**Bulletin 48**

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| УДК 57.087:574.5  **А.А. Dulenin, О.А. Kudrevskiy**  **THE USE OF LIGHTWEIGHT REMOTE OPERATED VEHICLE FOR MARINE COASTAL  HYDROBIOLOGICAL INVESTIGATIONS**  In this paper, we discuss personal experience on the use of lightweight unmanned remote operated vehicles (ROVs) in marine hydrobiological investigations of the marine coastal zone. The data obtained by operating ROVs allows making a complete picture of the sea bottom landscapes and on distribution of epibenthic organisms. The technical capabilities of ROVs provide full feedback of the device with operator and high speed of work and also give a significant depth of immersion and quite accurate geographical positioning. ROVs have a relatively low cost. Their additional advantage is the lack of legislative regulation during operation comparing to the case of scuba diving operations. The main disadvantage of their use is the impossibility of systematic sampling. The optimal use of ROVs is realized in combination with technical devices and methods of material collection, which ensure regular sampling such as dredging, bottom-sampling and diving. The methods of organization and conduction of hydrobiological investigations using ROVs are similar to diving surveys methods; however, they have a number of technical peculiarities. Our study shows that ROVs are suitable for underwater landscape mapping, field exploration of bottom invertebrates, qualitative and quantitative accounting of abundant hydrobionts.  **Key words:** marine hydrobiological investigations, coastal zone, remote operated vehicle (ROV).  *DOI: 10.17217/2079-0333-2019-48-6-17* |
| УДК 621.3.018.783.4:621.316.178  **V.P. Sivokon, D.V. Lapshov, O.A. Belov**  **DIAGNOSTIC SIGNS OF NON-STANDARD NONLINEARITY DISPLAY  IN ELECTRIC NETWORKS**  The use of pulsed power supplies led to the fact that most consumers of electrical networks have nonlinear characteristics, which negatively affects the level of higher harmonics and, accordingly, the quality of electricity. A high level of harmonics contributes to the manifestation of geomagnetic-induced currents, which can be diagnosed by evaluating variations in higher harmonics. However, the intrinsic harmonics of the network can mask the formation of their geomagnetic-induced currents. Therefore, the urgent task is to find non-standard diagnostic signs of geomagnetic-induced currents and equipment faults in the networks. Nonlinear processes are peculiar to the formation of not only higher harmonics, but also a number of other phenomena, such as amplitude modulation. As a result of searching for new approaches in the industrial current parameters diagnosis, the possibility of amplitude modulation of the even-numbered harmonics of the network is shown, and disturbances in the acoustic range excited by asynchronous motors are established. The detected physical phenomena can be used in the diagnosis of geomagnetic-induced currents in electrical networks and asynchronous motor faults.  **Key words:** nonlinearity in electric networks, interharmonics, amplitude modulation, geomagnetic-induced currents.  *DOI: 10.17217/2079-0333-2019-48-18-27* |
| УДК 637.5.035:664.92:634.7  **О.А. Kovaleva, E.M. Zdrabova, O.S. Kireeva**  **PROSPECTS OF CONCENTRATED BERRY JUICES USE IN THE TECHNOLOGY  OF MEAT PRODUCTS**  Meat industry products provide main source of animal proteins in the human diet. Peculiarities of the biochemical composition and properties of domestic raw meat justifies the need to search for new technologies for its processing in order to obtain final products with high characteristics desirable for consumers. Using berry raw materials and concentrated berry juices in the technology of creating competitive meat products is quite promising. High content of organic acids in concentrated berry juices allows to use them as bacteriostatic components in the production of meat products, such as ingredients of the curing mixture or components of protective coating for finished meat products. Our study showed improved quality indicators and organoleptic characteristics of new meat products, which were produced using concentrated berry juices. Concentrated berry juices in the meat system exhibited bacteriostatic properties, as well as antioxidant activity, which prolonged the shelf life of the meat product.  **Key words:** meat products, concentrated bilberry juice, concentrated red currant juice, curing salt mixture, organoleptic analysis, bacteriostatic properties, protective coatings.  *DOI: 10.17217/2079-0333-2019-48-28-35* |
