STOCK ASSESSMENT OF THE CURRENT STATE OF THE ZANDER *SANDER LUCIOPERCA* POPULATION IN THE AZOV SEA BASIN

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Characteristics of the state of the semi-anadromous zander *Sander lucioperca* (Linneus, 1758) stock in the Sea of Azov is given for 2014–2015. The data on the main biological parameters, the area of feeding grounds, and the state of natural and artificial reproduction are presented. It is found out that zander abundance is at a low level. The fishing ban on this species is substantiated.

Keywords: zander *Sander lucioperca*, the Sea of Azov, Taganrog Bay, the Don River, state of the stock, abundance, reproduction, spawning grounds, seawater salinity.

THE STATE OF THE DON RIVER VIMBA BREAM *VIMBA VIMBA* POPULATION IN THE CURRENT PERIOD

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Characteristics of the state of the vimba bream *Vimba vimba* stock in the Sea of Azov is given for 2014–2015. The data on the main biological parameters and the state of natural and artificial reproduction are presented, the prospects of changes in abundance are assessed. It is found out that vimba bream abundance is at a low level; the recommendations on its maintenance are given.

Keywords: vimba bream *Vimba vimba*, the Sea of Azov, Taganrog Bay, the Don River, state of the stock, abundance, reproduction, spawning grounds.

FLATFISHES IN THE AZOV AND BLACK SEA BASIN (BOTHIDAE, SCOPHTHALMIDAE, PLEURONECTIDAE, SOLEIDAE)

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Five species and subspecies of the order Pleuronectiformes are represented in the Sea of Azov and in the Russian part of the Black Sea: scaldfish, European flounder, Azov turbot, Black Sea turbot, and snouted sole. The summarized data on their distribution in different year seasons, the age of sexual maturation, reproduction, age structure, length and weight composition, stocks and catches are presented for the period from 1993 to 2017.

Keywords: the Sea of Azov, the Black Sea, flatfishes, Azov turbot *Scophthalmus maeoticus* (Pallas, 1814), European flounder *Platichtys luscus* (Pallas, 1814), scaldfish (*Arnoglossus kessleri* Schmidt, 1915), snouted sole *Pegusa nasuta* (Pallas, 1814), distribution, age, length and weight parameters.

EFFECT OF GROWING CONDITIONS IN PONDS ON THE VIABILITY OF YOUNG ANADROMOUS STURGEONS RESILIENCE

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The analysis of our own multi-year data obtained as a result of monitoring studies at fish-breeding farms in the Azov Sea basin has shown reclamation works that had been carried out not to the fullest extent affect the productivity of nursery habitat and hence the conditions of juveniles rearing in ponds. We have

considered changes in the feeding regime formation, as well as the influence of rearing conditions on the growth rate of juveniles and their viability at the stage of their release into natural waterbasins. The work describes and summarizes the results of the experiments conducted to determine the quality of juveniles, i.e. we have tested the fish for thermoresistance and salt tolerance. The stability of sturgeon fingerlings to stress factors is shown to decrease with lengthened periods of holding the fish under unfavorable conditions.
Keywords: Azov-Don region, juvenile, weight, Russian sturgeon *Acipenser queldenstaedtii*, stellate sturgeon *A. stellatus*, thermoresistance, hypertonic solution, stability.

STATE OF COMMERCIAL FISH STOCKS IN AZOV ESTUARIES

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Data are provided on the long-term and current status of commercial fish stocks from the Azov estuaries, and some aspects of their commercial exploitation and the impact of unrecorded, unregulated and illegal (IUU) catch are also considered. It has been established that in recent years there has been a tendency for the decline in commercial fish stocks in the estuaries, including valuable in commercial terms sander, ram, bream; the dominant component of the coastal ichthyocenoses of the eastern part of the Azov Sea will still be the silver Prussian carp. Long-term data on the dependence of the volumes of industrial catch and the number of fishing enterprises are analysed. According to the results of Scientific Fishing in the framework of Resource Research, trends in the variability of the annual average fish productivity in the estuaries of commercial fish species are considered in two adjacent years. Data on the volumes of recommended (possible) catch of aquatic bioresources by species of fish in each group of estuaries for the year 2018 are given.
Keywords: Azov estuaries, commercial exploitation of stocks, fishing statistics, valuable fish species, dominant species, control fishing, IUU fishing, commercial stock, recommended catch, deltas of rivers.

ON THE QUESTION OF RECREATIONAL FISHERIES IN THE RESERVOIRS OF THE STEPPE ZONE OF EURASIA

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Some materials are presented on the development of recreational fisheries in the largest reservoirs of the steppe zone through the examples of artificial reservoirs of the Kumo-Manych cascade and the Tobol River. The history of their creation is described and the analysis of the current state of reservoirs, including the hydrological and hydrochemical composition of the water bodies, and ichthyofauna is carried out; the objects of recreational fisheries, features of legal support and other issues of recreational fisheries have been discussed in regard to the Veselovsky (Rostov region, Russian Federation) and Karatomar (Kostanay region, Republic of Kazakhstan) reservoirs. The volume of aquatic biological resources caught by amateur fishermen in the Veselovsky Reservoir in 2014–2016 amounted to 7–89%, and, in particular, pike perch in 2014–2015 exceeded by 6–21% of the total recommended production, in Karatomar – 10% of the

established limits for fishing. The data analysis has shown that the degree of resources development by amateur fishermen depends to a large extent on the location of water bodies, species composition, exploitation rates, time of fishing and organizational aspects of recreational fishing. There are some differences in the legal provision of recreational fisheries in the water bodies under consideration.
Keywords: recreational fisheries, reservoirs, targeted species, legal norms, Veselovsky and Karatomar reservoirs.

