Translation
of

Informational Report

Under Contract № 04-299/2010-NIR

Scientific research on the issue
«Identification of salmon in the spawning return in 2010 on Iturup Island»

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по 2 этапу договора № 04-299 /2010-НИР

о научно-исследовательской работе по теме «Идентификация маркированных лососей в нерестовом возврате 2010 г. на о. Итуруп»

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Informational Report

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Scientific research on the issue

«Identification of salmon in the spawning return in 2010 on Iturup Island»

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Content

Introduction

The first release of salmon with tags on their otoliths, marked at the Kurilskiy and Reidovoy hatcheries, was carried out on Iturup Island in 2009. The total release amounted to 76 million salmon, of which 2.3 million were chum salmon and 7.3 million were pink salmon released by Kurilskiy Hatchery, and 23.9 million chum salmon and 42.2 million pink salmon by the Reidovoy Hatchery.

The 2008 Pink salmon of generation returned in 2010, which allowed research to begin on the assessment of the number of hatchery fish in the total run to Iturup Island.

Material and Methods

Material for the assessment of the origin of pink salmon spawners was collected at roe collection sites of hatcheries and spawning grounds, of basic rivers and tributaries. Moreover, material was collected from trap nets at Prostor and Kurilskiy Hatcheries. A total amount of 1,739 otoliths of pink salmon, and 800 otoliths of chum salmon were transferred to the Sector of the Otolithometric of SakhNIRO for analyses of the otoliths microstructure.

The analysis of the otoliths of pink salmon and chum salmon, collected in the Kurilskiy hatchery area was carried out in the second stage of research. The location of collection is presented below on the drawing (Fig 1). A total 439 otoliths of pink salmon and 146 otoliths of chum salmon were examined.

Thermoplastic cement was used for the preparation of otolith samples (Buehler, USA). The installation of the otoliths on glass was accomplished using low magnification from the Olympus SZ51 stereomicroscope. The preparation of the otoliths for an analysis of the microstructure was carried out in accordance with conventional otolith techniques (D. H. Secor et al., 1991).

The otoliths were polished on a MetaServ-250 grinding and polishing machine. Grinding of the otoliths was carried out on abrasive disks with aluminum-oxide and silicon-carbide-coated grit of 30-40 microns. For the polishing of saw cuts, the grinding disk FibrMet and diamond grinding paper ultra-prep from 0.1 to 9 microns were used. The microstructure of the otoliths was determined using an Olympus BX51 and an Axio Scope A1 microscope, with a magnification range of x200 to x1000.

