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| УДК 663.91 DOI: 10.17217/2079-0333-2023-64-8-21  **DEVELOPMENT OF CHOCOLATE TECHNOLOGY  WITH SEAFOOD FOOD ADDITIVES**  Agunovich Yu. A., Chmyhalova V. B.  Kamchatka State Technical University, Petropavlovsk-Kamchatsky, Klyuchevskaya str., 35.  In recent years, growth in the production and consumption of chocolate dictates the need to correct composition of the popular product by enriching it with proteins, minerals and vitamins and replacing sugar with a non-carbohydrate sweetener. The article presents the results of the development of technology  of chocolate with enriching ingredients based on seafood: with cucumaria powder and with the food fortifier ‟Kalmaks” based on the integumentary tissues of squid. The optimal amount of introduced concentrators is 5%, the optimal sequence of processing of the raw materials is determined. The nutritional value of the finished product and its energy value are determined. The degree of satisfaction of the daily protein requirement when consuming 100 g of chocolate is 15%, in fat 29%, in carbohydrates 11.8%, in energy 15.4%. As a result of the work, the shelf life of 50 days and the storage conditions of chocolate are set at a storage temperature not higher than 18º.  **Key words:** cucumaria, seafood, squid integument, chocolate. |
| УДК 504.5:582.272 DOI: 10.17217/2079-0333-2023-64-22-31  **COBALT AND COPPER EFFECT ON GERMLINGS GROWTH OF BROWN ALGA  *FUCUS DISTICHUS* SUBSP. *EVANESCENS* (FUCALES, PHAEOPHYCEAE)**  Klimova A.V., Klochkova T.A., Bolotova R.G.  Kamchatka State Technical University, Petropavlovsk-Kamchatskу, Klyuchevskaya Str. 35.  The data of cobalt and copper effect on the development of Kamchatka brown alga *Fucus distichus* subsp. *evanescens* is presented in the paper. The observations were carried out under laboratory conditions with temperature of 10°C, natural light and a photoperiod from July, 6 to August, 6. The cultivation media contained metals at nominal concentrations of 5, 10, 20, and 50 µg/l. It was found that Co addition to the medium mostly stimulated germlings growth. The average growth rate varied from 15.6 to 23.5 µm/day during entire experiment period but did not exceed 16.1 µm/day in the control group. On the contrary, a significant decrease of growth in groups grown in excessive copper media was revealed. By the end of the experiment the rate of germlings growth in media with copper of 10, 20, and 50 µg/l did not exceed 6 µm/day; in the media with minimum metal content was 11.2 µm/day. Also the abnormal formation of germlings rhizoids, the presence of extra- and intracellular copper deposits and underdevelopment of hyaline hairs were observed in all cultures with excessive copper content. The obtained results can be used to predict the responses of *Fucus* littoral communities to cobalt and copper environment pollution.  **Key words:** absolute growth rate, cobalt, copper, nominal concentrations, early stages of development, heavy metals,Fucales, *Fucus distichus* subsp*. evanescens*. |
| УДК 591.4:595.384.12(265.52) DOI: 10.17217/2079-0333-2023-64-32-42  **Morphology of the second larvae stage of shrimps  *Argis Ochotensis Kamtschatica* Sokolov, 2001 (Caridea, Crangonidae) from the Avachinsky Gulf (Southeast Kamchatka)**  Sedova N.A.  Kamchatka State Technical University, Petropavlovsk-Kamchatsky, Klyuchevskaya Str. 35  The second larval stage of the trumped shrims *Argis ochotensis kamtschatica* (Crangonidae) from the plankton of the Avacha Gulf (northwestern part of the Pacific Ocean, Southeast Kamchatka) is described. The existing larvae with the older larvae of *Argis ochotensis ochotensis* and *Argis dentata* were carried out, previously described for sinking waters. The main distinguishing features of the senior Zoea of the Kamchatka subspecies *A. ochotensis*: the presence of spines in the terminal margins of the tergits; a different length of the spine of the right and left skale; three-segment exopod of antennules; nine setae in the basial endites of maxillule; relatively short flagellum of the antenna; a different number of anteroventral margin on the right and left side of carapas; a small notch on the terminal margim of telson. An assumption has been expressed that A. ochotensis is more widespread in Pacific waters than this was considered before. It is shown that this subspecies can have two or three stages of Zoea.  **Key words:** shrimp, morphology of larvae, subspecies, northwestern part of the Pacific Ocean, shortened development, *Argis ochotensis*. |
