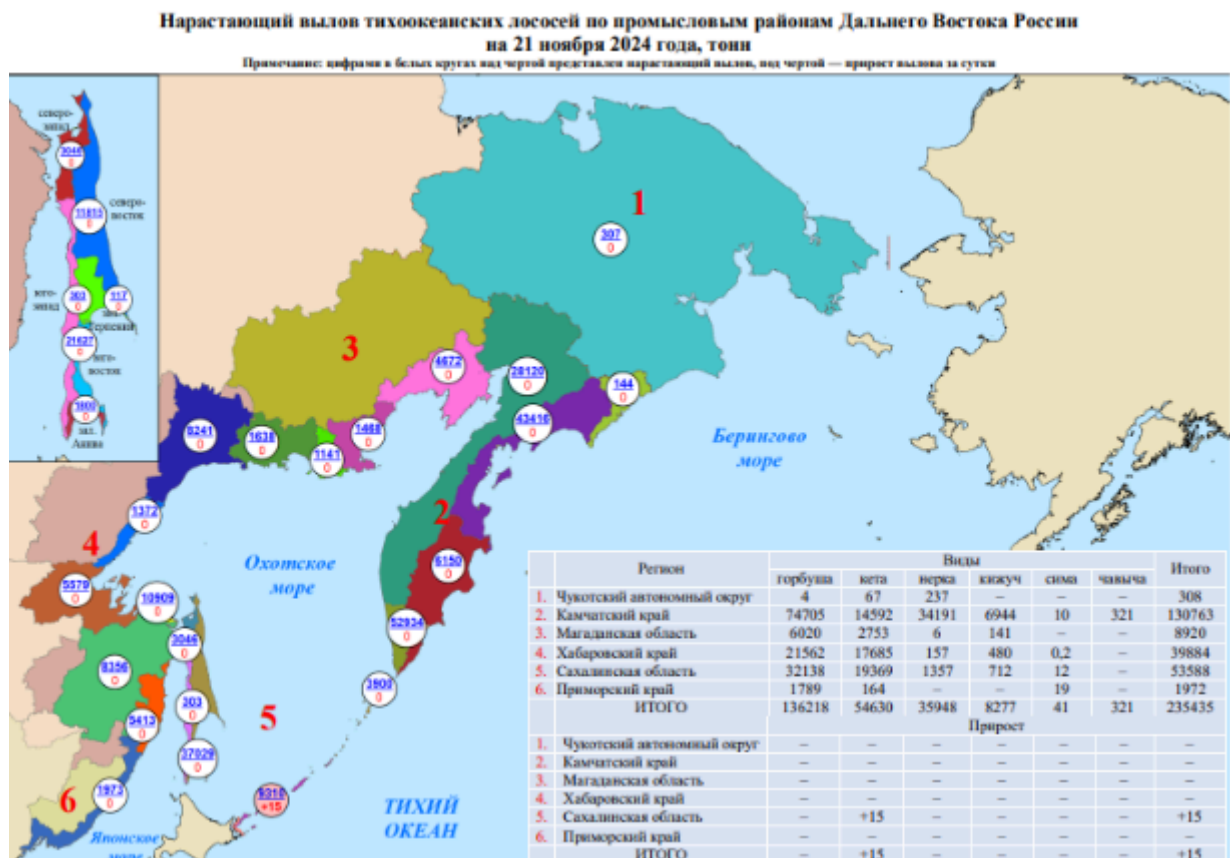


Fig. 30. Total salmon catch in the Russian Far East according to the Federal State Budgetary Scientific Institution “VNIRO”