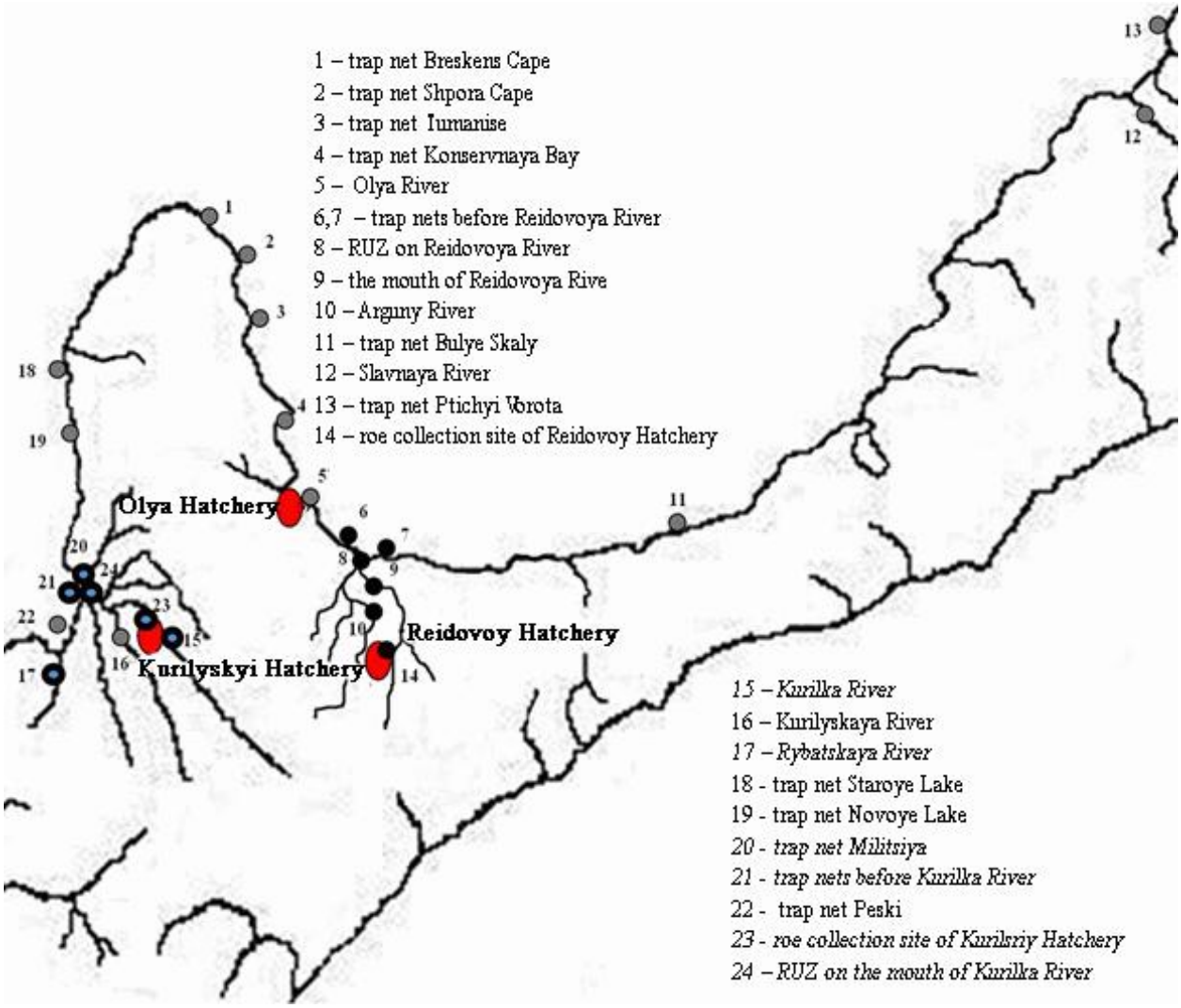

Figure 1. A drawing of the area of collection and identification of marked chum salmon and pink salmon spawners, in the 2010 return to Iturup Island. Red circles indicate the location of otolith collections examined on the second stage of research.

The marking of pink salmon of the 2008 generation at the Kurilskiy Hatchery, was carried out in an experimental manner. Pink salmon from groups #17 and #20 were subjected to marking in the late stages of incubation. The marking regime consisted of short cycles because there was little time before the eggs hatched; i.e. the formation of each stripe of the tag indicates a 12 hour gap between the stripe formation. The tag has the form: 3n,1,2nH. As shown by the studies of the otolith microstructure of chum salmon and pink salmon of the Kurilskiy Hatchery, daily incremental growth of their otoliths was minor during this period in their development. The formed tag has distinct lines, lying closely together.

The otolith microstructure of pink salmon from the Kurilskiy Hatchery were characterized by the presence of stripes in the area which formed before hatching (Fig.2).

