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Whitefish brood stocks and their role in aquaculture of Russia

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"GosNIORKH" named after L.S. Berg

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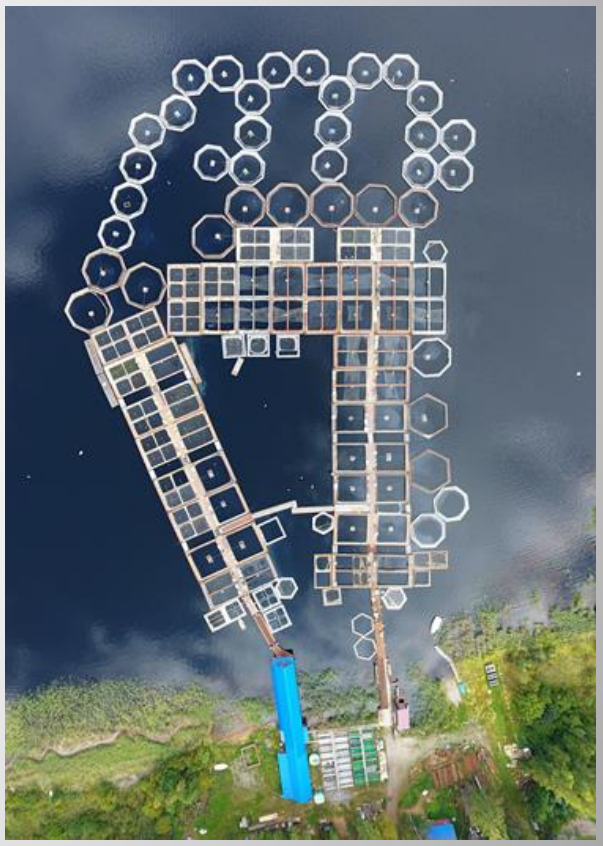
Brood stocks of whitefishes in Northwest Russia

- The fish farm “Forvat” LLC is located on Lake Sukhodolskoe of the Vuoksa system (Leningrad region).
- The fish farm is a place for experimental work of Berg Institute specialists, where technologies for growing whitefishes are developed, their production tests are carried out and introduced into aquaculture.
- Practical work contributes to the study of the biological characteristics of cultivated whitefish, to develop feed recipes and test them.
- The close cooperation of Berg Institute science and production allowed us to create a collection of different whitefishes.



Fish farm Forvat - whitefish nursery

Brood stocks:

Coregonus peled (lake form Ob' basin) since 1999

Coregonus peled (Ob' river) since 2014

Coregonus muksun (Ob' river) since 1999

Coregonus nasus (Ob' river) since 1999

Stenodus leucichthys nelma (Kubenskoe lake, Severnaya Dvina basin) since 2007

Coregonus lavaretus baeri (Ladoga lake) since 2003

Coregonus lavaretus natio ludogae (Ladoga lake) since 2004

Coregonus lavaretus lavaretus (the Finish Golf) since 2007

Coregonus lavaretus maraenoides (Chudskoe lake) since 2018

Immature stocks:

Stenodus leucichthys nelma (Ob' river) since 2015

C. lavaretus pidschian (Pechora river) since 2018

Whitefish cultivation allows to conduct scientific work and develop rearing technologies taking into account species specificity.

The control over the genetic purity of brood stocks is carried out by specialists of GosNIORCH.

Whitefish brood stocks are state registered.

Since 2018 genetic marking of brood stocks has began.

Biological features of whitefishes in aquaculture

Morphology

We noted the ontogenetic patterns of whitefish in the change of the exterior and the variability of external signs.

Life in cages can affect the body height and the size of unpaired fins.

Growth

Growth in farmed fish is usually higher than in natural populations.

Cultivated whitefish reach marketable weight in 3 years (2+).

Maturation

At puberty time in brood stocks the size of whitefishes is larger than in nature. In Siberian whitefish, it occurs 2-3 years earlier than in natural populations. In European whitefish - at the same or earlier age.

Ripning cycle

Coregonus lavaretus and peled ripen annually. The nelma, the muksun and the broad whitefish of older age groups often skip spawning due to high fertility and a long recovery period.

Stenodus leucichthys nelma

NATURAL POPULATIONS		
Natural range	**Kubenskoe lake** (basin of Northern Dvina river)	**Ob' river**
Feeding type	predator	
Size	up to 9 kg	up to 25 kg
Maturation	5+ - 6+ at weight 3 - 4 kg	8+ - 14+ at length 70 cm
Fecundity	90 - 180 thous. eggs	125 - 420 thous. eggs
Commercial value	valuable commercial species	
Conservation status	Red Book of the Russian Federation	limited fishing

AQUACULTURE

Kuben nelma – brood stock from 2007

Marketable size and age	2+ at weight 0.7- 1 kg
Maturation	female – 4+ - 6+ at weight 1.7 kg
Fecundity	25 - 80 thous. eggs
Density of eggs during incubation	36 – 42 thous. eggs/l
Cultivation conditions	Standard for whitefishes - tanks and cages

Ob' nelma – brood stock since 2015 (from eggs)
Age 4 years, weight 850 – 1100 g
Maturation of the first males is expected in 2020.

