

## **Release of Marked Salmon from Russian Hatcheries in 2019**

by

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Submitted to the

**NORTH PACIFIC ANADROMOUS FISH COMMISSION**

by

Russia

April 2020

**THIS PAPER MAY BE CITED IN THE FOLLOWING MANNER:**

Akinicheva, E., V. Volobuev, A. Yamborko, and M. Myakishev. 2020. Release of marked salmon from Russian hatcheries in 2019. NPAFC Doc. 1901. 6 pp. Sakhalin Branch of VNIRO (SakhNIRO), Magadan Branch of VNIRO (MagadanNIRO), and Sakhalin Branch of Glavrybvod (Available at <https://npafc.org>).

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**Keywords:** otolith marks, Russia, juvenile salmon, hatcheries.

## Abstract

The main aim of salmon marking in Russian hatcheries is to evaluate numbers of hatchery-reared salmon returns. In 2019, juvenile Pacific salmon was marked in four regions of the Russian Far East. The release number of marked juveniles was 390.02 million. This document presents data regarding otolith unique marks used in marking salmon juveniles released from Russian hatcheries in 2019.

## Marking results of salmon released from Russian hatcheries in 2019

As in preceding years, the main aim of salmon marking in Russian hatcheries is to evaluate numbers of hatchery-reared salmon returns. The presence of otolith marks is also used to determine the provenance of juvenile and immature salmon that were caught during trawling in Okhotsk and Bering Seas.

The largest number of Russian hatcheries is located in the Sakhalin-Kuril Islands region. Consequently, it is in this region that the greatest number of marked juvenile salmon is released. In 2019, the Sakhalin region's portion comprised 85% of the total number of marked juvenile salmon released by Russian hatcheries. Of these 85%, 73.69% were released on Sakhalin Island and 11.26% on Iturup Island. Approximately 10% of marked juvenile salmon was released in Kamchatka. The proportion of juveniles released by Magadan and Khabarovsk combined did not exceed 5% (Table 1).

**Table 1.** Release of marked juvenile salmon in the Russian Far East in 2019

PROVINCE	Number of released marked juveniles, mln					TOTAL	%
	CHUM	PINK	COHO	SOCKEYE	CHINOOK		
SAKHALIN	185.34	102.05	0.00	0.00	0.00	287.40	73.69
ITURUP	43.91	0.00	0.00	0.00	0.00	43.91	11.26
MAGADAN	6.31	6.10	0.55	0.00	0.00	12.96	3.32
KAMCHATKA	24.04	0.00	1.21	15.32	0.87	41.45	10.63
KHABAROVSK	4.31	0.00	0.00	0.00	0.00	4.31	1.10
TOTAL	263.90	108.15	1.77	15.32	0.87	390.02	100.00
%	67.66	27.73	0.45	3.93	0.22	100.00	

The total number of marked juveniles in Russia comprised of 390.02 million. The major part of the marked juvenile salmon was formed by chum salmon – 263.9 mln (67.66%), and pink salmon – 108.15 mln (27.73%). The proportions of other species, namely, coho, sockeye and chinook, were insignificant: 0.45%, 3.93% and 0.22%, respectively.

In Magadan region juveniles were marked in three hatcheries, in Kamchatka – in five hatcheries, and in Khabarovsk region – in one hatchery. In Sakhalin region the marking was done in eighteen hatcheries, three of which were located on Iturup Island. Two methods were used for hatchery marking: thermal (Munk et al., 1993) and 'dry' (Safronenkov et al., 1999).

Thirty-four unique marks were planned to be used. But due to technical reasons in two hatcheries where the marking process was stopped or changed, three unplanned marks were formed in a small number of juveniles. These were marks 4.1H and 3H for chum salmon that were formed as

a result of the cessation of marking process in the Lesnoy hatchery, and mark 9H for chum salmon in the Okhotsk hatchery. As a result, mark 4.1H found in 5.7 million juveniles from Lesnoy hatchery duplicates the chum mark from Lebedinyy hatchery. The remaining marks do not repeat marks from other hatcheries. Therefore, besides the planned 34 unique marks we have two more unplanned unique marks making the total of 36 unique marks.

Thus in 2019, Russian hatcheries released juveniles marked with total of 36 unique marks, including 8 thermal and 28 'dry' ones. Twenty-seven marks were used for marking one species of salmon, seven marks were used simultaneously on two species, and one mark was used on three species. Twenty-six different marks were used to mark juvenile chum salmon, ten marks were used for pink salmon, four marks were used for coho, two marks were used for sockeye and one mark for Chinook.

