**Bulletin 51**

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| УДК 620.91(571.66)  **D.S. Krotenko, V.A. Semchev, O.A. Belov, S.A. Zhukov**  **ANALYSIS OF FUTURE ENERGY SUPPLY DEVELOPMENT IN KAMCHATKA**  Regional energy supply is an urgent social, economic and technical task, the main idea of which is to produce electricity and heat for human life by means of natural energy resources use. The basis of energy supply can be both non-renewable energy resources of the Earth (coal, oil, gas) and renewable energy resources (energy of rivers, sea tides, heat of the Earth, wind and solar energy). Any region tries to have its own energy using its regional natural energy resource to the maximum. Of cause the price of this resource have to be as low as possible in comparison with other neighboring regions or countries. This determines the socio-economic prestige of the territory, the standard of population living and the investment attractiveness status of the region or country. Kamchatka has significant natural energy resources that make it possible to develop effective energy supply in this territory and implement major economic projects. The most promising projects concern the development of hydropower using unique hydroelectric resources of Kamchatka.  **Key words:** energy supply, energy resource, electric power, thermal energy, generation, energy rate, hydropower, geothermal energy, nuclear energy.  *DOI: 10.17217/2079-0333-2020-51-6-11* |
| УДК 621.3  **S.Y. Trudnev**  **Computer simulation of DC motor control system by example  of trawl winch electric drive**  The control system of a DC motor as part of trawl winch electric drive is described in the article. The analysis of widely used systems for regulating the DC motor speed is carried out: by changing the external voltage, by changing the circuit resistance and magnetic flux. The mathematical description of the control processes is given. On its basis and taking into account the characteristics of each method the computer models of each described speed control methods are developed in the Matlab program according to the structural diagram. A series of experiments were carried out on each computer model, and the output electrical signals, changes in the mechanical moment and angular velocity were processed.  **Key words:** frequency, DC motor, computer model, magnetic flux, angular velocity.  *DOI: 10.17217/2079-0333-2020-51-12-18* |
| УДК 637.071  **O.A. Kovaleva, N.N. Popovicheva**  **INFLUENCE OF BIOLOGICALLY ACTIVE ADDITIVES "IODONORM" ON ORGANOLEPTIC, PHYSICO-CHEMICAL AND FUNCTIONAL INDICATORS OF FERMENTED MILK PRODUCTS**  The possibility of using an iodized food additive in kefir corresponding to State standard 31454-2012 was studied. The kefir with the additive “Iodonorm” was produced under laboratory conditions in a thermostat at a temperature of (28 ± 2)ºC. To assess the possible toxic effects of additives “Iodonorm” using the method of elisa and a standard set of reagents “Tirodite-free T4” and “Thyroideia-triiodothyronine-01” the biochemical composition of laboratory animals blood which were fed yogurt with and without additive “Iodonorm” was studied. Data on the biochemical composition of the experimental animal blood showed the physiological feasibility of introducing the fermented milk product enriched with a biologically active form of iodine into their diet. Determination of organoleptic indicators of titrated acidity during the kefir with the additive “Iodonorm” storage showed that its introduction into the product does not reduce its shelf life and does not change its taste, smell and appearance. The obtained results are important for clinical practice, especially for correcting the nutrition of patients with thyroid dysfunction or pathology.  **Key words:** hormones, dairy products, iodine, functional products, bioadditive, “Iodonorm”, kefir, iodine deficiency.  *DOI: 10.17217/2079-0333-2020-51-19-25* |