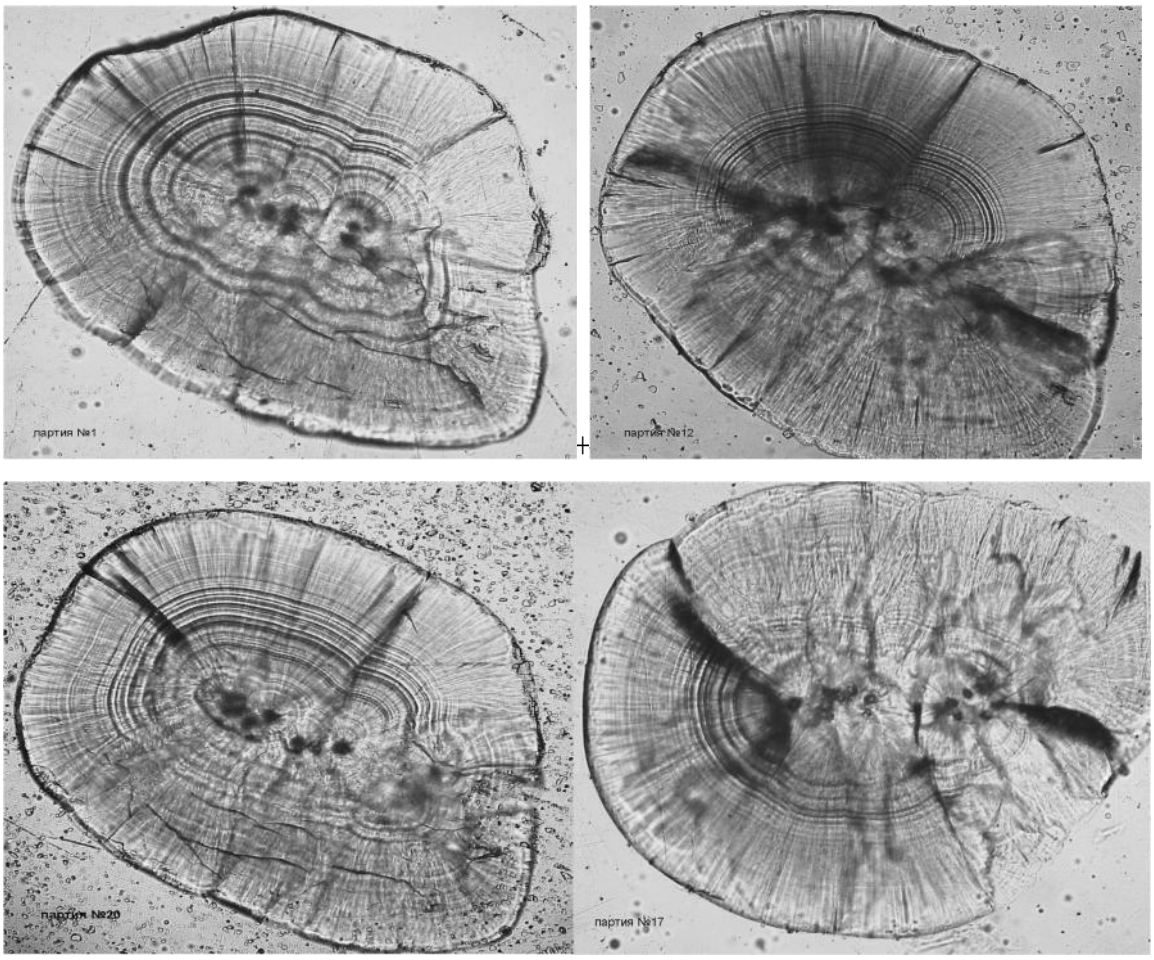

Figure. 2. The otoliths of pink salmon juveniles from groups #1, 12, 17 & 20 of the 2008 generation from Kurilskiy Hatchery, under a magnification of X200.

The opportunity does not exist for the thermal marking of salmon at the Kurilskiy Hatchery. The dry method of marking is applicable only to the hatching of embryos, then the tag was formed in the "striped" zone of otoliths.

The Results of the Analyses of the Otolith Microstructure of Salmon

The tag, formed in the microstructure of the otoliths of salmon of the 2008 generation at the Kurilskiy Hatchery, was poorly distinguishable on the otoliths of juveniles at X200 magnification, and clearly differed at X500 magnification (Fig. 3). The preparation of the samples and viewing them at a magnification of 500-1000X has been carefully carried out to detect the tags on the adult fish otoliths with closely spaced strips formed on the complex micro-structural background (Figs. 4 and 5).

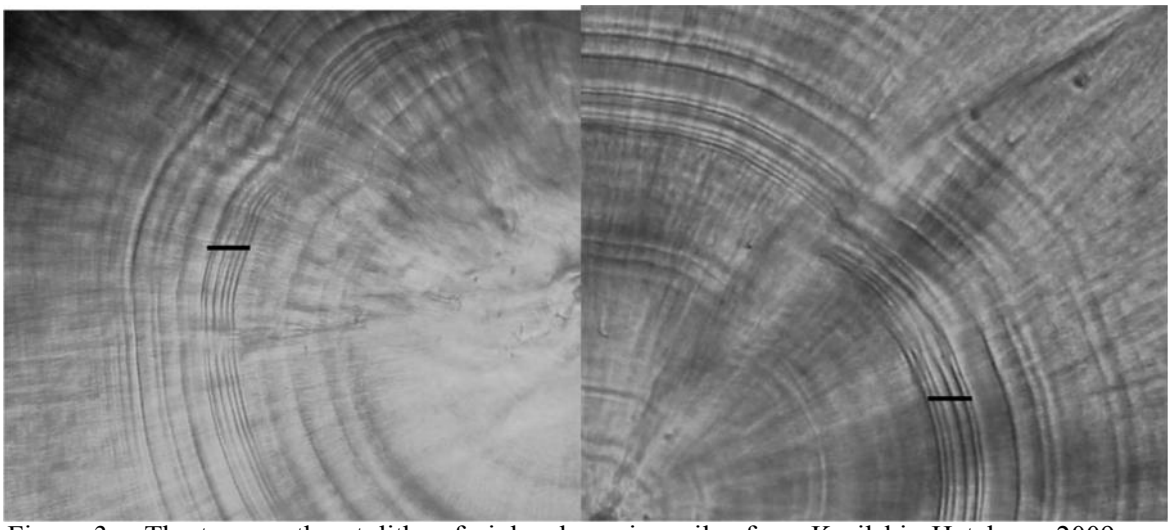

Figure 3. The tags on the otoliths of pink salmon juveniles from Kurilskiy Hatchery, 2009, groups #17 and 20, X500.