The data on marked salmon release is presented in Table 2. The hatch code notations were used to describe mark patterns (Hagen et al., 2000; Johnson et al., 2006).

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**Table 2.** Marked salmon production by the hatcheries of Russia in 2019

ID#	MARK TYPE	BROOD YEAR	YEAR OF RELEASE	SPECIES	COUNTRY	STATE/ PROVINCE	AGENCY	FACILITY	STOCK
1	2	3	4	5	6	7	8	9	10
RU18-01	TM	2018	2019	CHUM	RUSSIA	SAKHALIN	SAKHALINRYBVOD	ADO-TYMOVSKY HATCHERY	TYM' RIVER
RU18-02	TM	2018	2019	CHUM	RUSSIA	SAKHALIN	SAKHALINRYBVOD	POBEDINSKY HATCHERY	PORONAY RIVER
RU18-03	DM	2018	2019	CHUM	RUSSIA	SAKHALIN	SAKHALINRYBVOD	BUYUKLOVSKY HATCHERY	BUYUKLINKA RIVER
RU18-04	TM	2018	2019	CHUM	RUSSIA	SAKHALIN	SAKHALINRYBVOD	BEREZNYAKOVSKY HATCHERY	UDARNITSA RIVER
RU18-05	TM	2018	2019	CHUM	RUSSIA	SAKHALIN	SAKHALINRYBVOD	BEREZNYAKOVSKY HATCHERY	UDARNITSA RIVER
RU18-06	TM	2018	2019	CHUM	RUSSIA	SAKHALIN	SAKHALINRYBVOD	BEREZNYAKOVSKY HATCHERY	FIRSOVKA RIVER
RU18-07	TM	2018	2019	CHUM	RUSSIA	SAKHALIN	SAKHALINRYBVOD	BEREZNYAKOVSKY HATCHERY	NAYBA RIVER
RU18-08	TM	2018	2019	CHUM	RUSSIA	SAKHALIN	SAKHALINRYBVOD	SOKOLOVSKY HATCHERY	FIRSOVKA RIVER
RU18-09	TM	2018	2019	CHUM	RUSSIA	SAKHALIN	SAKHALINRYBVOD	TARANAYSKY HATCHERY	TARANAY RIVER
RU18-10	DM	2018	2019	CHUM	RUSSIA	SAKHALIN	SAKHALINRYBVOD	YASNOMORSKY HATCHERY	YASNOMORKA RIVER
RU18-11	DM	2018	2019	CHUM	RUSSIA	SAKHALIN	SAKHALINRYBVOD	SOKOL'NIKOVSKY HATCHERY	ZAVETINKA RIVER