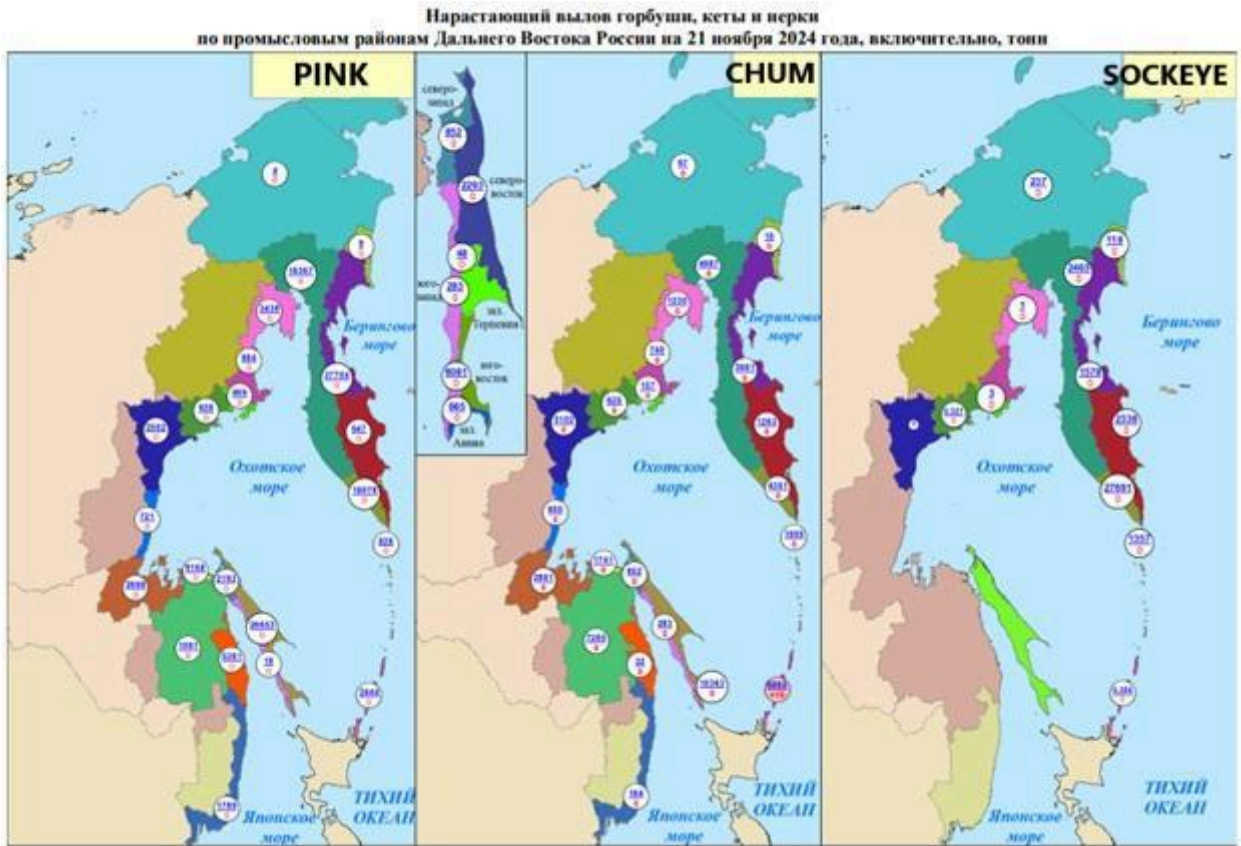


Fig. 31. Pink, Chum and Sockeye Salmon catch on Iturup and Kunashir in 2024.

Figure 32 presents data on Pink Salmon and Chum Salmon catches with trap nets in the coastal area of Kunashir Island over the past 23 years. The data clearly shows that the populations of these species are still in a depressed state. 2024 has seen a slight increase in catch of Chum Salmon though. Most likely, this happened due to the return of “hatchery-origin” fish reproduced at Lagunnoye Lake Salmon Hatchery and Ricorda River Salmon Hatchery.

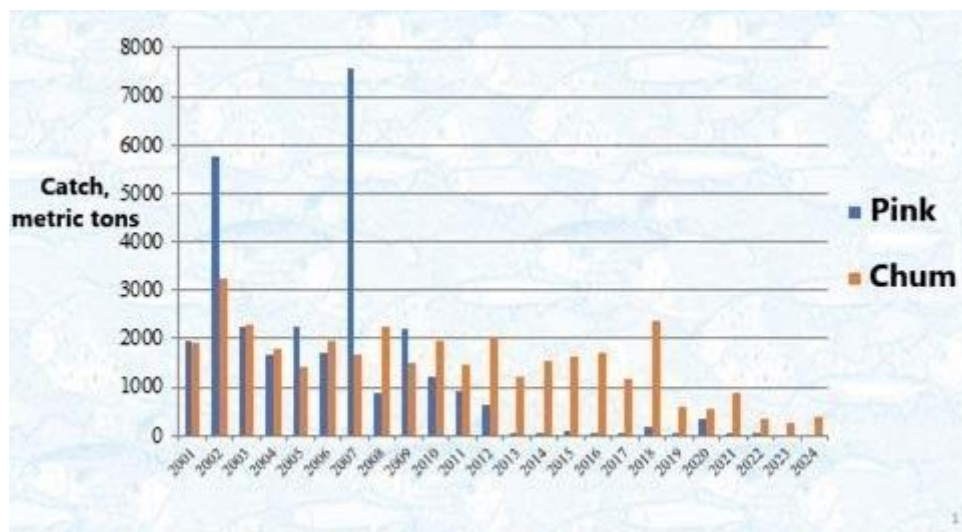


Fig. 32. Pink and Chum Salmon catch on Kunashir Island using trap nets from 2001 to 2024