| УДК 664.8.035.76  **N.V. Makarova, N.B. Eremeeva, Ya.V. Davydova**  **EDIBLE PACKING FROM APPLE PROCESSING WASTE**  Food packaging occupies a prominent place in solid household waste structure. In this regard, there is a need to create a biodegradable and edible packaging material. The technological properties of multilayer edible packaging such as large and small glasses, plates and spoons made on the basis of apple raw materials with the addition of a plasticizer – pectin in an amount of 2% are considered in the article. Apple squeezes is used as a reinforcing material in amount of 15% of the total mass of puree. Data on the study of organoleptic characteristics of manufactured products, their surface microstructure, water absorption capacity, and resistance to different temperature ranges (from low to high) are presented. The microstructure of the samples surface was studied in passing light and using laser microscopy. The chemical parameters of the packaging material, in particular, the presence of hydroxyl groups, were determined with the help of IR spectroscopy. During the study of organoleptic and structural properties, it was found that the packaging has acceptable organoleptic characteristics for the consumer. Although the microstructure of the packaging is heterogeneous, it is generally resistant to distilled water at different temperatures. Experiments showed that the best performance of the studied packaging samples has a ten-layer one. It does not lose its properties for a long time under the influence of hot liquid and being stored in the refrigerator and freezer.  **Key words:** edible packaging, apples, apple squeezes, structure, organoleptic properties, water absorption, strength, water resistance, biodegradability.  *DOI: 10.17217/2079-0333-2020-51-26-34* |
| УДК 664.66  **Y.A. Betz, N.L. Naumova**  **PASTRY PRODUCT DEVELOPMENT WITH APPLICATION OF  WHOLEGRAIN  QUINOA WHITE FLOUR**  The results of pastry product development using wholegrain quinoa white flour are presented. The organoleptic properties and chemical composition of unconventional raw materials are compared with premium wheat flour ones. It was revealed that the studied quinoa flour has beige tones in color, characteristic shades of light bitterness in taste, high content of lipids, dietary fiber, sugars, protein, vitamins B1 and B2, mineral elements in the absence of gluten and slightly lower amounts of vitamin PP and macronutrient Ca. The quality and nutritional value of pastry product with a substitution of 13% wheat flour for a similar amount of white quinoa raw material in the formulation was studied. It was found that the content of mineral elements in products of the modified formulation is higher: Mg – 1,6 times, P and Cu – 1,3–1,4 times, Se – 28,6%, Mn – 17,3%, Zn – by 9,2%, Fe – by 7,1%; vitamin B2 – by 14,1%; dietary fiber – by 6,3%.  **Key words:** wheat flour, wholegrain quinoa flour, chemical composition of raw materials, nutritional value of products.  *DOI: 10.17217/2079-0333-2020-51-35-39* |
| УДК 664.66  **E.S. Fazylova, N.L. Naumova, J.K. Eremina**  **FRENCH BAGUETTe WITH flax meal ADDItion**  The study results of the effect of flax meal with selenium, potassium, magnesium produced by RPA “Compass of Health” LLC on the formation of consumer properties and nutritional value of baguette were resented in the article. The physico-chemical characteristics of flax raw materials in a comparison with wheat flour of the first grade are investigated. It was found that replacing wheat flour in a baguette recipe in a dosage of 20% with flax raw materials worsens the consumer characteristics of the finished product, namely the color of the products becomes brown, the crumb is less elastic, the porosity is less developed, the taste of flax appears. Replacing 15% of wheat flour with non-traditional material in the composition of the products allows to get a baguette with a high content of protein (1,9 times), fat (1,6 times), mineral elements (magnesium – 2,6 times, potassium – 2, 1 time, calcium and copper – 1,7 times, iron – 1,6 times, phosphorus and zinc – 1,5 times, manganese and silicon – 1,3–1,4 times), dietary fiber (36,6%).  **Key words:** wheat flour, flax meal, selenium, potassium, magnesium, chemical composition of raw materials, nutritional value of products.  *DOI: 10.17217/2079-0333-2020-51-40-45* |