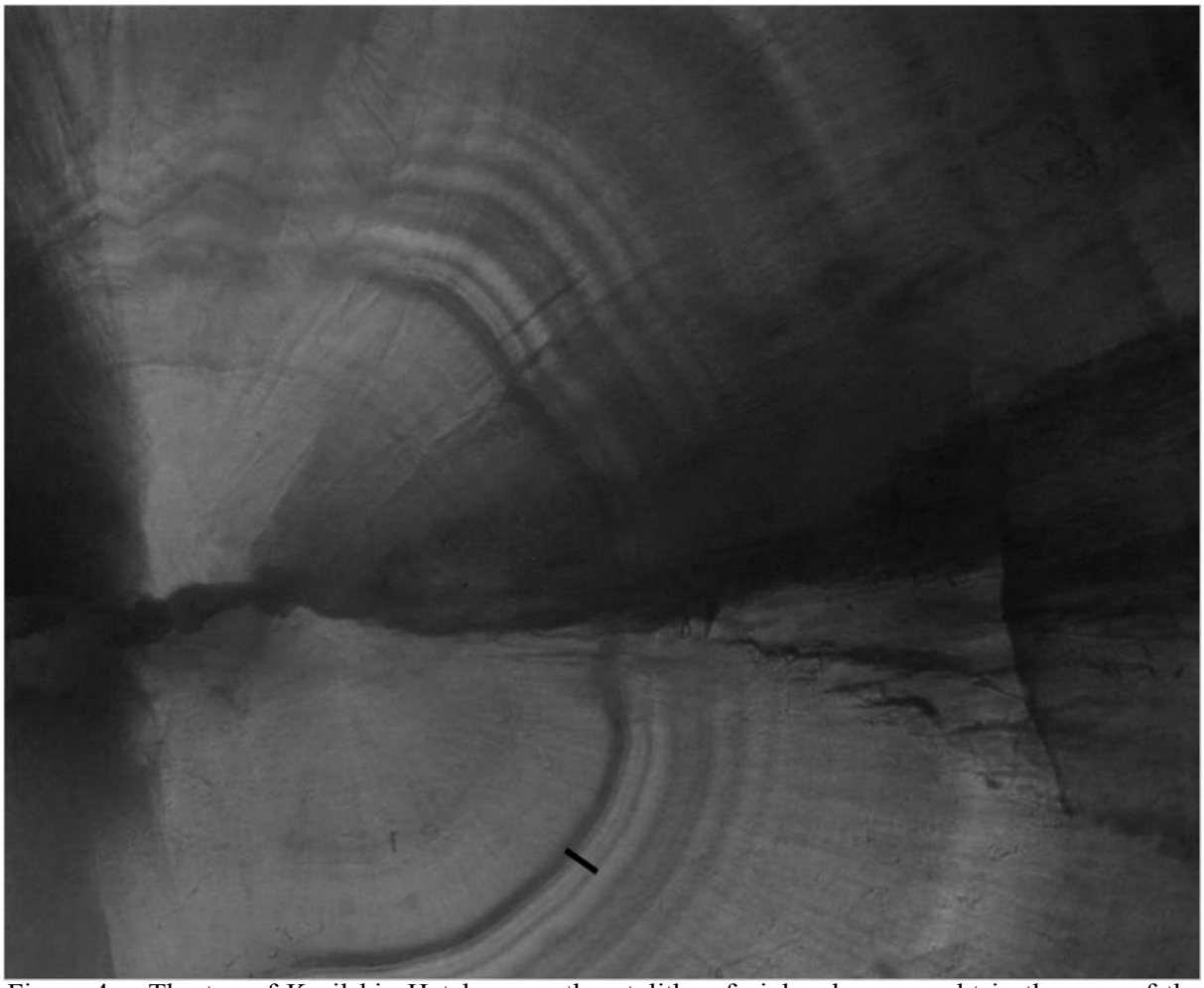

Figure 4. The tag of Kurilskiy Hatchery on the otoliths of pink salmon caught in the area of the Kurilka River mouth (21) on September 17, 2010, X500.

