STERLET *ACIPENSER RUTHENUS* (ACIPENSERIFORMES, ACIPENSERIDAE) OF MIDDLE VOLGA AND LOWER KAMA IN IV–XVIII CENTURIES AD: SIZE AND AGE COMPOSITION, GROWTH AND VALUE IN THE ANCIENT FISHING

© 2017 y. D.N. Shaymuratova[1], I.V. Askeyev[1], O.V. Askeyev[1], S.P. Monachov[1], A.O. Askeyev[1], A.A. Smirnov[2, 3]

[1]Institute of Problems in Ecology and Mineral Wealth, Tatarstan Academy of Sciences, Kazan, 420087

[2]North-Eastern State University, Magadan, 685000

[3]Magadan Research Institute of Fisheries and Oceanography, 685000

The article presents the results of the original study of some aspects of the biology of sterlet *Acipenser ruthenus* from the territory of the Middle Volga and northern Lower Volga region in the historical past. An analysis of bone remains obtained from 17 archaeological sites of the Late Holocene period (IV–XVIII centuries AD), showed data on the size-age composition, growth and value in the ancient fishing of subfossil sterlet of middle Volga and lower Kama. According to the revealed amount of bone remains took the main place in the ancient fishing of people of the Middle Volga and northern Lower Volga region. The ancient fishing was based on the most complete use of resource of this species.

Keywords: sterlet, archaeological sites of the Middle Volga and northern Lower Volga region, size and age composition, growth, middle Volga and lower Kama, Late Holocene.

ESTIMATION OF COMMERCIAL RETURN STERLET *ACIPENSER RUTHENUS* LOVER VOLGA FROM YOUNG FISH OF ARTIFICIAL REPRODUCTION

© 2017 y. L.A.Zykov*, Yu.V.Gerasimov, M.I.Abramenko*****

**Astrakhan branch of the Kazakh Institute of Environmental Design, Astrakhan 414041*

*** I.D. Papanin Institute for Biology of Inland Waters Russian Academy of Sciences, Borok, Yaroslavl region, 152742*

****Southern Scientific Centre, Russian Academy of Sciences, Rostov-on-Don, 344006*

Based on the model, describing the change in abundance and biomass generation of fish during its life cycle, defined commercial return from the young stud artificial reproduction with the rate of sexual maturation, spawning frequency, depending on the age of natural mortality and fishing on the degree of its constituent individuals. The role of artificial reproduction in the formation of the population sterlet in the period 1970-1980-ies. Recommendations on the restoration and management of stocks.

Keywords: Caspian sterlet, artificial reproduction, number, a biomass, population, trade return.

TOXIC ACTION OF NEONICOTINOID INSECTICIDES ON STYRGEON FISHES IN THEIR EARLY ONTOGENESIS

© 2017 y. N.I. Shcherbakova, E.A. Fedorova, E.S. Stroeva

Azov Fisheries Research Institute, Rostov-on-Don, Russia, 344002

We studied the action of four insecticides of the neonicotinoid family (actara, tanrek, apache and gazelle) on sturgeon species at stages of their early development, in particular, on embryos and pre-larvae of the sturgeon *Acipenser gueldenstaedtii* . and the bester *Huso huso*. x *Acipenser ruthenus*. For sturgeon pre-larvae the insecticides are found to be of middle (apache, gazelle, tanrek) and

low toxicity (actara). The neonicotinoids affected the physiological parameters of sturgeon pre-larvae. The weight and linear growth decreased, and the rate of yolk sac resorption got slower. The characteristic teratogenic effects were also defined during the action of insecticides on sturgeons in their early ontogeny (eggs and pre-larvae). The embryos in solutions of apache, gazelle and actara obtained shortened trunks and caudal peduncles, sometimes malformations of head and hydrocephalus of pericardial cavity. In rare cases with pre-larvae, the action of tanrek, apache, actara and gazelle produced hypoplasia of the cerebral department (short rostrum, eye hypoplasia), a shortened trunk and caudal peduncle, dropsy of pericardial cavity, and the absence of forebrain, olfactory pits and eyeballs. The number of pathological symptoms and the degree of their severity were dose-dependent. Any specific abnormalities caused by the action of neonicotinoids were not found. The results of our experimental data allowed us to calculate the threshold (LOEC) and the effective (EC_{16}) concentrations. It was concluded that neonicotinoids can have toxic effects on the early ontogenesis processes of commercial fish species. This makes necessary to conduct systematic monitoring observations on the concentrations of insecticides in fishery ponds.
Keywords: insecticides, neonicotinoids, embryos, pre-larvae, toxicity, survival, embryogenesis, teratogenicity.

THE CURRENT STATE OF THE ICHTHYOFAUNA OF THE TULA RESERVOIRS

© 2017 y. A.D. Bykov, Yu.A. Mitenkov

Russian Federal Research Institute of Fisheries and Oceanography, Moscow, 107140

The article considers the question of the formation of the ichthyofauna of water reservoirs of Tula region. The brief description of different reservoirs of Tula Region and the reasons of their violent eutrophication are given. The data on the structure of net fisheries, the species composition and frequency of occurrence of fishes during the long lasting period of observations on this group of water bodies is provided. The processes of the extension of the species composition by the self–colonization of the new for the region species and by the premeditated acclimatization are described. The specifics of fishery and the problems of biomelioration of Tula reservoirs are briefly considered.
Keywords: water reservoirs, cooling reservoirs, ichthyofauna, dimock structure, fishery, introduction.