5.1. Pink salmon

The catch of Kunashir Pink Salmon with trap nets is currently extremely low. The highest catches of both generative lines (even and odd years) occurred at the end of the 20th – beginning of the 21st centuries. Pink Salmon stock of odd-year spawning line, having reached a maximum in 2007, sharply declined. Even-year generation stock has also been declining. However, there were no restrictions on fishing or recommendations to reduce the fishing pressure on Pink and Chum Salmon in Kunashir in the Fishery Strategy for 2024. Commercial fishing quotas were allocated to four companies.

In-season data provided to SakhRybVod and SakhNIRO showed that until mid-August, the river escapement was extremely low, and only individual Pink Salmon spawners were recorded on the spawning grounds. Zero catch and low escapement rate in the rivers made the specialists of YKRK company take the initiative to apply to the Association of Fishermen of Sakhalin Region (AFS) with a request to take measures to restrict fishing. They have thus initiated the process of approval and decision making. At the regular meeting on August 28, Anadromous Fish Commission (AFC) made a decision to restrict Pink Salmon fishing on Kunashir Island (Protocol No. 38). However, the situation did not improve. River escapement was zero and commercial quotas for Pink Salmon were not used in 2024.

5.2. Chum salmon

Chum Salmon in the coastal waters of Kunashir Island are currently caught with trap nets. The main part is caught in the second half of September – October. The distribution of catches along the coast is uneven. Most of the Chum Salmon are harvested from the Sea of Okhotsk coast in the area of the Pervukhina Bay. This might be explained by the return of “hatchery-origin” Chum Salmon. In the southern part of the island (Izmeny Bay), the abundance of Chum Salmon is small; and coastal fishing in this part of the island is not yet carried out.

In 2024, the Anadromous Fish Commission (AFC) set a total catch quota of 3,920 metric tons for Chum Salmon with trap nets in the coastal area of Kunashir Island. 3,000 metric tons of the total was allocated to YKRK (Appendix No. 7 to Protocol No. 23 of the meeting of the Anadromous Fish Commission dated July 18, 2024). In fact, total coastal catch in 2024 was **384.434 metric tons**, and **374.545 metric tons** of this total was caught by the YKRK company.

In addition to fishing in the coastal area, two companies harvested “hatchery-origin” Chum Salmon at the egg collection points according to quotas for aquaculture and fish farming. In total, 148.393 metric tons of “hatchery-origin” Chum Salmon were caught, including 85.960 metric tons that were caught at the Lagunnoye Lake Salmon Hatchery.

Table 13. Chum Salmon catch (in metric tons) on Kunashir in 2024

Fishing companies Kunashir Island	Trap nets	Salmon hatchery (at egg collection points)
YKRK / Lagunnoye Lake Salmon Hatchery	374.545	85.96
Muravyov Individual Entrepreneur/ Ricorda River Salmon Hatchery	0	62.433
Island Fish LLC	1.974	0
Golubaya Zvezda LLC	7.1	0
Delta LLC	0	0
Zaliv Spokoyny LLC	0.083	0
Kunashir bereg LLC	0.231	0
Yuzhno-Kuril bereg LLC	0.501	0

	<i>Total:</i>	384.434	148.393
	<i>Total:</i>	532.827	

As can be seen from Table 13, “hatchery-origin” Chum Salmon in the total catches of Kunashir Island amounted for 27.85%.

The Chum Salmon run was weak and episodic. However, there is a positive increasing trend in Chum Salmon catch compared to 2023 (Fig. 33).