RU18-12	DM	2018	2019	CHUM	RUSSIA	SAKHALIN	SAKHALINRYBVOD	KALININSKY HATCHERY	KALINKA RIVER
RU18-13	DM	2018	2019	CHUM	RUSSIA	SAKHALIN	SAKHALINRYBVOD	KALININSKY HATCHERY	KALINKA RIVER
RU18-14	DM	2018	2019	CHUM	RUSSIA	SAKHALIN	SAKHALINRYBVOD	KALININSKY HATCHERY	KALINKA RIVER
RU18-15	DM	2018	2019	CHUM	RUSSIA	SAKHALIN	SAKHALINRYBVOD	KALININSKY HATCHERY	KALINKA RIVER
RU18-16	DM	2018	2019	CHUM	RUSSIA	SAKHALIN	SAKHALINRYBVOD	UROZHAYNYY HATCHERY	CHERNAYA RIVER
RU18-17	DM	2018	2019	CHUM	RUSSIA	SAKHALIN	SAKHALINRYBVOD	UROZHAYNYY HATCHERY	KALINKA RIVER
RU18-18	DM	2018	2019	CHUM	RUSSIA	SAKHALIN	SAKHALINRYBVOD	BAKHURA HATCHERY	BAKHURA RIVER
RU18-19	DM	2018	2019	CHUM	RUSSIA	SAKHALIN	SAKHALINRYBVOD	LESNOY HATCHERY	OCHEPUKHA RIVER
RU18-20	DM	2018	2019	CHUM	RUSSIA	SAKHALIN	SAKHALINRYBVOD	LESNOY HATCHERY	OCHEPUKHA RIVER
RU18-21	DM	2018	2019	CHUM	RUSSIA	SAKHALIN	SAKHALINRYBVOD	LESNOY HATCHERY	OCHEPUKHA RIVER
RU18-22	DM	2018	2019	CHUM	RUSSIA	SAKHALIN	SAKHALINRYBVOD	OKHOTSKY HATCHERY	UDARNITSA RIVER
RU18-22	DM	2018	2019	CHUM	RUSSIA	SAKHALIN	SAKHALINRYBVOD	OKHOTSKY HATCHERY	UDARNITSA RIVER
RU18-23	DM	2018	2019	CHUM	RUSSIA	SAKHALIN	SAKHALINRYBVOD	DOLINKA HATCHERY	DOLINKA RIVER
RU18-24	DM	2018	2019	CHUM	RUSSIA	ITURUP	SAKHALINRYBVOD	LEBEDINYY HATCHERY	LEBEDINYY LAKE
RU18-25	DM	2018	2019	CHUM	RUSSIA	ITURUP	SAKHALINRYBVOD	MINERAL'NYY HATCHERY	MINERAL'NYY STREAM
RU18-26	DM	2018	2019	CHUM	RUSSIA	MAGADAN	OKHOTSKRYBVOD	ARMANSKY HATCHERY	KUL'KUTY RIVER
RU18-27	DM	2018	2019	CHUM	RUSSIA	MAGADAN	OKHOTSKRYBVOD	ARMANSKY HATCHERY	YAMA RIVER

