**Bulletin 52**

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| УДК 502.3 DOI: 10.17217/2079-0333-2020-52-6-17  **HARDWARE-SOFTWARE COMPLEX FOR MONITORING ATMOSPHERIC AIR  POLLUTION AND SELECTING OPTIMAL MOVEMENT ROUTE**  Rybak V.A., Ryabichina O.P.  The article substantiates the urgency of creating the declared system and shows that it is impossible to obtain fast data on the degree of atmospheric air pollution using currently available methods, although this information is important for population of large cities and industrial centers. We present results on the development and use of an automated system for monitoring the atmospheric air using models of the pollutants transport. The system is based on hardware and software complex consisting of microcomputer, pollution sensors, wireless communication module and unmanned aerial vehicle. The pollution indicators obtained in real time are processed in order to build up-to-date maps, including providing an opportunity to choose the optimal route taking into account the adverse effects of pollution. The developed mobile application enables users to receive information on-line and make forecasts based on data on wind speed and direction in short and medium terms.  **Key words**: hardware and software complex, pollution maps, atmospheric air monitoring, forecasting the transfer of pollutants. |
| УДК 621.3:004.94 DOI: 10.17217/2079-0333-2020-52-18-26  **COMPUTER MODELING OF SEMICONDUCTOR CONVERTERS**  Trudnev S.Yu.  The description of widely used modern semiconductor converters and an overview of the basic diagrams of the operation of booster, chopper and pulse-width voltage converters are provided. A theoretical and mathematical description of the control processes of converters is given, on the basis of which computer models of semiconductor converters were developed in the *Matlab* program. On each computer model, a number of experiments were carried out and output current-voltage characteristics were processed, which makes it possible to conclude on the operability of developed computer models. The confirmed adequacy of computer models allows using them in the educational process during the course on electrical machines.  **Key words:** switch, computer model, voltage, semiconductor converter. |
| УДК 543:582.272.46 DOI: 10.17217/2079-0333-2020-52-27-39  **TISSUE DESTRUCTION IN THE BROWN ALGA, *SACCHARINA BONGARDIANA*,  DURING THE PROCESS OF THERMAL-ALKALIN TREATMENT  WHEN PRODUCING BIOGEL**  Klochkova T.A., Saltanova N.S.  *Saccharina bongardiana* is one of the most widespread kelp species in Kamchatka, which is characterized by a broad ecological plasticity and morphological variability. We describe differences in its morphogenesis and developmental biology from the other *Saccharina* and *Laminaria* species from Kamchatka, and features of its internal structure that allow this species to develop in the tidal zone and withstand the effects of adverse environmental factors. The method developed by the authors to control the process of *S. bongardiana* tissue destruction occurring in the process of thermo-alkaline treatment when producing biogel from this alga is described[[1]](#footnote-1)\*.  **Key words:** developmental biology, algal biogel, tissue destruction,morphogenesis, thermo-alkaline treatment, *Saccharina bongardiana*. |
| УДК 674:66.040.22/.25:628.316.12 DOI: 10.17217/2079-0333-2020-52-40-49  **Determination of optimal parameters for the modification of cellulose-containing sorption material (chestnut leaf litter)**  Svyatchenko A.V., Sapronova Zh.A., Sverguzova S.V., Porozhnyuk E.V., Lypandina N.S.  The effect of heat treatment temperature on the structural and sorptional properties of sorption material such as chestnut leaf litter (CLL) was studied. Comparison of the specific surface area of the obtained materials showed that heat treatment not only increased the total pores number, but also changed the pore size distribution. With an increase of sample processing temperature, the specific surface area value of CLL increased from 2.6 to 27.9 m2/g (10.7 times). As we found, the optimal temperature range for carrying out modification was 200–250°C. As shown, with the indicated parameters of heat treatment, the surface area of the material increased with partial preservation of the wood leaf overall structure. When performing heat treatment under these conditions, the efficiency of water treatment reached its maximum (91 and 97%).  **Key words:** spindle oil, leaf litter, oil products, purification, wastewater. |