| УДК 563.961:664.691/.694  **I.V. Krylova, M.V. Efimova, А.А. Efimov**  **THE USE OF CUCUMARIA AS AN ADDITIVE IN PASTA PRODUCTS**  Traditional pasta products, which are usually made with wheat flour and water, have a low nutritional value, and, therefore, in recent years they are enriched with various nutrients. In this paper, we discuss the possibility of including dried powdered *Cucumaria okhotensis* as an enriching additive in the pasta formulation. According to literary data it is characterized by a high nutritional value and contains a variety of essential biologically active functional components. The method for obtaining fine cucumaria powder with a water content not exceeding 3% was developed. The rational amount of dried powdered cucumaria added to the pasta dough is 5 g per 100 g of flour. With this ratio, the colour, shape, taste, smell, and the pasta integrity after cooking were evaluated by the maximum score. The taste and smell of cucumaria additive was evaluated as moderate. The conduced studies expand the possibilities of enriching pasta products with a valuable, from biological point of view, additive from cucumaria.  **Key words:** pasta products, cucumaria, drying, trituraion, organoleptic characteristics, quality.  *DOI: 10.17217/2079-0333-2019-48-36-42* |
| УДК 639.2/.3:664.95  **A.I. Ukolov, V.P. Rodionov, P.P. Starovoitov**  **HYDRO-CAVITATION JET REMOVAL OF VISCERA IN DECAPITATED FISH**  This work continues a series of our papers on the possibility of using hydrodynamic super-cavitation to remove the viscera in decapitated fish with the aim of introducing this method in the production activities of fish industry enterprises. Our experiments allowed to determine the optimal pressure range of the pumping unit, which is necessary to ensure this process. It was established, when using the developed cavitators, it is possible to clean fish from the viscera at a pressure from 0,5 MPa to 1,5 MPa without destroying its body. The computer simulation of this process confirmed the presence of a concentrated vapor phase in the internal volume of the fish abdominal cavity. However, due to the phase transition a decrease in pressure and flow rate at the surface of the fish body was observed, that contribute to preserving integrity of the product.  **Key words:** pressure, cavitation, simulation, cleaning, fish processing, viscera removal.  *DOI: 10.17217/2079-0333-2019-48-43-48* |
| УДК 639.2.03:639.211(265.53)  **V.V. Volobuev, M.N. Gorokhov, I.S. Golovanov, L.L. Khovanskaya, A.V. Yamborko**  **SOCKEYE SALMON *ONCORHYNCHUS NERKA* (WALBAUM)  FROM THE NORTH-EASTERN CONTINENTAL COAST OF THE OKHOTSK SEA**  In this paper, we summarized previously published and newly obtained data on the least abundant Pacific salmon species, *Oncorhynchus nerka*, which is distributed on the northern continental coast of the Okhotsk sea. The data on its biological characteristics, population structure, natural reproduction and economic use are presented. It was stated that sockeye salmon from Magadanskaya oblast is characterized by a relatively small size (58–60 cm in length) and body weight (2,5–2,8 kg). Under the conditions of reproduction, it is divided into limnophilic and rheophilic ecotypes, which breed in the lakes and river mouths. The dominant ecotype is limnophilic one. It was found that in the studied populations along with the migratory species, there are neotenic landlocked individuals of sockeye salmon, the entire life cycle of which takes place in native lakes. 86–94% of the landlocked sockeye salmon are male individuals. The reproductive ecology peculiarity of limnophilic sockeye salmon is that during breeding season dwarf landlocked individuals together with migratory fish form a single spawning pool.  **Key words:** age, reproduction, sockeye salmon, fishery, size and weight characteristics, northwest of the Okhotsk sea.  *DOI: 10.17217/2079-0333-2019-48-49-58* |