FISHERY SAKHALIN-HOKKAIDO («SPRING») HERRING *CLUPEA PALLASI*

© 2017 y. L.M. Zverkova, N.P. Antonov

Federal Research Institute of Fisheries and Oceanography, Moscow, 107140

It is shown, that irrational fishing could be the reason for the almost complete loss of the commercial value of the Sakhalin-Hokkaido herring. In the 1920–1940-s along with the traditional pre-spawning and spawning fish catch, the development of young fish at age 1–2- years was developed. The joint effect the loss of fish in spawning grounds and immature ones could lead to an irreversible reduction in the stock of this herring,which is still present.
Keywords: Sakhalin-Hokkaido herring, spawning fish, young fish, catch, stock.

THE COMPOSITION AND CHARACTERISTICS OF FISHES' ABUNDANCE OF RUSSIAN OUTER SUBLITTORAL IN THE JAPAN/EAST SEA IN THE WARM PERIOD OF YEAR

© 2017 y. D.G. Kravchenko, Z.M. Pantyukh, D.V. Izmyatisky

Pacific Ocean scientific research fishery center – TINRO-center, Vladivostok, 690950

The composition and some structural elements of the Japan/East Sea Russian outer sublittoral's fishes in May-October are considered. 272 species of fishes are registered, but actually in trawl catches only 120 species occur. The maximum quantity of species (90) encounters in Peter the Great Bay, but the minimum (55) – in the North part of Tatar Strait. *Theragra chalcogramma, Glyptocephalus stelleri, Hippoglossoides dubius* and *Acanthopsetta nadeshnyi* have the high frequency of occurrence. Besides, *Theragra chalcogramma, Clupea pallasii, Pleurogrammus azonus* and *Acanthopsetta nadeshnyi* are mass species. Middle-long-term sum fishes' abundance in Russian outer sublittoral equals 1926272.2 thousand pieces or 35507 pieces/km^2. *Theragra chalcogramma, Clupea pallasii* and *Pleurogrammus azonus* predominate by their number of pieces (their sum share is 71.1%). The middle-long-term number of pieces varies from 23.7 till 56.6 thousand pieces/km^2 in different areas.

Keywords: outer sublittoral, ichthyofauna, ichthyocen, frequency of occurrence, abundance, species diversity.

FEATURES OF MESONEPHROS STRUCTURES COMMON PIKE *ESOX LUCIUS*

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Yaroslavl State Agricultural Academy, 150042

Data on the structure of tissues and cell the ultrastructure of mesonephros pike *Esox lucius* were received. Similarity of tissues structure that form the nephron and renal interstitium and ultrastructure agranulocytes, eosinophils, chloride cells with freshwater bony fishes have been shown. The differences in the development of hematopoietic tissue, of the total area of tissue of the body, the ultrastructure of neutrophils granules and cells with radial vesicles. Nephron cervical department was found.

Keywords: pike *Esox lucius*, mesonephros, tissue structure, cell ultrastructure.

EFFECT OF THE QUALITATIVE COMPOSITION OF FOOD OBJECTS ON THE DIGESTIVE ENZYMES ACTIVITY OF ATHERINIDAE FAMILY 0-GROUP IN THE COASTAL WATERS OFF SEVASTOPOL IN SUMMER

© 2017 y. I.V. Vdodovich, E.A. Kolesnikova, N.S. Kuzminova, O.A. Rilkova,

V.S. Mukhanov

Institute of Marine Biological Research A.O. Kovalevsky Russian Academy of Sciences, Sevastopol, 299011

The data on physiological status and feeding behavior of Atherinidae family 0-group have been presented. It was found, that Atherinidae family 0-group has a wide variability in the diet, change in their food preferences depend on time and place of sampling. The activity of α-amylase, γ-GGT, alkaline phosphatase, concentration of creatinine and β-lipoproteine in Atherinidae family 0-group tissues depended on the consumed food items.

Keywords: Atherinidae family 0-group, feeding behavior, digestive enzyme, coastal waters of Sevastopol.

STOCK DYNAMICS MODELING WITH KNOWN ESTIMATIONS FOR ABUNDANCE AND CATCH AT AGE

© 2017 y. I.I. Shevchenko

Pacific Research Fisheries Center, Vladivostok, 690090

We describe a framework for generating appropriate models for time series of abundance and catch at age. The approach is based on “fishmetic”. This term is used to capture uncertainty in fish population arithmetic. In particular, it is assumed that measurement and estimation errors are random variables with Laplace or Gaussian distributions. The key step in the framework is to find the coefficients of natural and fishing mortality for common fishmetic equations. This problem is reduced to a global minimization of a nonlinear cost function. A package of types, functions and scripts in Julia was developed to evaluate cost functions and to undertake the minimization task with use of the NLopt package. The implementation was tested on several artificially generated data sets. In future work, we plan to study stability of the framework for real data sets.

Keywords: fishmetic, fish abundance and catch at age dynamics, interactive environment for technical and scientific computing.

IN MEMORY OF VALENTIN YAKOVLEVICH SKLYAROV (10.11.1948–26.07.2017): SHORT SCIENTIFIC BIOGRAPHY

L.G. Bondarenko, Research Institute of the Asov Fishery Problems;
Z.M. Sergieva, Federal Research Institute of Fisheries and Oceanography

Here are presented the major milestones of the scientific path of Valentin Yakovlevich Sklyarov who was the Doctor of Agricultural Science, Professor, the honored scientist of the Russian Federation, and the honored worker of fishery industry of Russia. Prof. Sklyarov was a specialist in the field of aquaculture and ichthyology, famous among Russian and foreign scientific community. Valentin Yakovlevich for more than 25 years served as the Director of the Krasnodar Research Institute of Fishery. During the last few years he was the Deputy Director and then the Director of Krasnodar branch of «VNIRO», leading the resource studies in freshwater basins of six regions of the Russian Federation. Prof. Sklyarov authored 280 scientific publications.

Keywords: aquaculture, ichthyology, feeding fish, fish food, scientific path.