Table 2 (continued). Marked salmon production by the hatcheries of Russia in 2019

ID#	FINAL RELEASE SITE	NUMBER OF RELEASED	HATCH CODE	RBr	GRAPHIC IMAGE		MARK SCHEDULE
					PREHATCH	POSTHATCH	
1	11	12	13	14	15	16	17
RU18-01	TYM' RIVER	17468000	H5.1	2:1.5.2.1		I I I I I	(4X)24C:24H,(2X)24C:48H
RU18-02	PORONAY RIVER	13242400	H4	2:1.4		I I I I	(4X)24C:24H
RU18-03	BUYUKLINKA RIVER	25141900	3.4nH	1:1.3.2.4n	I I I III		(2X)24D:24W,(1X)24D:48W,(4X)12D:12W
RU18-04	BOL'SHOY TAKOY RIVER	1046000	H6	2:1.6		I I I I I	(6X)24C:24H
RU18-05	BAKLANOVKA RIVER	1046000	H6	2:1.6		I I I I I	(6X)24C:24H
RU18-06	BOL'SHOY TAKOY RIVER	1035300	H6	2:1.6		I I I I I	(6X)24C:24H
RU18-07	BOL'SHOY TAKOY RIVER	6269700	H6	2:1.6		I I I I I	(6X)24C:24H
RU18-08	BELAYA RIVER	5061000	H3.4	2:1.3.2.4		I I I I I I	(2X)24H:24C,(1X)24H:48C,(4X)24H:24C
RU18-09	TARANAY RIVER	4511700	H1.3,1	2:1.1.2.3.3.1		I I I I I	(1X)24C:48H,(2X)24C:24H,(2X)24C:48H
RU18-10	YASNOMORKA RIVER	8527600	4n,2H	1:1.4n,2.2	III I I		(3X)12D:12W,(1X)12D:48W,(2X)24D:24W
RU18-11	ZAVETINKA RIVER	13260000	1.2,2H	1:1.1.2.2.3.2	I I I I I		(1X)24D:48W,(1X)24D:24W,(1X)24D:48W,(2X)24D:24W
RU18-12	KALINKA RIVER	35504700	3.2H	1:1.3.2.2	I I I I I		(2X)24D:24W,(1X)24D:48W,(2X)24D:24W
RU18-13	PIONERKA RIVER	2091000	3.2H	1:1.3.2.2	I I I I I		(2X)24D:24W,(1X)24D:48W,(2X)24D:24W
RU18-14	GASTELLOVKA RIVER	985000	3.2H	1:1.3.2.2	I I I I I		(2X)24D:24W,(1X)24D:48W,(2X)24D:24W
RU18-15	TARANAY RIVER	18116	3.2H	1:1.3.2.2	I I I I I		(2X)24D:24W,(1X)24D:48W,(2X)24D:24W
RU18-16	CHERNAYA RIVER	1649500	5.1H	1:1.5.2.1	I I I I I I		(4X)24D:24W,(2X)24D:48W
RU18-17	CHERNAYA RIVER	6291700	5.1H	1:1.5.2.1	I I I I I I		(4X)24D:24W,(2X)24D:48W
RU18-18	BAKHURA RIVER	808400	4.2nH	1:1.4.2.2n	I I I I I I		(3X)24D:24W,(1X)24D:48W,(2X)12D:12W
RU18-19	OCHEPUKHA RIVER	7501700	4.3H	1:1.4.2.3	I I I I I I I		(3X)24D:24W,(1X)24D:48W,(3X)24D:24W
RU18-20	OCHEPUKHA RIVER	5712500	4.1H	1:1.4.2.1	I I I I I		(3X)24D:24W,(2X)24D:48W
RU18-21	OCHEPUKHA RIVER	2280600	3H	1:1.3	I I I		(3X)24D:24W
RU18-22	UDARNITSA RIVER	17661100	5.2H	1:1.5.2.2	I I I I I I I		(4X)24D:24W,(1X)24D:48W,(2X)24D:24W
RU18-22	UDARNITSA RIVER	5920100	9H	1:1.9	I I I I I I I I I		(9X)24D:24W
RU18-23	DOLINKA RIVER	2307600	1.4H	1:1.1.2.4	I I I I I		(1X)24D:48W,(4X)24D:24W
RU18-24	LEBEDINY Y LAKE	21513300	4.1H	1:1.4.2.1	I I I I I		(3X)24D:24W,(2X)24D:48W
RU18-25	MINERAL'NYY STREAM	22395100	3.3nH	1:1.3.2.3n	I I I III		(2X)24D:24W,(1X)24D:48W,(3X)12D:12W
RU18-26	KUL'KUTY RIVER	123000	1.3,1H	1:1.1.2.3.3.1	I I I I I		(1X)24D:48W,(2X)24D:24W,(2X)24D:48W
RU18-27	ARMAN RIVER	137152	1.3,1H	1:1.1.2.3.3.1	I I I I I		(1X)24D:48W,(2X)24D:24W,(2X)24D:48W