| УДК 574.2:639.222.2  **V.V. Gorbachev, A.A. Smirnov**  **INFLUENCE OF ECOLOGIC-BIOLOGIC AND GENETIC FACTORS ON INTRASPECIFIC STRUCTURE OF PACIFIC HERRING (*CLUPEA PALLASII*)**  In this paper, we summarized and analyzed data from published references and our personal materials on the influence of main environmental factors on intraspecific structure of the Pacific herring on its whole distribution area. In total, we analyzed data collected from 26 areas located on the coast of Eurasia and North America. Herring from the Arctic and Pacific Oceans were clustered based on combined ecological-biological and genetic data. As shown, it is possible to distinguish three herring metapopulations, such as trans-arctic, Asian (Asian-Pacific) and North American, on the basis of genetic data and growth characteristics and development of the species. The influence of the following factors on the parameters of herring populations were determined, such as seawater temperature, salinity and abundance of zooplankton. As established, change of the leading limiting factor occurs during the life of the herring. In the first year of life, this includes seawater temperature; later, when the fingerlings migrate from the coastal part to the seaward area, the main limiting factor is the abundance of food (*p* < 0,05 for both factors). The direct and delayed influence of the anthropogenic factor on the condition of herring populations is also discussed.  **Key words:** genetic markers (DNA), metapopulation, meta-analysis of ecological and biological data, Pacific herring, environmental factors.  *DOI: 10.17217/2079-0333-2019-48-59-70* |
| УДК 669.018.6:582.657.2  **N.A. Dyakova, S.P. Gaponov, A.I. Slivkin**  **ACCUMULATION OF HEAVY METALS AND ARSENIC AND EFFECT OF POLLUTING SUBSTANCES ON FLAVONOID CONTENT IN *POLYGONUM AVICULARE* (CARYOPHYLLALES, POLYGONACEAE)**  Accumulation of heavy metals (lead, mercury, cadmium, nickel, copper, zinc, cobalt, and chrome) and arsenic as well as bio-active compounds was studied in the common knotgrass collected from the areas subjected to different anthropogenic impact. All samples that we collected met the existing requirements of regulatory documentation on the content of heavy metals and flavonoids. In some samples collected from the territories experiencing anthropogenic stress and differing in increased levels of toxic elements in the upper soil layers and grasses, synthesis of polyphenols was induced, which was probably due to their antioxidant effect. Cadmium and copper had a moderate negative effect on the accumulation of flavonoids in the common knotgrass. In case of other elements, a weak negative correlation with the accumulation of flavonoids in the plants was noted. This higher plant species can serve for a bioindication purpose.  **Key words:** *Polygonum aviculare*, common knotgrass, heavy metals, flavonoids, Central Black Soil Region.  *DOI: 10.17217/2079-0333-2019-48-71-77* |
| УДК [581.6 + 582.272.7+582.272.46](571.66)  **T.A. Klochkova, O.A. Dakhno, T.G. Dakhno**  **EFFECT OF THE SEAWEED EXTRACTS ON EARLY DEVELOPMENT OF GARDEN STRAWBERRY IN KAMCHATKA’S CONDITIONS**  In terms of agriculture, Kamchatka peninsula belongs to the zone of risky farming. In this region, agriculture depends on government incentives to purchase seeds, mineral fertilizers, gasoline and diesel fuel. We aimed to determine the prospects of using Kamchatka’s brown seaweed as biostimulants of berry crops. The effects of extracts from *Fucus distichus* subsp. *evanescens* and *Saccharina bongardiana* on survival rate, growth and early development of strawberry was studied, applying methods of wetting of the root system in the seaweed extracts before planting and also foliar spraying. Minimum amount of the original seaweed raw material and low concentrations of the extract induced positive effect on development of plants. Even one-time wetting of strawberry roots in seaweed extract had positive effect on plants’ height and number of leaves, and foliar spraying induced an increased number of stolons.  **Key words:** Avacha Bay, biostimulants, seaweed extract, *Fucus distichus* subsp. *evanescens*, *Saccharina bongardiana*, southeastern Kamchatka, berry crops.  *DOI: 10.17217/2079-0333-2019-48-78-89* |