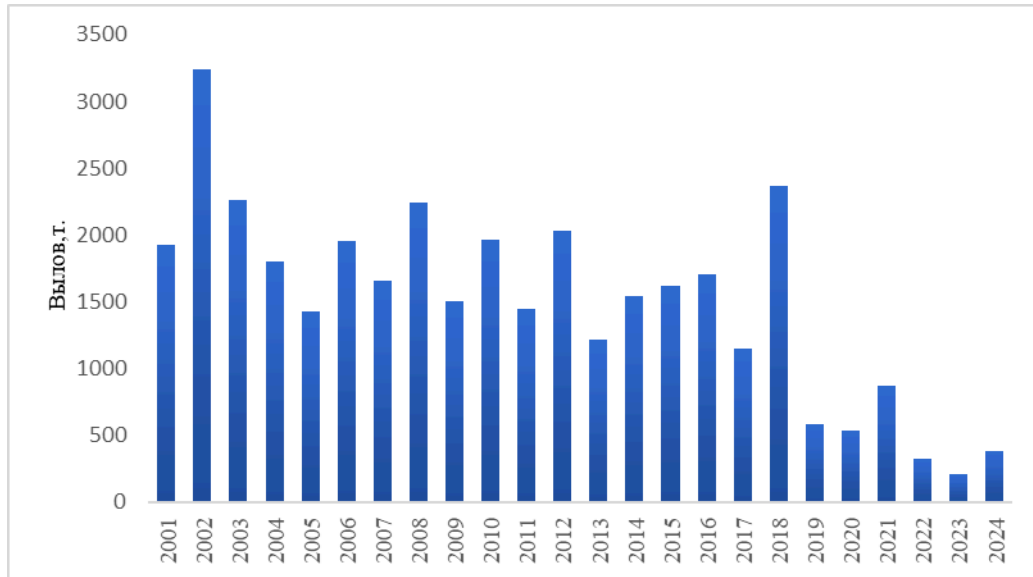


Fig. 33. Dynamics of Chum Salmon catch by fishing companies on Kunashir Island from 2001 to 2024.

Figure 34 presents statistical data for the period 2011–2024 on the Chum Salmon catch by YKRRK (using coastal trap nets) relative to the total Chum Salmon catch with trap nets on Kunashir Island.

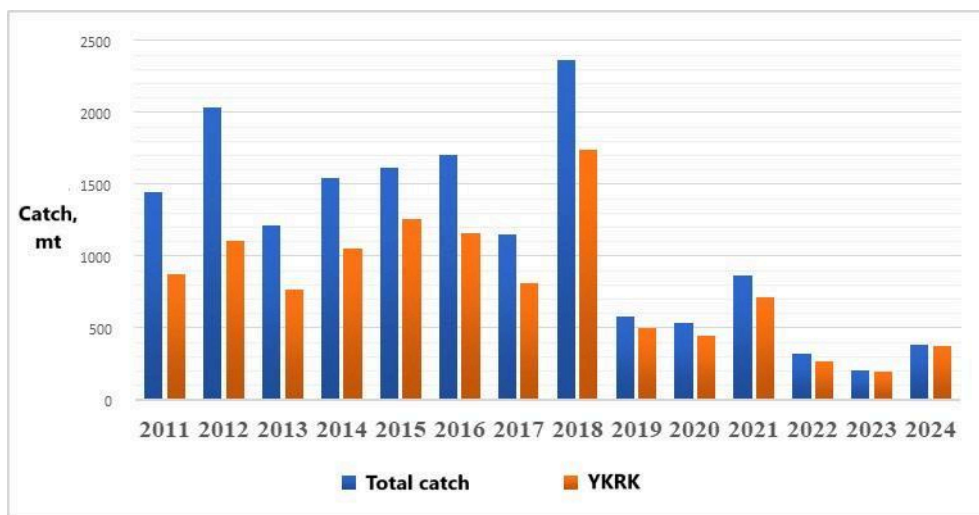


Fig. 34. Chum Salmon catch by YKRRK relative to the total Chum Salmon catch on Kunashir Island, incl. for the period 2011–2024.

The participation of YKRRK company in the Chum Salmon fishery in different years ranged from 70 to 85%. In 2023, the share of this company in the total Chum Salmon harvest on Kunashir was 94.6%, in 2024 it was up to 97.5%.

As a rule, the largest catches and the number of trap nets deployed occur on the Sea of Okhotsk coast. Usually, by the end of the first ten days of November, the last trap nets are removed, since their further operation is associated with the risk of destruction by strong fall storms.

