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Abstracts of the Fifteenth International Symposium of the Russian Society of Nematologists (Russia, Moscow, 23-25 August, 2023)

BERKINBAY O., OMAROV B.B., SULEIMENOV M.Zh. & TASHIBAEV E.S. Nematodes of jeyran (*Gazella subgutturosa* Guldenstadt, 1780).

In Central Asia, 19 nematodes species were recorded in goitered gazelle: *Parabronema skrjabini*, *Gongylonema pulchrum*, *Skrjabinodera saiga*, *Setaria labiato-papillosa*, *Skrjabinema ovis*, *Ostertagiella circumcincta*, *O. occidentalis*, *Camelostrongylus mentulatus*, *Marshallagia marshalli*, *Haemonchus longistipes*, *Nematodirus gazellae*, *N. dogieli*, *N. mauritanicus*, *N. oiratianus*, *N. spathiger*, *Nematodirella gazellae*, *Dictyocaulus filaria*, *Trichocephalus skrjabini*, *Trichostrongylus* sp. In Kazakhstan, 15 nematode species were identified in goitered gazelle: *Skrjabinodera saiga*, *Setaria labiato-papillosa*, *Skrjabinema ovis*, *Ostertagiella circumcincta*, *Ostertagiella occidentalis*, *Camelostrongylus mentulatus*, *Marshallagia marshalli*, *Haemonchus longistipes*, *Nematodirus gazellae*, *Nematodirus dogieli*, *Nematodirus mauritanicus*, *Nematodirus oiratianus*, *Nematodirus spathiger*, *Nematodirella Gazellae*, *Trichocephalus skrjabini*, *Trichostrongylus* sp. In Uzbekistan 6 nematodes species were found in goitered gazelle: *Parabronema skrjabini*, *Gongylonema pulchrum*, *Nematodirus gazellae*, *Dictyocaulus filaria*, *Trichocephalus skrjabini*. Four species of nematode parasites were detected in goitered gazelle in the State National Park: *Setaria labiato-papillosa*, *Nematodirus gazellae*, *Nematodirella gazellae*, *Trichocephalus skrjabini*. – **Institute of Zoology of the Committee of Science, Ministry of Science and Higher Education of the Republic of Kazakhstan, Almaty, 050060, Republic of Kazakhstan; e-mail: berkinbay49@mail.ru.**

BUGMYRIN S.V.[1], BELOVA O.A.[2], ROMANOVA L.Yu.[2], KHOLODILOV I.S.[2], BESPYATOVA L.A.[1], CHERNOKHAEVA L.L.[2], GMYL L.V.[2], KLIMENTOV A.S.[2], IVANNIKOVA A.Y.[2], POLIENKO A.E.[2], YAKOVLEV A.S.[2], IESHKO E.P.[1], GMYL A.P.[2] & KARGANOVA G.G.[2] Ixodid ticks and the infections in Karelia (Russia).

Ixodid ticks (Ixodidae) are vectors of dangerous human infections. The main tick species, that determine the epidemiological situation for tick-borne diseases in northern Europe, are *Ixodes ricinus* and *I. persulcatus* ticks. In recent years, significant changes in the number and distribution of these species have been observed, accompanied by an expansion of the sympatric range. This work summarises the data of long-term studies carried out in Karelia since 2007 on the infection of *I. persulcatus* and *I. ricinus* ticks with various pathogens, including new viruses with unclear pathogenic potential. As a result, tick-borne encephalitis virus (TBEV, Siberian genotype), Alongshan virus, several representatives of the family *Phenuiviridae*, *Borrelia afzelii*, *Borrelia garinii*, *Ehrlichia muris*, *Candidatus* Rickettsia tarasevichiae and *Candidatus* Lariskella arthropodarum were identified. Data were obtained on the geographical and temporal variability of tick infection rates with these main pathogens. The average infection rates of *I. persulcatus* with TBEV and *Borrelia burgdorferi sensu lato* were 4.4% and 23.4% and those of *I. ricinus* were 1.1% and 11.9%, respectively. We did not find a correlation between the infection rate of ticks and TBEV, *B. burgdorferi s.l.* and *Ehrlichia muris/chaffeensis* and the sex of the vector. In general, the peculiarities of the epidemiological situation in Karelia are determined by the wide distribution and high abundance of *I. persulcatus* ticks and by their relatively high infection rate with TBEV and *B. burgdorferi s.l.* in most of the territory, including the periphery of the range. – **[1]Institute of Biology, Karelian Research Centre, RAS, Petrozavodsk, 185910, Russia; e-mail: sbugmyr@mail.ru; [2]FSASI "Chumakov FSC R&D IBP RAS", Moscow, 108811, Russia.**