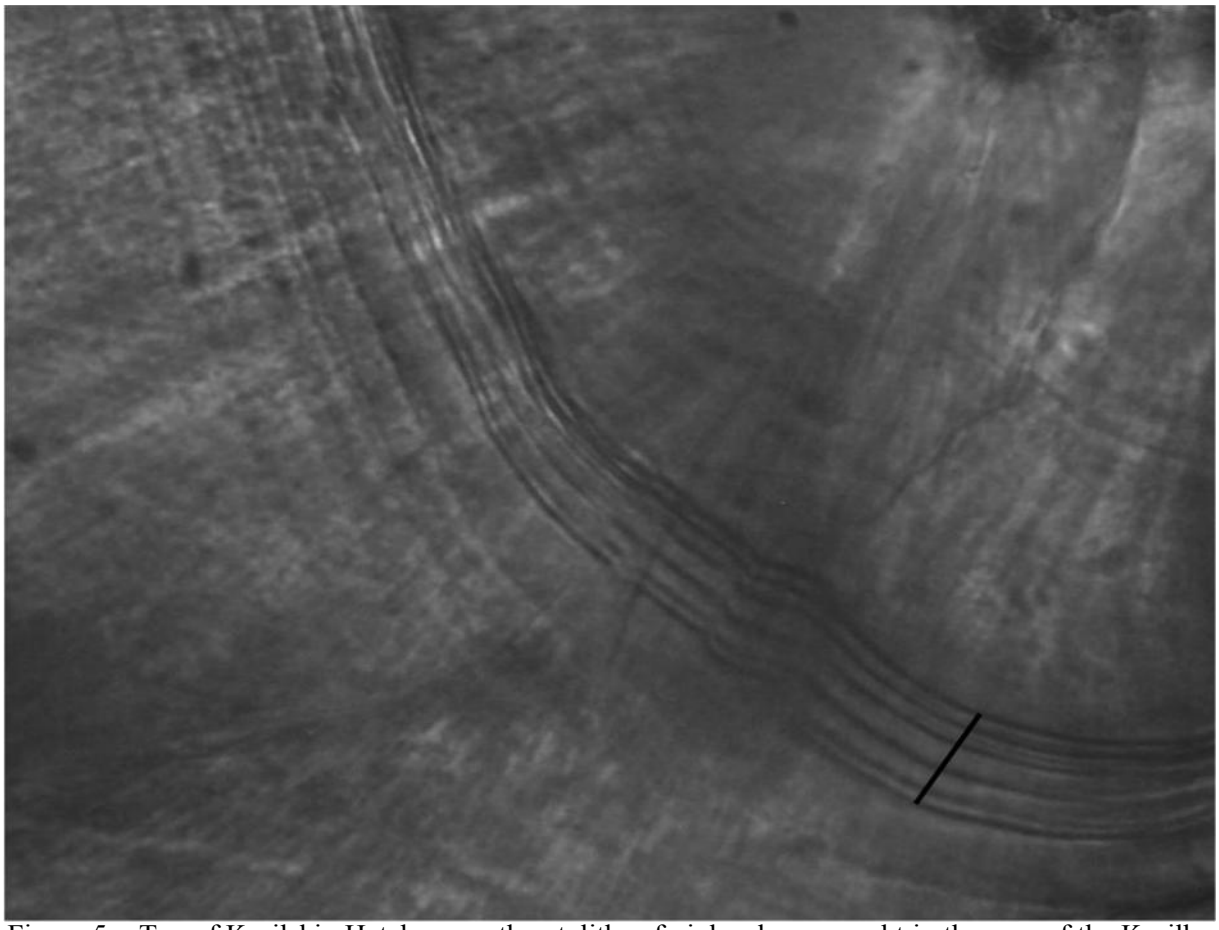

Figure 5. Tag of Kurilskiy Hatchery on the otoliths of pink salmon caught in the area of the Kurilka River mouth (21) on August 17, 2010, X1000.

The total amount of marked juvenile salmon from the Reidovoy and Kurilskiy hatcheries was 75.7 million, of which 26.2 million were chum salmon and 49.6 million were pink salmon (Tab. 1)

Table 1

The amount of marked juvenile salmon released on Iturup Island, 2009

Name of hatchery	Species	Total release, million	Marked juveniles, million	% marked juveniles
Reidovoy	pink salmon	42.24	42.24	100
	chum salmon	23.89	23.89	100
Kurilskiy	pink salmon	67.4	7.32	10.860534
	chum salmon	18.7	2.3	12.299465
Total	pink salmon	109.64	49.56	45.202481
	chum salmon	42.59	26.19	61.493308
	Total amount of juveniles	152.23	75.75	49.760231

The main group of juveniles was marked at Reidovoy Hatchery (100% of the juvenile release). About 12.3 % of chum salmon and 10.8% of pink salmon were marked at Kurilskiy Hatchery.

Otolith microstructure analyses of 146 chum salmon did not reveal any marked fish.

The otoliths of 460 marked pink salmon were selected for identification in the Kurilskiy Hatchery spawning return; however some otoliths were split in the selection,

storage or transport process, and had no center. As a result, the otolith microstructure of only 439 individual pink salmon were identified. (Tab. 2).

Table 2

Data of the identification of marked pink salmon in the area of Kurilskiy Hatchery, 2010.

Data of the collection	Place of the collection	The amount of samples, pcs.	% of marked fish		The point on the drawing
			Kurilskiy Hatchery	Japanese	
Aug. 13, 2010	Trap net "Militsiya"	59	0.00	1.69	20
Aug. 17, 2010	Kurilka River mouth	49	4.08	0.00	24
Aug. 30, 2010	The mouth of Kurilka River	48	0.00	0.00	24
Sep. 8, 2010	Roe collection site of Kurilskiy Hatchery	46	2.17	0.00	23
Sep. 10, 2010	Kurilka River, net 45x45	48	2.08	0.00	15
Sep. 108, 2010	Kurilka River discharge zone	44	22.73	0.00	21
Sep. 22, 2010	RUZ in Kurilka River mouth	50	8.16	0.00	24
Sep. 25, 2010	Roe collection site of Kurilskiy Hatchery	50	0.00	0.00	23
Oct. 4, 2010	Roe collection site of Kurilskiy Hatchery	46	2.17	0.00	23
Total		439			

Examined otoliths were collected at the roe collection site of the Kurilskiy Hatchery, and in the trap nets in the area of the mouth of the Kurilka River. Moreover, the microstructure of 50 pink salmon individuals caught in the stream of the Kurilka River above the Kurilskiy Hatchery, were examined.