In 2024, in order to use up its commercial quotas for Chum Salmon, the YKRK company set up 9 trap nets, 2 of them were located in the fishing parcel No. 65-18-18 within the Lesnaya River-Petrovka River boundaries (Golovnina Bay, Pacific coast), and other 7 trap nets were located in the fishing parcel No. 65-18-08 within 0.4 km northeast of Cape Spiridonov-Asin Stream (Pervukhina Bay, Sea of Okhotsk coast).

As for YKRK company trap nets, the first Chum Salmon were registered on September 19 in the fishing parcel No. 65-18-18 (Golovnina Bay) with a catch of 0.318 metric tons (Fig. 35) and in the fishing parcel No. 65-18-08 (Pervukhina Bay) with a catch of 0.902 metric tons (Fig.36). 2 peaks of salmon runs were observed during the fishing period: the first was on October 01-05, and the second was on October 16-20. Then the catches began to decline, and the company management decided to remove the first trap nets in the Golovnina Bay on October 29.

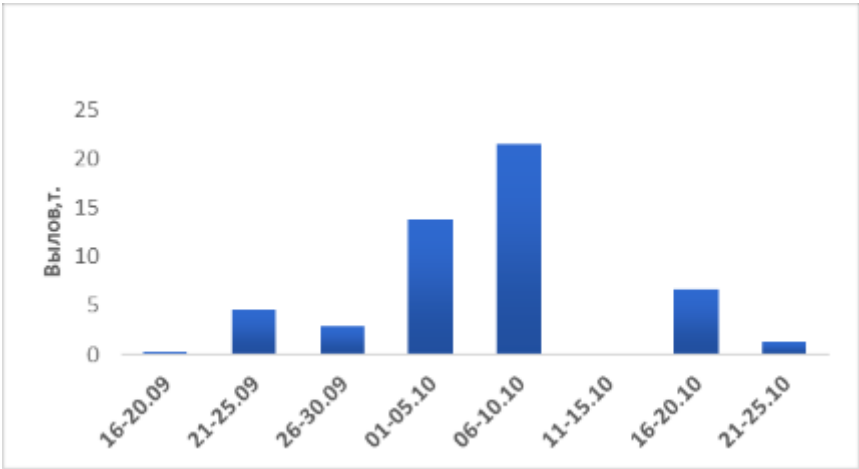


Fig. 35. Dynamics of Chum Salmon catch (in metric tons) in the fishing parcel 65-18-18

The beginning of Chum Salmon run was reported on September 21, with two peaks of the run: mixed spawning population (wild + hatchery-reared) on October 01-10 and hatchery-reared population on October 16-20. The late return of hatchery-reared fish is probably connected with the release of juveniles from late planting of eggs imported from other areas in 2021 and 2022.

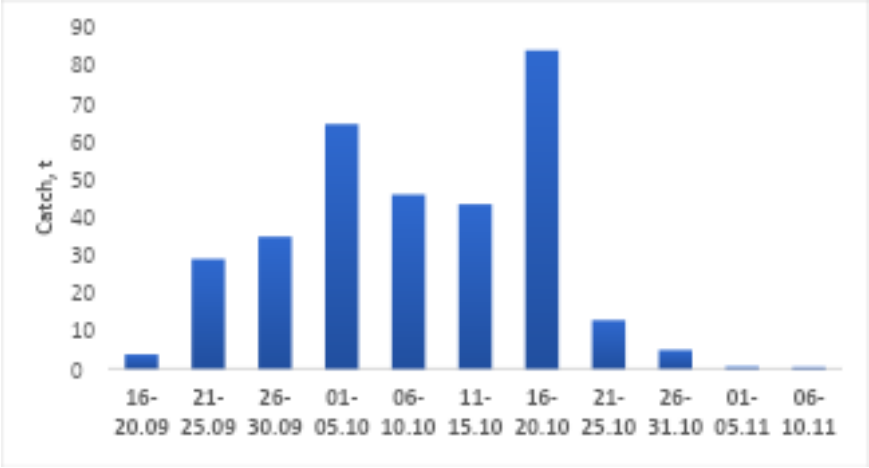


Fig.36. Dynamics of Chum Salmon catch (in metric tons) in the fishing parcel 65-18-08

In general, Chum Salmon fishing continued until November 06, inclusive (Table 14).

Table 14. Chum Salmon catch (in metric tons) with trap nets in 2024.