| УДК [582.272.46:581.95]"2018-2019" (265.53)  **A.V. Klimova, A.A. Matveev**  **KELP AND OTHER MACROPHYTES FINDS IN BOTTOM TRAWL CATCHES**  **AT THE WESTERN COAST OF KAMCHATKA DURING 2018–2019**  The data on macroalgae found during summer bottom trawl surveys on the Western Kamchatka shelf during 2018–2019 are presented. The collected species were represented by almost whole thallus, large well-identifiable fragments of thallus, or in most cases, large-dispersed detritus, in which it was not possible to determine the remains of algae before the species. Totally, 9 species of algae have been identified, 6 of them belong to *Laminariales*. One of the found species, *Thalassiophyllum clathrus*, has been listed yet in the scientific literature containing information on the algoflora of south-western Kamchatka, neither as a representative of the bottom flora nor as an alien species. Macroalgae were caught in bottom trawl gear at depths from 36 to 101 m. Almost all algological material processed by the authors was collected in the South of Kamchatka on the shelf areas located from 51°N to 53°N. Two species, *Laminaria inclinatorhiza* and *Fucus distichus*, were found much further North, near the mouth of the Khairyuzov river[[1]](#footnote-1)1.  **Key words:** macroalgae, deepwater drifting plants, *Laminariales*, *Arthrothamnus bifidus*, *Thalassiophyllum clathrus,* bottom trawling, western Kamchatka.  *DOI: 10.17217/2079-0333-2020-51-46-54* |
| УДК 582.272.7(265.52)  **N.G. Klochkova, А.N. Kashutin, T.A. Klochkova**  **GROWTH AND REPRODUCTION OF LABELED PLANTS  OF *FUCUS DISTICHUS* SUBSP. *EVANESCENS* (PHAEOPHYCEAE, FUCALES)  IN THE AVACHA BAY (SOUTHEASTERN KAMCHATKA)**  The growth and propagation of *Fucus distichus* labeled plants from Kamchatka were studied in the time period from April 1, 2017 to February 1, 2018. Five groups of plants bearing 1, 2, 3, 4, and 5 dichotomies with 5 plants in each group were selected. During observation period, labeled plants were measured and examined during syzygy tides 14 times with a frequency of 1–2 times per month. The increase of their total length, length of branches of each dichotomy order and establishment, and maturity stage of receptacles were analyzed. Statistical processing of field-collected material revealed that plants with mature eggs and anterozoids, supplying significant amount of zygotes to the marine environment, were found all year around. Exception was the winter period from January to February, which was characterized by a sub-zero seawater temperature and development of landfast ice or dense snow cover in the subtidal zone, which is the main growth zone of *Fucus*. Plants of all size and age groups overwinter bearing a large number of receptacles in the maturity stage preceding complete maturation and exit of zygotes. Because of that they are capable of providing active spring propagation in *F. distichus*. The second peak of active reproduction in this species was recorded in October. From October to January, settled zygotes developed into juvenile seedlings. The extended propagation times of individual *Fucus* plants and population as a whole, along with a high level of reproduction, can guarantee preservation of this species in adverse natural and man-made conditions.  **Key words:** brown algae, *Fucus distichus* subsp. *evanescens*, plant labeling, seasonal development, maturity of receptacles, southeastern Kamchatka.  *DOI: 10.17217/2079-0333-2020-51-55-65* |
| УДК [574.52: 595.384](268.45)  **A.G. Dvoretsky, V.G. Dvoretsky**  **SYMBIONTS AND SESSILE MICROBIOTA OF RED KING CRAB FROM EASTERN MURMAN (DALNEZELENETSKAYA BAY, BARENTS SEA) IN JULY 2014**  Red king crab *Paralithodes camtschaticus* in the Barents Sea is a non-indigenous species. Its population is considered as a valuable biological resource. The study results of symbionts and sessile microbiota living on the body surface of their crustacean hosts are presented in the article. Materials collected in the Dalnezelenetskaya Bay (the Barents Sea) in the summer of 2014 were used to study the sessile microbiota composition. 45 specimen of the red king crab were caught during diving. 38 species of symbionts and sessile microbiota were found on their surface. They were met relatively rare. The most widespread species among them were the bivalve mollusks *Mytilus edulis* (settlement intensity – 40%). Small crustaceans – copepods *Tisbe furcata* and amphipods *Ischyrocerus commensalis* (100% occurrence on mature crabs) dominated among the symbiotic organisms. The copepods occupied mainly the gills, and amphipods colonized the limbs and mouthparts of the host. In comparison with previous years of research the species composition of associated organisms has not changed significantly, but there are fluctuations in the population indices associated with changes in the size composition of crabs and the number of crabs at different stages of molting. Associated organisms did not have a clear negative effect on the red king crab during the investigation.  **Key words***:* red king crab, the Barents Sea, symbionts, sessile microbiota.  *DOI: 10.17217/2079-0333-2020-51-66-72* |