| УДК 581.6:(582.272.7+582.272.46):634.75  **T.A. Klochkova, A.V. Klimova, N.G. Klochkova**  **PROSPECTS OF USING LAMINARIACEAN ALGAE FROM KAMCHATKA**  **IN THE REGIONAL HORTICULTURE**  The widespread use of synthetic fertilizers and plant growth stimulators gave a tremendous impetus to the development of industrial agriculture. Recently, organic gardening, which does not use artificial chemical fertilizers and pesticides, has become increasingly popular in many countries around the world. To grow high-quality environmentally friendly products, seaweeds were used as plant growth stimulators from the ancient times. In this paper, we discuss the beneficial effect of seaweeds on the development of higher plants based on reference analysis. On the shelf of Kamchatka, the basis of bottom vegetation is composed of laminariaceaen algae and their species diversity is higher in this region comparing to any other area in Russia. Abundant kelps are cast ashore along the coast of Kamchatka, due to peculiarities of their vertical and geographical distribution, composition of phytocenoses, developmental biology, and oceanological and hydro-meteorological conditions in this region. Usually, the beach-cast kelps include plants that (1) have completed their development, (2) are being naturally eliminated from the thick algal beds, or (3) are detached from the bottom due to wave action. Widespread involvement of marine vegetative resources in the regional horticulture can provide an impetus to its development. Significant seasonal changes occur in the chemical composition of the laminariaceaen algae, and it should be considered when choosing options for their usage in the regional horticulture[[1]](#footnote-1)1.  **Key words:** algae cast ashore, algae use, Kamchatka, laminariaceaen algae, growth stimulation.  *DOI: 10.17217/2079-0333-2019-48-90-103* |
| УДК 595.384.12(265.52)  **N.A. Sedova**  **ECOLOGICAL CLASSIFICATION OF CARIDEAN SHRIMPS (DECAPODA, CARIDEA) FROM ADJACENT KAMCHATKA MARINE WATERS BASED ON LARVAL DEVELOPMENT**  Features of the larval development of caridean shrimps and ways of adaptation of their species to different habitat conditions are considered. Based on morphological and ecological similarity of larvae, the shrimpswere divided into groups called ecological guilds. Seven guilds were determined. It is shown how different shrimp species can use the same type of resource, if they are separated morphologically, spatially, and temporarily.  **Key words:** shrimp, larvae, ecological factors, guilds, nutrition, competition, development, stages.  *DOI: 10.17217/2079-0333-2019-48-104-115* |
| УДК 577.15:582.739  **D.K. Chernyshuk, L.E. Ivachenko, K.S. Golokhvast**  **VARIABILITY OF ACID PHOSPHATASE ACTIVITY IN SOYBEAN (*GLYCINE SOJA*)  UNDER CONDITIONS OF TOXIC INFLUENCE OF CADMIUM AND COPPER SULFATES**  Research on the metabolic profiles of soybeans using polymorphism of the protein marker systems presents ideal genetic basis for solving practical problems of soybean breeding with improved nutritional properties and agronomic traits. In this study, we examined mechanism of the biochemical adaptation of wild soybean to the experimentally modeled effects of cadmium and copper sulfates in concentrations, which are 2 times higher than permissible. As we found, cultivation of wild soybean on the soil contaminated with copper and cadmium sulfates leads to increased oxidative processes in soybeans, with copper being more toxic than cadmium. Growing wild soybean in the soil with copper and cadmium sulfates showed that acid phosphatase exhibited stable specific activity and high variability of multiple forms. Additional treatment of soybean seeds with dihydroquercetin, before placing in the soil contaminated with copper and cadmium, caused a decrease in specific activity and an increase in the number of multiple forms of acid phosphatase relative to the control. Thus, it is assumed that pre-sowing treatment of soybean seeds with dihydroquercetin may increase the adaptive potential of wild soybeans to the effects of copper and cadmium sulfates.  **Key words:** *Glycine soja*, acid phosphatase, peroxidase, heavy metals, oxidative stress, biochemical adaptation, dihydroquercetin.  *DOI: 10.17217/2079-0333-2019-48-116-124* |

1. 1 This study was supported by the Federal Agency for Fishery (Rosrybolovstvo) of the Russian Federation in the framework of state assignment on scientific research works (№ of state registration АААА-А18-118092690018-5, ААА-А19-119041990004-2). [↑](#footnote-ref-1)