Marked fish were observed during the whole period of the spawning run. Pink salmon with the tags on the otoliths were observed sporadically in the first half of the spawning run, the majority (75%) was found in the second half of the run (Rig. 6).

The most significant observation of marked individuals was in a sample from the discharge trap net zone of the Kurilka River in mid-September.

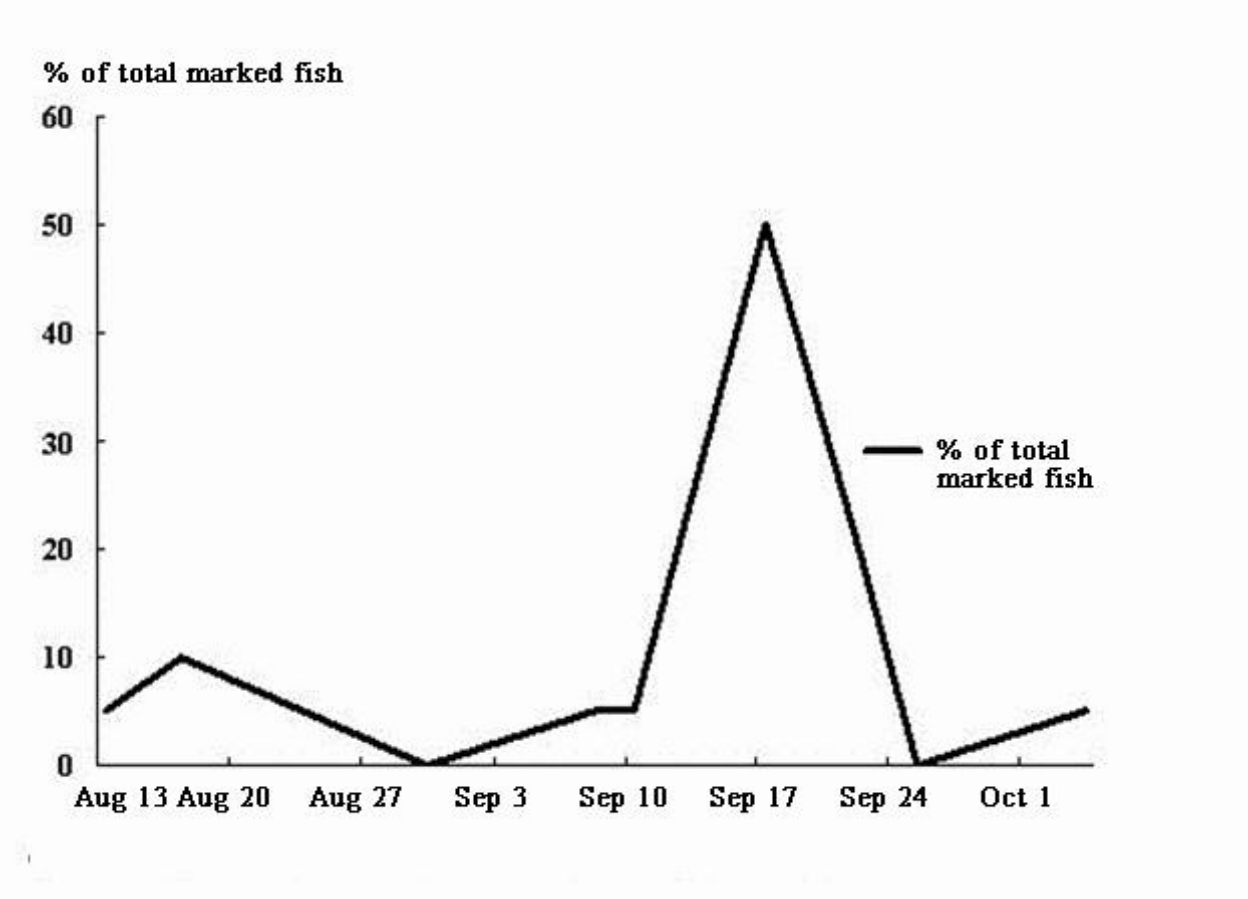

Figure 6. Distribution of identified individuals during the spawning run of 2010.

Change in the proportion of marked fish in the samples during the spawning run presented below (Fig. 7).