Coregonus lavaretus

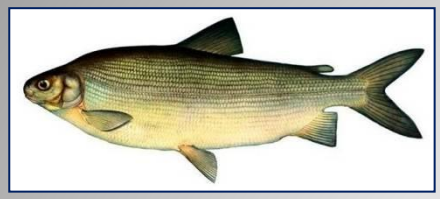
NATURAL POPULATIONS	
Whitefish forms from the Ladoga (two forms), the Gulf of Finland and Chudskoe Lake	
Size	in fishery 400 - 600 g
Food type	benthophage
Puberty	4+ - 5+ at weight 500 - 800 g
Fecundity	30 - 70 thous. eggs
Economic status	valuable commercial species
Population status	Volhovsky form (Ladoga) - Red book of the Russian Federation, Ladoga lake form and Baltic form - reducing stocks Chudskoy form- sharply reduced stock

AQUACULTURE	
Commercial status achievement	2+ at weight 500 - 700 g
Puberty	starting at 3+ at weight 600 - 800 g
Fecundity	20 - 70 thous. eggs
Density of eggs during incubation	45 - 53 thous. eggs (Chudskoy -78 thous. eggs)
Holding conditions	Standard for whitefishes - tanks and cages

Coregonus muksun

NATURAL POPULATION	
Area	Ob' river
Food type	benthophage - everyphage
Size	average weight 1 - 2 kg, maximum up to 8 kg
Puberty	5+ - 6+ at weight 500 - 800 g
Fecundity	40 - 60 thous. eggs
Economic status	valuable fishing species of Siberia
Population status	catastrophic decline

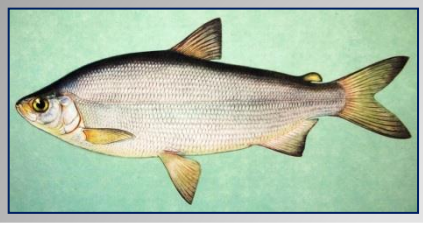
AQUACULTURE	
Commercial status achievement	2+ at weight 700 - 900g
Puberty	starting at 4+ - females
Fecundity	45 - 100 thous. eggs
Density of eggs during incubation	54 - 58 thous. eggs
Holding conditions	Standard for whitefishes - tanks and cages



Coregonus nasus

NATURAL POPULATION	
Area	Ob river
Food type	benthophage
Size	average weight 1 - 2 kg maximum up to 12 kg
Puberty	5+ - 6+ at weight 1 – 1.5 kg
Fecundity	30 - 170 thous. eggs
Economic status	valuable commercial species of Siberia and the European north of Russia
Population status	Rare species

AQUACULTURE	
Commercial status achievement The fastest growing species among reared whitefishes	2+ at weight 0.8-1.5 kg
Puberty	3+ - 4+ at weight 1.5 – 2.5 kg
Fecundity	20-80 thous. eggs
Density of eggs during incubation	38 - 46 thous. eggs
Holding conditions	Standard for whitefishes - tanks and cages



Coregonus peled

NATURAL POPULATION	
Area	Ob' river (lake and river forms)
Food type	planktophage
Size	in fishery 800 - 900 g maximum 3 kg
Puberty	3+ - 4+ at weight 0.3 – 0.5 kg
Fecundity	20 - 50 thous. eggs
Economic status	valuable commercial species
Population status	relatively abundant

AQUACULTURE

Commercial status achievement	2+ at weight 350 - 550g
Puberty	2+ - 3+
Fecundity	20 - 70 thous. eggs
Density of eggs during incubation	105 - 120 thous. eggs
Holding conditions	Standard for whitefishes - tanks and cages

A promising object for the commercial hybrid production with broad whitefish, muksun, nelma

Whitefish brood stocks for commercial aquaculture and artificial reproduction

The most valuable species for consumption market in the collection are Siberian muksun, broad whitefish, peled lake form and nelma. The fastest reared whitefish forms from *lavaretus* group are considered the most promising: Volkhov and Baltic whitefish, as well as the Chudskoy whitefish, which is resistant to high temperature.

Part of eggs obtained from spawners, as well as reared juveniles, is sold to commodity farms in the North-West of Russia. Commodity fish enters the trading network of St. Petersburg, Moscow and other regions.

Recently, brood stocks of species such as muksun, Kubenskaya nelma, broad whitefish and some whitefish have been used to replenish natural populations, which are significantly depleted.

Since 2018, the Berg Institute has begun work on the genetic certification of natural populations of whitefish and brood stocks of Forvat, used for artificial reproduction.