| УДК 597.552.511+598.279.23(571.66) DOI: 10.17217/2079-0333-2023-64-43-52  **CORRELATION BETWEEN THE NUMBER OF SOCKEYE SALMON  (*ONCORHYNCHUS NERKA*) PRODUCERS  AND WINTERING STELLER’S SEA EAGLES (*HALIAEETUS PELAGICUS*)  ON LAKE KURILSKOYE (SOUTHERN KAMCHATKA)**  Lobkov E.G.1, Dubynin V.A.2  1 Kamchatka State Technical University, Petropavlovsk-Kamchatsky, Klyuchevskaya Str. 35.  2 Kamchatka Branch of the Russian Federal Research Institute of Fisheries and Oceanography (KamchatNIRO), Petropavlovsk-Kamchatsky, Naberezhnaya Str. 18.  A phenomenal winter cluster of three large bird species of prey such as Golden eagle (*Aquila chrysaetos*), White-tailed eagle (*Haliaeetus albicilla*) and Steller’s sea eagle (*H. pelagicus*) is recorded on Lake Kurilskoye more than 40 years annually. The Steller’s sea eagle is a dominant species. The long-term dynamics of Steller’s sea eagle number on Lake Kurilskoye demonstrates obvious connection between the number of birds and sockeye salmon producers (*Oncorhynchus nerka*). However, no statistical data processing was carried out and the significance of this relationship was unknown. The correlation coefficient between the number of Steller’s sea eagles and sockeye salmon that came to spawn during 1976–2008 was 0.673. It indicates the significant relationship between the number of fish and large bird species of prey wintering on the lake. At the same time, it was found that the correlation indicators changed functionally in different periods of time.  **Key words:** Steller’s sea eagle, correlations, sockeye salmon, Lake Kurilskoye. |
| УДК 639.2.053:597.3(265.53) DOI: 10.17217/2079-0333-2023-64-53-75  **BOTTOM AND NEAR-BOTTOM ICHTHIOCENE DOMINANT SPECIES  OF WESTERN KAMCHATKA SHELF: SIZE COMPOSITION**  Matveev A.A., Varkentin A.I.  Kamchatka Branch of the Russian Federal Research Institute of Fisheries and Oceanography (KamchatNIRO), Petropavlovsk-Kamchatsky, Naberezhnaya Str. 18*.*  This work continues our study on the long-term dynamics of the state of fish stocks from the Sea of Okhotsk on the shelf off Western Kamchatka. Data on size composition of 20 dominant fish species that were described in our first paper are presented. The information was collected during 2014–2021. A total of 1,740 scientific trawls carried out during the summer period were processed. The obtained information allowed to expand the existing ideas about the maximum length of ichthyofauna individual representatives.  **Key words:** bottom trawl surveys, Western Kamchatka, Western Kamchatka shelf, Sea of Okhotsk, size composition. |
| УДК 597. 42/.55(265.52) DOI: 10.17217/2079-0333-2023-64-76-89  **FEEDING AND INTRA-SPECIES FOOD RELATIONSHIPS OF STONE COCKSCOMB *ALECTRIAS ALECTROLOPHUS* (STICHAEIDAE) IN THE INTERTIDAL ZONE  OF AVACHA BAY (SOUTH-EASTERN KAMCHATKA)**  Tokranov A.M., Zheleznyak M.Yu.  Kamchatka Branch of Pacific Geographical Institute FEB RAS, Petropavlovsk-Kamchatsky, Partyzanskaya Str. 6.  Based on materials collected in April – September 2021–2022 in the intertidal zone of the north-eastern part of the Avacha Bay, the seasonal dynamics of the stone cockscomb *Alectrias alectrolophus* size composition, the feeding habits and food relationships of its individuals at the age from 0+ to 7 years old in this biotope were analyzed. It was established that living mainly in different horizons of the littoral and the use of food organisms of different sizes for food allowed individuals of different ages to avoid tense food relations and effectively use the food resources of the littoral zone. Although all of them constantly stayed on the same pebble-boulder areas in the tidal zone from the end of June to October and amphipods served as their main food objects (from 65.9 to 89.1% by weight in different months).  **Key words:** Avacha Bay, stone cockscomb, littoral, food relationships, feeding, South-Eastern Kamchatka. |