| УДК 502.3 DOI: 10.17217/2079-0333-2020-52-50-63  **CONTENTS OF HEAVY METALS IN THE SOILS  OF PETROPAVLOVSK-KAMCHATSKY (KAMCHATKA TERRITORY) IN 2017–2018**  Avdoshchenko V.G., Klimova A.V.  The paper presents the results of determining the content of zinc, copper and lead in the soil cover of the territories of Petropavlovsk-Kamchatsky in the summer period of 2017–2018. The total copper content in the city's soils did not differ significantly from the geochemical background of South-Eastern Kamchatka. In 2017–2018, its concentration ranged from 12.68 mg/kg to 42.36 mg/kg. The highest copper content in 2017 was found in the area of “Bus terminal 10 km”, in 2018 –“Botany lane”. The lowest content in 2017 and 2018 was observed in the Spartak stadium district. The zinc content in the city's soils in 2017–2018 varied in the range of 7.03–64.54 mg/kg. The largest content in 2017 was found in the district “Regional library”, in 2018 – “Hospital”. In 2017, the area “Spartak stadium” was characterized by the lowest zinc content, in 2018 – “Bus terminal”. For all the studied areas, excluding the background area, a significant excess of the geochemical background of lead was observed. The range of its content in 2017–2018 was 8.80–309.80 mg/kg. Among the districts, the highest concentration of lead was observed in 2017 at the “Hospital” site, in 2018 – “Botany lane”, the smallest in 2017 – “Spartak Stadium”, in 2018 – “Bus terminal”.  **Key words:** copper, metal pollution, Petropavlovsk-Kamchatsky, lead, soil, heavy metals, urbanized territories, zinc. |
| УДК 597.556.33(265.5) DOI: 10.17217/2079-0333-2020-52-64-73  **FEATURES OF DETERMINING THE AGE AND LIFE EXPECTANCY OF MASS  SEA PERCH *SEBASTES* SP. SPECIES IN THE PACIFIC WATERS OF KAMCHATKA  AND NORTHERN KURIL ISLANDS**  Zudina S.M., Ovcherenko R.T.  The determination of fish age has a big application value because in most currently used methods of reserves calculation the matrix of catches based on age group are used. Data on the minimum and maximum age are also input information for the so-called non-mathematical DLM (Data Limited Method) methods which are currently used for estimating sea perch stocks in the waters of Kamchatka. Accordingly, mistakes in determining the age will lead to incorrect estimates of the main commercial species stocks of sea perch in fishing areas. The data on determining the age of the three most common species of sea perch species – Northern (*Sebastes borealis*), Pacific (*Sebastes alutus*) and blue (*Sebastes glaucus*) in the waters of Kamchatka are presented in the article. The results of the definitions are compared with the obtained data of a "parallel assessment" of age by two researchers. The degree of error allowed for each species is determined and a comparative analysis of our age data with those obtained by foreign researchers is carried out.  **Key words:** age, annual ring, blue perch, otolith, Northern perch, Pacific perch. |
| УДК [591.8:567.8](282.247.416.8) DOI: 10.17217/2079-0333-2020-52-74-85  **HISTOPATHOLOGY OF THE INTERNAL ORGANS IN THE LAKE FROG *PELOPHYLAX RIDIBUNDUS* (PALLAS, 1771) FROM RESERVOIRS  OF KOLTSOVO-MORDOVIN FLOODPLAIN OF SARATOV RESERVOIR**  Mineev A.K.  The histological state of some internal organs of the lake frog (*Pelophylax ridibundus* (Pallas, 1771)) from Koltsovo-Mordovin floodplain of the Saratov reservoir was analyzed as an effective indicator of the anthropogenic pollution. In studied reservoirs, amphibians showed signs of chronic toxicosis, the severity of which corresponded to 2–4 points, according to the five-point system for assessing the toxicological condition of animals. Two types of histopathologies of the liver and 1 type of histopathology of the spleen and gonads were found. No pathologies were found in the tissues of the bladder, kidneys and heart. The variety of detected histopathologies of liver may be the result of exposure of hydrobionts to a wide range of organic and inorganic pollutants present in the water of the reservoir.  **Key words:** histopathology of internal organs, lake frog, Saratov reservoir. |

1. \* This study was partially 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-А19-119041990002-8*).* [↑](#footnote-ref-1)