CRAYFISH IN THE RESERVOIRS IN ROSTOV REGION: STATE OF POPULATIONS, FORECAST AND MANAGEMENT OF ITS STOCKS IN CURRENT PERIOD

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Astacological research in AzNIIIRKh is carried out with the aim of studying the natural populations of river crayfish living in the reservoirs of the Rostov region, assessing their stocks, developing a total allowable catch and measures on rational use of the stocks. The work summarizes the results of AzNIIIRKH's long-term research on the biology and ecology of the Kuban crayfish populations in the waterbodies of the Azov Sea basin. The crayfish habitat in fishery reservoirs of the Rostov Region has been characterized. The qualitative and quantitative characteristics of the productive crayfish populations and the factors hindering the propagation and development of populations of crayfish are considered. The author's approach is given to the forecasting of total allowable catch in Rostov region. Recommendations for the conservation and rational use of crayfish-productive populations have been developed.
Keywords: Kuban crayfish *Pontastacus cubanicus,* Azov Sea basin, reproductive potential, stocks, total allowable catch, IUU fishing, loss, replenishment.

ZOOPLANKTON IN THE LOWER DON IN CURRENT PERIOD

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Seasonale data are presented on the species composition, species-dominants, abundance and biomass of the zooplankton of the Lower Don. The data obtained have been compared with the literature data and give evidence of the stability in the species composition and the steady state of the zooplankton community over the last decade.
Keywords: lower Don, zooplankton, species composition, abundance, biomass, species-dominants, food base, plankton feeders.

MICROSATELLITE POLYMORPHISM OF THE NATURAL AND DOMESTICATED AZOV AND BLACK SEA POPULATIONS OF STELLATE STURGEON *ACIPENSER STELLATUS*

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On the basis of analysis of five microsatellite loci (*An20, AoxD161, AoxD165, Afug41, Afug51*), the special characteristics of intraspecies polymorphism of the natural and domesticated populations of the Azov and Black Sea stellate sturgeonare identified.Significant divergence between the individuals in different groups of broodstocks and between the individuals in broodstocks and in natural populations, according to the established distribution of frequenciesof STR-alleles ($p < 0.001$), is presented. By contrast, the groups of fish individuals from the Black Sea and the Sea of Azov are only slightly differentiated (Fst = 0.007). It is evident that intraspecies population composition of the Azov and Black Sea stellate sturgeon underwent extensive changes, resulting from anthropogenic pressure.
Keywords: stellate sturgeon *Acipenser stellatus*, polymorphism, microsatellites.

ACTIVE SUBSTANCES OF MODERN CLASSES PESTICIDES IN RESERVOIRS IN THE SOUTHERN RUSSIA

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The content of 14 active ingredients (AI) of modern classes pesticides in habitat (water and bottom sediments) of hydrobionts, most used in agriculture of the Southern Federal District, was studied. These substances can enter the water by percolating through the soil or carrying it with air masses and accumulating in bottom sediments. It has been find that the level of AI content of pesticides does not exceed the established maximum permissible concentration, but is on the verge of influence on the formation and development of progeny of commercial fish species.
Keywords: pesticides, pesticide pollution, HPLC, active ingredients.

HEAVY METALS IN THE ECOSYSTEM OF THE AZOV SEA

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Average data are presented on the content of heavy metals in the water, sediments and commercial fishes of the Azov Sea over a 30-year period. The assessment is done in accordance with the Russian regulations. Particular attention is given to the years distinguished by highest concentrations of heavy metals in the main elements of the ecosystem. Comprehensive pollution of water and bottom sediments of the Azov Sea assessed by the use of such integral characteristics as maximum permissible concentrations and the average characteristic concentrations has been considered. Accumulation of metals in organs and tissues of fish has been correlated with the concentrations of elements in water and bottom sediments. The potential effect of high and low concentrations of metals on aquatic organisms has been assessed. The probable effects of heavy metals on the organism of fish are described.
Keywords: Azov Sea, heavy metals, arsenic, concentration, substance, the levels of accumulation, sediment, fish.

ACCUMULATION OF ORGANOCHLORINE PESTICIDES AND POLYCHLORINATED BIPHENYLS IN THE ORGANS OF THE AZOV SEA COMMERCIAL FISH SPECIES

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Pesticide monitoring conducted in the Azov Sea in 1989–2016 allowed us to obtain and analyze data on the accumulation of organochlorine pesticides and polychlorinated biphenyls in commercial fishes. The relationship was revealed between histopathological changes observed in the mullet and the accumulation of organochlorine compounds in the fish body. Out of defined PCB congeners we identified persistent and dangerous penta-, hexa- and hepta-chlorbiphenyls among which there were found some dioxin-like congeners.

Keywords: Azov Sea, commercial fish species, accumulation, organochlorine compounds, organochlorine pesticides, polychlorinated biphenyls.

LONG-TERM DYNAMICS OF OIL POLLUTION OF HYDROBIONTS ENVIRONMENT IN THE AZOV SEA

© 2018 y. L.F. Pavlenko, G.V. Skrypnik, T.L. Klimenko, N.S. Anokhina, V.S. Ekylic, M.V. Sevostyanova, T.O. Barabashin

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According to the results of studies conducted in the Azov Sea in different seasons of 1985–2016, the pollution dynamics is presented of water and bottom sediments of the oil components, including polycyclic aromatic hydrocarbons. Genesis of hydrocarbons in the aquatic environment and bottom sediments of the Sea of Azov in modern period is considered.

Keywords: Azov Sea, pollution, oil products, PAH, genesis of hydrocarbons.