It should be noted that an insignificant number of marked spawners is primarily due to the small number of released marked juveniles. When calculating the number of the return of pink salmon, the Kurilskiy Hatchery should take into account that its release in 2009 amounted to 10.8% of the total release (Tab. 1), thus, the proportion of marked fish can be an order of magnitude higher than the values presented.

However, at the present initial stage of work, caution should be taken in evaluating the number of hatchery pink salmon due to the lack of data to assess the dynamics of change in the number of hatchery fish in the total run, during the whole spawning run.

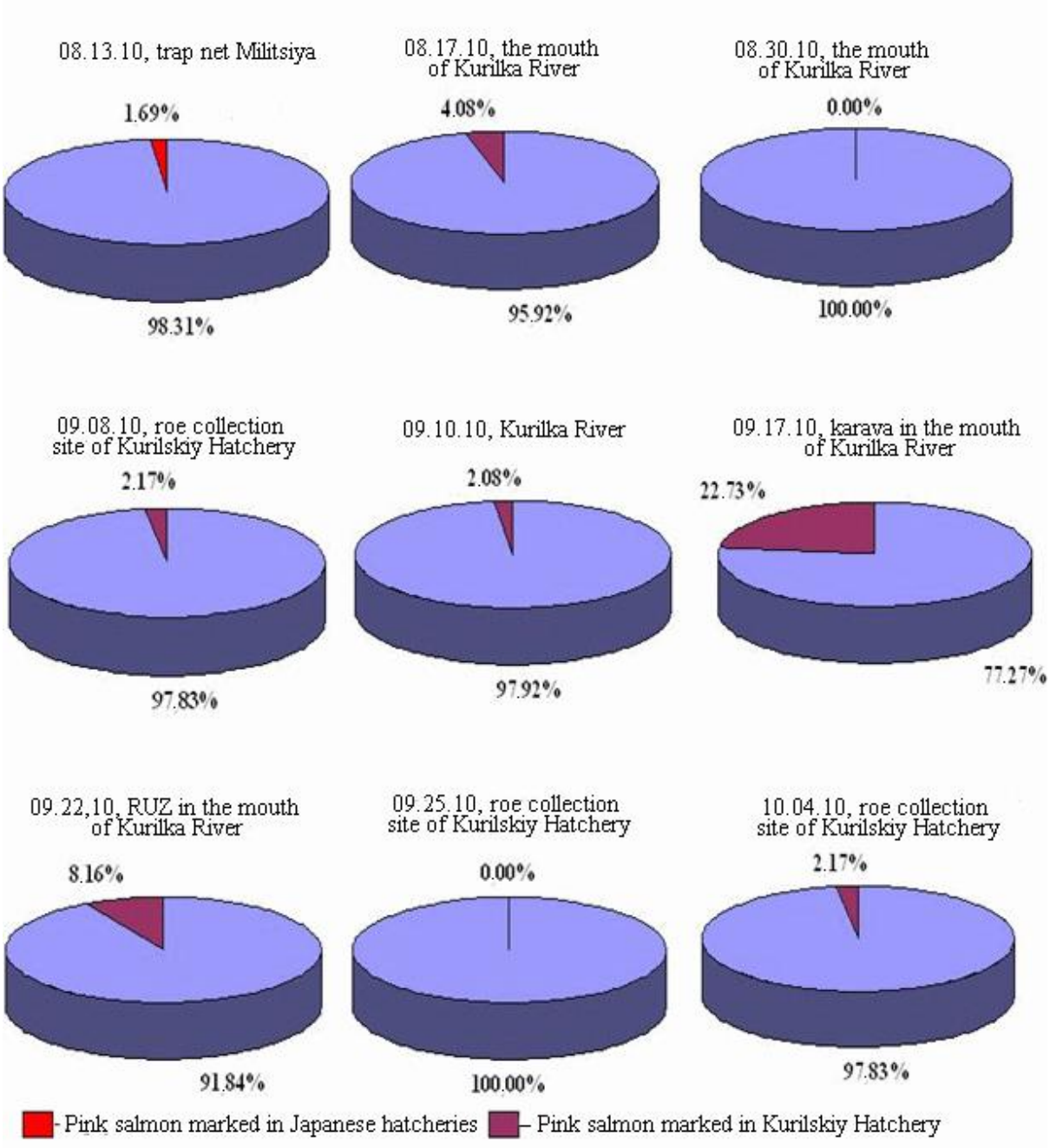

Figure 7. The proportion of marked pink salmon in the samples from the catches in the area of the Kurilskiy Hatchery in 2010.

One fish marked by a Japanese hatchery was first observed among marked spawners during a 4-year period (Fig. 8).

The specific origin of the fish will be explained later but the pink salmon was marked by the tag 3n-2H, and was released in 2009 from a Japanese hatchery on Hokkaido Island. The individual pink salmon was caught by a trap net in Kurilskiy Bay. Fish with Japanese tags were not observed among the fish entering in the river.