Five-day period	Chum Salmon catch using trap nets in the coastal fishing parcels, metric tons	
	65-18-08	65-18-18
Sept 16-20	3.792	0.318
Sept 21-25	28.893	4.625
Sept 26-30	34.755	2.895
Oct 01-05	64.298	13.810
Oct 06-10	45.814	21.480
Oct 11-15	43.304	0
Oct 16-20	83.882	6.620
Oct 21-25	12.795	1.317
Oct 26-31	4.952	
Nov 01-05	0.557	
Nov 06-10	0.438	
<i>Total: from September 19 to November 06, 2024</i>	323.48	51.065
<i>Total:</i>	374.545	

In total, **374.545 metric tons** were caught in the fishing parcels of YKRRK, which amounted to 12.5% of the allocated quotas.

6. Fishing pressure and fishing efforts when catching Chum Salmon with trap nets

In 2024, we tried to analyze such indicators as fishing pressure and fishing effort.

The fishing pressure was calculated using the formula:

$$\text{Fishing pressure} = \frac{\text{Number of kilometers}}{\text{Number of trap nets}}$$

And the fishing effort according to the formula:

$$\text{Fishing effort} = \frac{\text{Number of fish caught}}{\text{Number of trap nets}}$$

Calculations for 2024 are given in Table 15. The calculations took into account trap nets where Chum Salmon were caught. Tables 16 and 17 show calculations for previous years.

Table 15. Calculation of fishing pressure and fishing effort for Chum Salmon fishing in 2024

	Fishing parcel, No.	Number of trap nets	Length of coastline along the fishing parcel borders, km	Catch, metric tons	Fishing pressure	Fishing effort
						Chum Salmon
1	65-18-08	7	20.6	323.48	2.9	46.2
2	65-18-18	2	14.4	51.065	7.2	25.5
	TOTAL	9	35	374.545	3.9	41.6

Table 16. Calculation of fishing pressure and fishing effort for Chum Salmon fishing in 2023

	Fishing parcel, No.	Number of trap nets	Length of coastline along the fishing parcel borders, km	Catch, metric tons	Fishing pressure	Fishing effort
						Chum Salmon
1	65-18-08	6	20.6	177.969	3.4	29.7
2	65-18-18	2	14.4	17.318	7.2	8.7
	TOTAL	8	35	195.287	4.4	24.4

Table 17. Calculation of fishing pressure and fishing effort for Chum Salmon fishing in 2022

	Fishing parcel, No.	Number of trap nets	Length of coastline along the fishing parcel borders, km	Catch, metric tons	Fishing pressure	Fishing effort
						Chum Salmon
1	65-18-08	5	20.6	171.338	4.12	34.3
2	65-18-18	2	14.4	64.542	7.2	32.3
	TOTAL	7	35	235.88	5	33.7

7. Chum salmon growth rate

Chum Salmon *Oncorhynchus keta* (Walbaum), due to its short period of stay in freshwater and distinct homing is the most commercially valuable species for breeding so as the main object of artificial reproduction in all countries of the North Pacific.

In Russia and primarily in the Sakhalin Region, where most of the salmon hatcheries are concentrated, the number of juvenile Chum Salmon is constantly increasing. To understand the difference between hatchery and wild Chum salmon in a particular area, and for the rational exploitation of stocks, as well as for predicting catches, biological analyses aimed at age determination by using fish scale are carried out. It is well known that there is a close correlation between the abundances of spawners of adjacent age groups, which makes it possible to predict the catch of the next year based on the catch of the current year (Elnikov, 2024).

Studying the age composition of fish stocks and their growth is necessary both for understanding living conditions and for assessing population sizes.

When studying the migrations of Pacific Salmon, it is of great importance to identify features that are typical for a particular local herd. For Chum Salmon it is the growth and scale structure (Fig. 37).