| УДК [591.524.12:595.384.12](265.5)  **N.A. Sedova**  **FEATURES OF LARVAL DEVELOPMENT OF SHRIMPS OF GENUS *SPIRONTOCARIS* (DECAPODA, THORIDAE) IN THE NORTHWEST PACIFIC**  Larvae of 11 shrimp species of genus *Spirontocaris* were found in plankton samples collected at the coast of Kamchatka and Chukotka. The most reliable features for species identification have been identified. A generalized morphology of the larvae of genus *Spirontocaris* was given. The main morphological differences of the larvae of the corresponding stages were described. The maximum density of larvae recorded in June 2015 in the eastern part of the Okhotsk Sea was 182 ind/m2. The time of larvae appearance in plankton, the duration of the larval development, and the depths above which zoea develops are indicated. It is assumed that in the eastern part of the Okhotsk Sea at least two species of genus *Spirontocaris* unknown for this region exist.  **Key words**: genus *Spirontocaris,* srimps larvae, development stages, morphology, lmbs, segments, spines, setae, Kamchatka, Chukotka.  *DOI: 10.17217/2079-0333-2020-51-73-82* |
| УДК 597.2/.5 (265.5)  **S.S. Grigoriev**  **ECOLOGY OF SPAWNING AND EARLY DEVELOPMENT OF MARINE FISHES  IN ADJACENT KAMCHATKA WATERS**  Spawning and early development environments of marine fishes inhabiting along the Kamchatka Peninsula were discussed. Typical aquatic biotopes that allow spawning and early development of fishes, as well as those of the ichthyofauna community, were considered. The largest part are species having epipelagic, mesopelagic and neritopelagic eggs. The portion of sublittoral, elittoral, and bathipelagic eggs is low, littoral eggs has the smallest one. Larvae of most species after incubation in upper and middle layers continue to pelagic development, but fall into deeper layers. Most of larvae developing from pelagic eggs continue to develop in the bottom layers of water above the shelf (mesobenthal development) in all studied areas. The fish species correlation by biotopic groups in studied areas in adjacent Kamchatka waters varies slightly. It is proposed to distinguish seven ecological groups of marine fishes based on the conditions and habits of spawning: epipelagophiles, mesopelagophiles, batipelagophiles, lithophiles, phytophiles, psammophiles and nauticophils.  **Key words:** ichthyofauna, spawning, ecological characteristics, biotopes, ecological groups.  *DOI: 10.17217/2079-0333-2020-51-83-98* |
| УДК [574.52:594.1](265.53)  **V.S. Zharnikov**  **ENVIRONMENTAL CONDITIONS INFLUENCE ON SPATIAL DISTRIBUTION  OF *MYA UZENENSIS* (BIVALVIA: MYIDAE) IN VARIOUS AREAS OF TAUI BAY,  THE SEA OF OKHOTSK**  The results of studying the environmental conditions influence on the spatial distribution of *Mya uzenensis* on the littoral in some areas of the Taui Bay are presented. The population and distribution of mollusks on the littoral was determined primarily by the littoral horizon and the bottom type. Large mollusks inhabit mainly soft ground of the lower horizon, and younger specimens are concentrated on solid fractions of the bottom on the middle horizon. Depending on the thermal regime of the region the growth rate, density and biomass of *Mya* populations have significant differences. The high abundance, biomass, and maximum sizes of mollusks were noted in the hearted areas, such as the Olsky Estuary and the Veselaya Bay. The desalinated waters don’t significantly affect the density and biomass of the mollusk settlements; however, the average mollusk shell close to the desalination source was longer than those apart 200–300 m. The study of the environmental factors influence on the growth, abundance, and biomass of *M. uzenensis* showed that this mollusk living conditions in the areas of the Olsky Estuary and the Veselaya Bay are most favorable.  **Key words:** Bivalvia, *Mya uzenensis*, littoral zone, substrate, water temperature, salinity, mollusk settlement, shell length, Sea of Okhotsk.  *DOI: 10.17217/2079-0333-2020-51-99-107* |

1. 1 This study was supported by the grant from Russian Foundation for Basic Research (RFBR) (project № 19-04-00285 А). [↑](#footnote-ref-1)