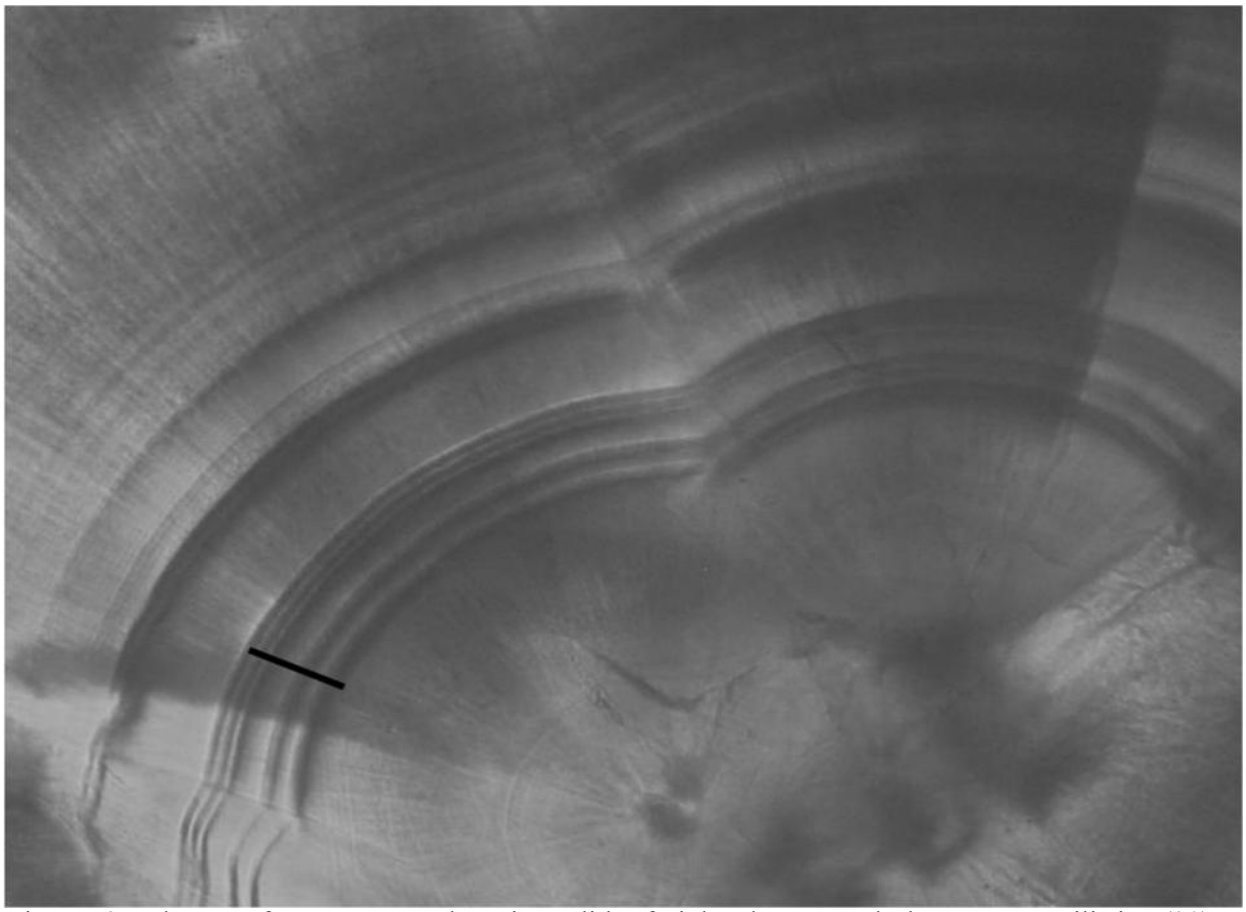

Figure 8. The tag of Japanese Hatchery in otolith of pink salmon caught by trap net Militsiya (20) 08.13.10, X500

The high proportion of marked fish observed in the mouth of the base river in comparison to the much smaller number found at the roe collection site of the hatchery, may be due to the straying in the natural spawning grounds, and the specific dynamics of the hatchery fish run. Future research should collect more material in order to estimate the proportion of hatchery fish passing to the spawning grounds.

Conclusion

The following results were obtained during the study:

1. Fish marked with the tag of Kurilskiy Hatchery were identified in the spawning return in the area of the Kurilka River.
2. Individuals originating from the final group of hatching eggs were observed throughout the spawning run, although the majority came in the second half of the run.
3. The largest part of the marked salmon was observed at the trap net located in the area of the mouth of the Kurilka River, but the proportion of marked fish at the roe collection site of the Kurilskiy Hatchery and above on stream of the river, was significantly lower.

Reference

1. Secor, D.H., Dean, J.M. and Laban, E.H., 1991. Manual for Otolith Removal and Preparation for Microstructural Examination. Belle W. Baruch and Electric Power Research Institute, Columbia, SC. 85 pp.