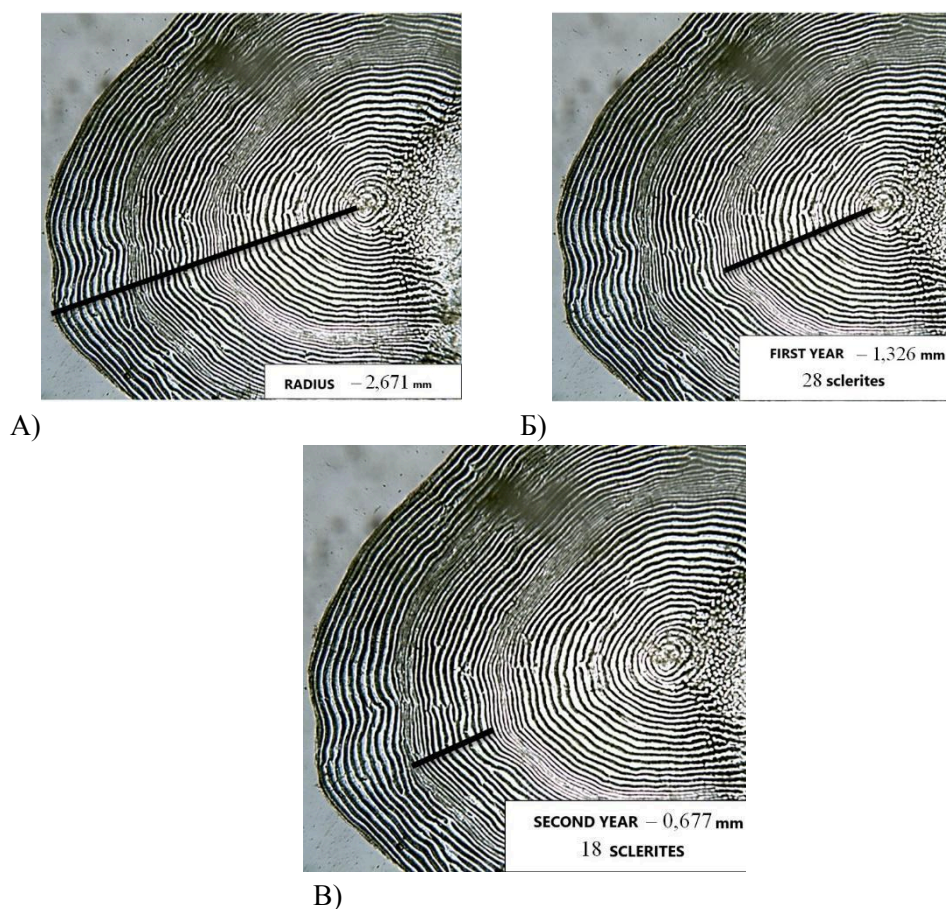


Fig. 37. Scheme for scale measurement in Chum Salmon spawners: full radius length (A), radius of the first (B) and second (C) annual ring.

Salmon scales can be used for a reliable and accurate age determination and growth estimation at any year of its life cycle. Salmon scales grow in the early period of their life cycle and the nature of scale growth is essential for determining the state of Chum Salmon stocks in a given river. The scale plate starts to form when an average size of a fry is 39-40 mm, first sclerites begin to form on the scales when a fry is of 40-42 mm long. The scale diameter fluctuates from 0.17 to 0.3.

In the early life stage of a juvenile, the growth of scales is most intensive and the formation of sclerites is much faster than during its further growth. Later, the ratio between the growth of

scales and the body changes. The rate of sclerites formation on scales, as well as the formation of annual rings, varies. The younger the fish, the faster the formation of sclerites (Kulikova, 1976).

The absolute growth is calculated using a ratio of distance between circuli in scales and body length, taking into account the body length of a fry when the scales start to grow (Lee, 1926).

First, the total radius of the scale is measured from the center to the edge (Fig. 1A), then each annual increment is measured separately, counting the number of sclerites in it (Fig. 1B, C). The area of the scale with the largest radius is selected for measurements (Elnikov, 2024).

Scale samples collected from the catches with coastal trap nets and from catches in the Pervukhina River (salmon hatchery) of different age composition will be used for growth rate calculation. In 2024, the age composition is represented by groups 2+, 3+ and 4+. A total of 727 scale samples were collected. 150 scale samples were prepared (25 samples of each age group). This will allow to determine such features as:

1. Number of sclerites (concentric rings on the outer layer of scales);
2. Sizes of annual zones;
3. Shape and size of scales;
4. Width of sclerites.

The collected materials will allow us to calculate absolute fish growth, growth rates and identify the characteristics of the local stock of Chum Salmon on Kunashir Island.

Conclusions

The presented report is based on the field research data from 2022–2024, as well as data from publications and archival materials. The study included field work on the rivers of Kunashir, analysis of biological and statistical data on the catch. Fish parameters (length, weight, gonad condition) were determined using standard methods. All data on the age structure, collected from scales, were sent to the specialized institute SakhNIRO for further stock assessment.

In 2024, five Kunashir watercourses were surveyed. Spawning grounds of Pink Salmon and Chum Salmon were examined on the rivers (for example, Petrova, Andreyevka), but their escapement remains critically low. Monitoring of some rivers, such as the Ilyushina River, are important, so they are examined 3 times per season.