Table 2 (continued). Marked salmon production by the hatcheries of Russia in 2019

ID#	MARK TYPE	BROOD YEAR	YEAR OF RELEASE	SPECIES	COUNTRY	STATE/ PROVINCE	AGENCY	FACILITY	STOCK
1	2	3	4	5	6	7	8	9	10
RU18-28	DM	2018	2019	CHUM	RUSSIA	MAGADAN	OKHOTSKRYBVOD	ARMANSKY HATCHERY	ARMAN RIVER
RU18-29	DM	2018	2019	CHUM	RUSSIA	MAGADAN	OKHOTSKRYBVOD	OL'SKY HATCHERY	OLA RIVER
RU18-30	DM	2018	2019	CHUM	RUSSIA	MAGADAN	OKHOTSKRYBVOD	YANSKY HATCHERY	YANA RIVER
RU18-31	TM	2018	2019	CHUM	RUSSIA	KAMCHATKA	KAMCHATRYBVOD	PARATUNSKY HATCHERY	PARATUNKA RIVER
RU18-32	DM	2018	2019	CHUM	RUSSIA	KAMCHATKA	KAMCHATRYBVOD	OZERKOVSKY HATCHERY	BOL'SHAYA RIVER
RU18-33	DM	2018	2019	CHUM	RUSSIA	KAMCHATKA	KAMCHATRYBVOD	KETKINSKY HATCHERY	AVACHA RIVER
RU18-34	DM	2018	2019	CHUM	RUSSIA	KHABAROVSK	AMUR RYBZOD	ANYUYSKY HATCHERY	ANYUY RIVER
RU18-35	DM	2018	2019	PINK	RUSSIA	SAKHALIN	SAKHALINRYBVOD	PUGACHEVSKIY HATCHERY	SEN'KA RIVER
RU18-36	DM	2018	2019	PINK	RUSSIA	SAKHALIN	SAKHALINRYBVOD	ANIVSKY HATCHERY	BYSTRAYA RIVER
RU18-37	DM	2018	2019	PINK	RUSSIA	SAKHALIN	SAKHALINRYBVOD	ANIVSKY HATCHERY	SEN'KA RIVER
RU18-38	DM	2018	2019	PINK	RUSSIA	SAKHALIN	SAKHALINRYBVOD	ANIVSKY HATCHERY	OCHEPUKHA RIVER
RU18-39	DM	2018	2019	PINK	RUSSIA	SAKHALIN	SAKHALINRYBVOD	TARANAYSKY HATCHERY	TARANAY RIVER
RU18-40	DM	2018	2019	PINK	RUSSIA	SAKHALIN	SAKHALINRYBVOD	TARANAYSKY HATCHERY	CHERNAYA RIVER
RU18-41	DM	2018	2019	PINK	RUSSIA	SAKHALIN	SAKHALINRYBVOD	UROZHAYNYY HATCHERY	CHERNAYA RIVER
RU18-42	DM	2018	2019	PINK	RUSSIA	SAKHALIN	SAKHALINRYBVOD	BAKHURA HATCHERY	BAKHURA RIVER
RU18-43	DM	2018	2019	PINK	RUSSIA	SAKHALIN	SAKHALINRYBVOD	LESNOY HATCHERY	OCHEPUKHA RIVER
RU18-44	DM	2018	2019	PINK	RUSSIA	SAKHALIN	SAKHALINRYBVOD	DOLINKA HATCHERY	DOLINKA RIVER
RU18-46	DM	2018	2019	PINK	RUSSIA	MAGADAN	OKHOTSKRYBVOD	ARMANSKY HATCHERY	OYRA RIVER
RU18-47	DM	2018	2019	PINK	RUSSIA	MAGADAN	OKHOTSKRYBVOD	ARMANSKY HATCHERY	ARMAN RIVER
RU18-48	DM	2018	2019	PINK	RUSSIA	MAGADAN	OKHOTSKRYBVOD	OL'SKY HATCHERY	OLA RIVER
RU18-49	DM	2018	2019	PINK	RUSSIA	MAGADAN	OKHOTSKRYBVOD	YANSKY HATCHERY	YANA RIVER
RU18-50	DM	2018	2019	COHO	RUSSIA	MAGADAN	OKHOTSKRYBVOD	ARMANSKY HATCHERY	ARMAN RIVER
RU18-51	DM	2018	2019	COHO	RUSSIA	MAGADAN	OKHOTSKRYBVOD	OL'SKY HATCHERY	OLA RIVER
RU18-52	DM	2018	2019	COHO	RUSSIA	MAGADAN	OKHOTSKRYBVOD	YANSKY HATCHERY	YANA RIVER
RU18-53	TM	2018	2019	COHO	RUSSIA	KAMCHATKA	KAMCHATRYBVOD	PARATUNSKY HATCHERY	PARATUNKA RIVER
RU18-54	DM	2018	2019	SOCKEYE	RUSSIA	KAMCHATKA	KAMCHATRYBVOD	OZERKOVSKY HATCHERY	BOL'SHAYA RIVER
RU18-55	TM	2018	2019	SOCKEYE	RUSSIA	KAMCHATKA	KAMCHATRYBVOD	MALKINSKY HATCHERY	BOL'SHAYA RIVER
RU18-56	TM	2018	2019	CHINOOK	RUSSIA	KAMCHATKA	KAMCHATRYBVOD	MALKINSKY HATCHERY	BOL'SHAYA RIVER
RU17-40	DM	2017	2019	COHO	RUSSIA	KAMCHATKA	KAMCHATRYBVOD	VILUYSKY HATCHERY	BOLSHOY VILUY LAKE

Table 2 (continued). Marked salmon production by the hatcheries of Russia in 2019

