COMPARATIVE ANALYSIS OF BIOLOGICAL AND FISHING PRODUCTIVITY OF VALUABLE FISHERIES OF THE CASPIAN BASIN

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Based on the literature data, a comparative analysis of the biological and commercial productivity of valuable commercial Caspian sturgeon and salmon fish has been carried out, the reserves of which are currently at a historical minimum and need to be restored. It is shown that the greatest yield of biomass, products and catch from the replenishment unit (1.0 million juveniles) is noted for species characterized by the highest rate of growth in the first year of life (size and body weight of yearlings), length, age of puberty and associated with these indicators of the coefficients of natural mortality of fish.

Key words: Caspian, valuable fish, growth, puberty, life expectancy, mortality, biological productivity, catches, comparative analysis.

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

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To model time series of fish abundance and catch at age data we use an approach that is based on simple fish arithmetic and takes into account unavoidable uncertainty. We assume that measurement and estimation errors are random variables and have the Laplace or Gaussian distributions. First, we evaluate coefficients of the natural and fishing mortality and parameters of density functions. Then, we represent each cohort as a dynamic Bayesian network with abundances as hidden states and catches as observations. Parameters of distribution densities for transition and observation models are evaluated at the first stage. For each cohort, we consider how to perform such basic Bayesian estimation tasks as filtering, smoothing, and prediction. We illustrate the framework application with the case of a linear Gaussian family of distributions when all Bayesian estimations are relatively simply done. All estimations and graphing were made in Julia with use of different libraries including the Fishmetica package. All symbolic manipulations were carried out in Mathematica.

Keywords: cohort analysis, dynamic Bayesian networks, filtering, smoothing, prediction.

THE RESULTS OF THE FISHERIES SURVEY OF THE OKA RIVER WITHIN THE BOUNDARIES OF THE KALUGA REGION

© 2019 A.D. Bykov, Yu. A. Mitenkov, D. M. Palatov

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The article provides a description of the structure of catches of smooth and stationary nets and fry nets in different habitats run-of-river area the Kaluga area the river Oka. The modern composition of the fish population and the occurrence of certain species of fish and fish-like rivers of the Oka river within the Kaluga region are shown. The time dynamics of changes in the composition of ichthyofauna over a long period of observations according to different authors is considered.

Key words: Oka River, Kaluga region, structure of the catches, the species composition of fishes, ichthyomass

THE PROBLEMS OF DIAGNOSTIC OF DINAMICS MODELS OF FISHERY POPULATIONS

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This article is proceeding of the report on the methodologically stock assessment working group in 2017. The article is devoted to the actual problem of unification of the stages of the procedure of justification of the total allowable catch. It is shown that all the variety of methods can be immersed in a common space of parameters, which allows to achieve reproducibility of the results obtained by different methods. The unified method of diagnostics of models of different levels of information support is offered, based on the analysis of isolines of probability in space of reference points of management.

Key words: mathematical modeling, mathematical statistics, control theory.

ASSESSMENT OF THE RED KING CRAB BYCATCHES IN THE BOTTOM FISH FISHERY WITHIN THE RUSSIAN WATERS OF THE BARENTS SEA AND THE EFFICIENCY OF THEIR REGULATION

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The analysis of the red king crab bycatch in the bottom fish fishery within the Exclusive Economic Zone (EEZ) of Russia in the Barents Sea for the period 2010–2017 was carried out. It

was shown that the annual catch of the crab in 2010–2017 in the bottom fish fishery ranged from 2–8 thousand t, which was 0.5–6.2% of the total biomass of the red king crab in the Russian EEZ of the Barents Sea. The catch of commercial males can reach 5.9% of the crab commercial stock. According to the calculations, the area closed for trawling was annually preventing bycatch of 5–15 thousand t. The current standard of the crab trawl bycatch of 10 specimens per 1 t of catch was discussed. Alternative ways of the crab bycatch regulation were proposed.

Key words: the Barents Sea, bottom trawl fishery, red king crab, demersal fish, bycatch, fishery law regulations.

PROSPECTS OF CULTIVATION OF AQUACULTURE OBJECTS IN THE LAKES OF KARELIA

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In the article, for the first time, an assessment of the state of three freshwater bodies of the Republic of Karelia (L. Maslozero, L. Syargozero and L. Elmozero) in the cultivation of different ages of rainbow trout in cages is given. Limnological characteristics of these lakes are given. The dynamics of the species diversity of quantitative and structural indicators of hydrobionts in the new conditions has been studied. Phosphorus and nitrogen load from trout farms on water bodies is calculated according to the developed methods. The maximum allowable volumes of commercial trout cultivation without damage to aquatic ecosystems and water users are determined.

Key words: lake ecosystems, hydrobionts, trout farming, biogenic load, Republic of Karelia

RESULTS OF WORK ON CULTIVATION OF PELAD (COREGONUS PELED) IN THE MAGADAN REGION

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Results of work on peled cultivation (Coregonus peled) in the Magadan region are presents in the article. Description of semi-closed water installation of supply for the rearing of juvenile whitefish for specimen is given. The data on the biological and hematological indicators of hatchery raised juvenile peled are given.

Key words: peled (Coregonus peled), Magadan region, biological and hematological indicators, salmon hatchery.

DISTRIBUTION OF SOME MACRO- AND MICROELEMENTS IN THE ORGANS AND TISSUE OF GREENLING PLEUROGRAMMUS AZONUS AND FLOUNDER HIPPOGLOSSOIDES DUBIUS (AMUR BAY, JAPAN SEA)

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The contents of some elements in muscular and bone tissue, gills, reproductive gland, liver and skin of Arabesque greenling Pleurogrammus azonus and southern halibut flounder Hippoglossoides dubius caught in Amur Bay (Peter the Great Bay, Japan Sea) were studied. Characteristic features of this element distribution in organs and tissue are shown. Higher accumulation of some elements by bottom-dwelling species - southern halibut which consumes crustaceans, bivalves and polychaetes was found. The content of toxic elements - lead, cadmium, arsenic and mercury in the organs and tissue of the studied species caught in Amur Bay does not exceed the maximum permissible concentration.

Keywords: arabesque greenling Pleurogrammus azonus, southern halibut flounder Hippoglossoides dubius, element composition, heavy metals, Peter the Great Bay, Japan Sea.

FREEDIVING AS PERSPECTIVE METHOD OF PERSONAL FISHERY OF RED KING CRAB IN THE BARENTS SEA

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The paper provide results of natural research and calculations of volume red king crab's catch by freedivers and underwater hunters in the Barents Sea. Presented data of features of crab's catch by apnea method, it's effectiveness and possible of catching depth. The intensity of fishing by freedivers of commercial males in the summer period at depths of up to 20 m red king crab can be 1 crab/hour. Russian, Norway and USA's personal fishery laws about king crabs was described.

Key words: red king crab, freediving, personal fishery, underwater hunting, the Barents Sea.

LIMITATIONS AND OPPORTUNITIES FOR THE USE OF A PROBABLE COHORT MODEL FOR DETERMINING FISH NUMBERS

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The article considers the limitations of using the probabilistic cohort model. It is shown that the model has limitations on fishing intensity. The model provides an adequate estimate of the population when the coefficient of total subsequent use of the stock exceeds 0.4. Restrictions are associated with the underestimation of natural mortality, which is absent in the input data of the model. Algorithms for correcting the results are given. It is shown that in the presence of data on natural mortality, there are no errors in the calculation of numbers.

Key words: probabilistic cohort model, natural mortality, scope of application.