1. No destruction or degradation of Pacific Salmon spawning grounds was detected during the survey of water bodies on Kunashir Island between late September and early November.
2. Pink Salmon runs to Kunashir Island in 2024 (as well as in 2023) were extremely small, the population is declining; escapement rate in spawning grounds is only 0.54% of the norm. Fishing was practically non-existent.
3. Anadromous Fish Commission (AFC) promptly introduced restrictions on the Pink Salmon fishery on Kunashir Island, but this did not improve the situation regarding the escapement to the spawning grounds.
4. Chum Salmon population shows a tendency to dominate in spawning water bodies (previously, Pink Salmon dominated). However, the escapement rate in spawning grounds in 2024 was only 6.35% (below the critical level of 30%). Spawning is becoming late, probably due to climate change.
5. In 2024, 14.1 million eggs from their own broodstock were planted for incubation at the Lagunnoye Lake Salmon Hatchery. 9.6 million eggs from the broodstock were planted at Ricorda River Salmon Hatchery.
6. When analyzing the biometric characteristics, it was revealed that the average weight of Chum Salmon in 2024 (2,437.9 g) is close to that of 2023 and lower than the data on the average weight of Chum Salmon obtained by Kaev in the period from 1993 to 2013 – 3,086 g.
7. The age composition of Chum Salmon (Kaev, Romasenko, 2017) on Kunashir Island usually has four groups – from 2+ to 5+. However, in 2022, an individual 5+ years old was found only in the Ilyushina River, and in 2023, 5+ years old individuals were not encountered at all! In 2024, a male aged 5+ and weighing 7,200 g was caught only once in the Sernovodka River. The analysis of the age structure of Chum Salmon showed that four- and three-year-olds fish dominate in numbers in 2024.
8. Commercial quotas for Pink Salmon (1,200 tons) were not used due to its low abundance. The main fishery is focused on Chum Salmon, with most of the catches occurring on the coast of the Sea of Okhotsk. Trap nets were used to use the quotas. The catch increased compared to last year and amounted to 532.8 metric tons, 27.85% of which was “hatchery” salmon. Actual catches remain low, and the allocated quotas are not being used.
9. The significant increase in “hatchery” salmon stock requires an assessment of its contribution to the overall population. For this purpose, otoliths were collected and will be analyzed between January and April 2025.
10. To determine the growth rate of Chum Salmon and to possibly identify some characteristics of local populations of Chum Salmon on Kunashir Island, scale samples were prepared, which will be analyzed by the author in the future if necessary.

List of references

1. Gritsenko O.F. 2012. Fishes of the Kuril Islands. – M.: VNIRO. – 384 p.
2. Elnikov, A.N., Zelennikov O.V. The methodology of determining the age of Chum Salmon // Proceedings of VNIRO. - 2024. - V. 197. - P. 36-42.
3. Zinichev V.V., Leman V.N., Zhivotovsky L.A., Stavenko G.A. 2012. Theory and practice of biodiversity conservation in Pacific salmon breeding. – M: VNIRO. –8 p.
4. Kaev A.M., Romasenko L.V. 2017. Pink Salmon and Chum Salmon of Kunashir Island (population structure, reproduction, fishery): monograph //Yuzhno-Sakhalinsk: SakhSU. - 124 p.
5. Kaev A.M., Strukov D.A. 1999. Some parameters of Pink Salmon *Oncorhynchus gorbuscha* and Chum Salmon *Oncorhynchus keta* reproduction on Kunashir Island // Fisheries research in the Sakhalin -Kuril region and adjacent waters. - Yuzhno-Sakhalinsk: SakhNIRO. - V. 2. - P. 38-51.
6. Kulikova N.I. 1976. Scale structure and growth pattern of Chum Salmon of different stocks // Proceedings of TINRO. – V.74. P.81-92.
7. Lee R. 1926. Age determination of fish. // A Review of the Methods of Age and Growth Determination in Fishes. Krasnoyarsk. P. 17-32.
8. Reports of the South Kuril department of the Federal State Budgetary Institution “Glavrybvod”.
9. Pravdin I. F. 1966. Guide to the Study of Fish. Moscow: Food Industry. – 376 p.
10. VNIRO website with data analytics on Pacific salmon catches in 2024:
<http://vniro.ru/ru/nauchnaya-deyatelnost/lososevaya-putina>