ID#	FINAL RELEASE SITE	NUMBER OF RELEASED	HATCH CODE	RBr	GRAPHIC IMAGE		MARK SCHEDULE
					PREHATCH	POSTHATCH	
1	11	12	13	14	15	16	17
RU18-28	ARMAN RIVER	723148	1.3,1H	1:1.1.2.3.3.1	I III I		(1X)24D:48W,(2X)24D:24W,(2X)24D:48W
RU18-29	UGLIKANKA RIVER	4570300	5.3nH	1:1.5.2.3n	I I I I I III		(4X)24D:24W,(1X)24D:48W,(3X)12D:12W
RU18-30	YANA RIVER	755000	3.2n,2H	1:1.3.2.2n,3.2	I I I II II		(2X)24D:24W,(1X)24D:48W,(1X)12D:12W,(1X)12D:48W,(2X)24D:24W
RU18-31	PARATUNKA RIVER	16581484	H3.3	2:1.3.2.3		III III	(2X)24C:24H,(1X)24C:48H,(3X)24C:24H
RU18-32	BOL'SHAYA RIVER	1751352	3.3H	1:1.3.2.3	I I I I I I		(2X)24D:24W,(1X)24D:48W,(3X)24D:24W
RU18-33	AVACHA RIVER	5707207	7H	1:1.7	I I I I I I I		(7X)24D:24W
RU18-34	ANYUY RIVER	4305197	1.5H	1:1.1.2.5	I I I I I I		(1X)24D:48W,(5X)24D:24W
RU18-35	SEN'KA RIVER	20132800	4.2H	1:1.4.2.2	I I I I II		(3X)24D:24W,(1X)24D:48W,(2X)24D:24W
RU18-36	BYSTRAYA RIVER	7439.8	5.1H	1:1.5.2.1	I I I I I I		(4X)24D:24W,(2X)24D:48W
RU18-37	BYSTRAYA RIVER	3667.6	5.1H	1:1.5.2.1	I I I I I I		(4X)24D:24W,(2X)24D:48W
RU18-38	BYSTRAYA RIVER	15321.8	5.1H	1:1.5.2.1	I I I I I I		(4X)24D:24W,(2X)24D:48W
RU18-39	TARANAY RIVER	15482800	H3.2n	2:1.3.2.2n		III II	(2X)24C:24H,(1X)24C:48H,(2X)12C:12H
RU18-40	TARANAY RIVER	67857	H3.2n	2:1.3.2.2n		III II	(2X)24C:24H,(1X)24C:48H,(2X)12C:12H
RU18-41	CHERNAYA RIVER	4164900	3n,4H	1:1.3n,2.4	III I I I I		(2X)12D:12W,(1X)12D:60W,(4X)24D:24W
RU18-42	BAKHURA RIVER	4705500	3.4H	1:1.3.2.4	I I I I I I I		(2X)24D:24W,(1X)24D:48W,(4X)24D:24W
RU18-43	OCHEPUKHA RIVER	18544200	3.2H	1:1.3.2.2	I I I II		(2X)24D:24W,(1X)24D:48W,(2X)24D:24W
RU18-44	DOLINKA RIVER	12527700	3.1H	1:1.3.2.1	I I I I		(2X)24D:24W,(2X)24D:48W
RU18-46	ARMAN RIVER	97419	1.5H	1:1.1.2.5	I I I I I I		(1X)24D:48W,(5X)24D:24W
RU18-47	ARMAN RIVER	1723925	1.5H	1:1.1.2.5	I I I I I I		(1X)24D:48W,(5X)24D:24W
RU18-48	UGLIKANKA RIVER	2519400	5H	1:1.5	I I I I I		(5X)24D:24W
RU18-49	YANA RIVER	1755100	4.2nH	1:1.4.2.2n	I I I I II		(3X)24D:24W,(1X)24D:48W,(2X)12D:12W
RU18-50	ARMAN RIVER	118500	5.2H	1:1.5.2.2	I I I I I II		(4X)24D:24W,(1X)24D:48W,(2X)24D:24W
RU18-51	UGLIKANKA RIVER	119178	3.2nH	1:1.3.2.2n	I I I II		(2X)24D:24W,(1X)24D:48W,(2X)12D:12W
RU18-52	YANA RIVER	317083	4.3nH	1:1.4.2.3n	I I I I III		(3X)24D:24W,(1X)24D:48W,(3X)12D:12W
RU18-53	PARATUNKA RIVER	670570	H3.3	2:1.3.2.3		III III	(2X)24C:24H,(1X)24C:48H,(3X)24C:24H
RU18-54	BOL'SHAYA RIVER	14747000	3.3H	1:1.3.2.3	I I I I I I		(2X)24D:24W,(1X)24D:48W,(3X)24D:24W
RU18-55	BOL'SHAYA RIVER	575965	3.1H	1:1.3.2.1	I I I I		(2X)24D:24W,(2X)24D:48W
RU18-56	BOL'SHAYA RIVER	873720	H4	2:1.4		III I	(4X)24C:24H
RU18-57	BOLSHOY VILUY LAKE	544003	3.1H	1:1.3.2.1	I I I I		(2X)24D:24W,(2X)24D:48W