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BUTORINA N.N., KHATSAEVA R.M., LIMANTSEVA L.A. & PLYKINA M.S. Structural features of the epidermal structures of *Mentha* L. mint leaf and their changes when infected with the root-knot nematode *Meloidogyna incognita*.

Experiments on infestation of two species of mint varieties, 'Kurchavaya' (*Mentha spicata* var. *crispa*) and 'Longifiolia' (*Mentha longifolia* subsp. *Longifiolia*) by the nematode *Meloidogyne incognita* (Kofoid & White, 1919) Chitwood, were conducted in field conditions at the experimental field of the scientific-experimental station "Tchernogolovka" in 2022. An increase of 37% in the amount of essential oil in mint of 'Kurchavaya' variety was obtained when compared to non-infected plants. There was no change in the amount of essential oil in nematode-infestated 'Longifiolia' mint. The study of chemical composition and quantity of essential oil glands and glandular hairs of leaves of infested and uninfested mint samples was initiated. In both mint cultivars, C, O, N, Al and Ca were present in the spectrogram. In the spectrogram of mint cultivar 'Kurchavaya', the presence of Mg, Cl and Na were also noted. Differences in the number of essential oil glands and glandular hairs were found. An increase in the number of essential oil glands on both sides of the leaf and in the number of glandular hairs on the upper side of the leaf was observed in the 'Kurchavaya' variety. In 'Longifiolia' variety, the number of essential oil glands on the upper side of the leaf increased, while on the lower side their number decreased. The number of glandular hairs decreased on both sides of the leaf. Additional studies are needed to establish reliably the effect of infestation on leaf epidermal structures. – **A.N. Severtsov Institute of Ecology and Evolution, RAS, Moscow, 119071, Russia; e-mail: nbut@list.ru.**

CHALKIN A.A., ARBUZOVA E.N., KOZYREVA N.I. & KULINICH O.A. Fumigation of timber to eradicate xylophagous nematodes.

Methyl bromide is recommended for wood fumigation as the most effective agent for killing wood-boring insects and pathogens. Considering that the treatment of methyl bromide is restricted by the International Convention, the ethanedinitrile (EDN) fumigant has recently become increasingly important as the most environmentally suitable fumigant for the disinfestation of products. To this purpose, studies were conducted to investigate the effect of EDN on xylophagous nematodes. In experiments, fifty *Pinus sylvestris* pine logs (150 × 300 mm) were infected with *Bursaphelenchus xylophilus* nematodes (isolate US1-Bx). The inoculum was about 6,000 nematodes per log. The infected logs were placed for 5 weeks in a thermostat at 27°C. Fumigation experiments were conducted in two fumigation chambers V = 0.85 m^3. The required amount of EDN Sterigas 1000^{TM} Fumigant gas was pumped into the chambers to achieve the required dosage. Ten logs were placed in each chamber. The following fumigant doses were used: 25 g m^{-3}, 50 g m^{-3}, 75 g m^{-3} for 24 h exposure and 50 g m^{-3} for 12 h exposure. Controls were infected logs without fumigation. Nematode numbers in wood samples were tested 3 days before fumigation and 24 h, 48 h, 10 days and 28 days after fumigation. In all trials, at 20°C, the fumigant caused 100% mortality of *B. xylophilus* at all applied doses. The numbers of nematodes isolated according to the Baermann funnel technique in the fumigated logs ranged from 11 to 188 nematodes per 100 g of wet weight of wood. All isolated nematodes were dead. – **All-Russian Plant Quarantine Centre, Bykovo, Moscow Region, 140150, Russia; e-mail: chalkin10@yandex.ru.**

FADEEVA N.P. & KARPOVA A.A. Taxonomic study of marine nematodes of sandy beaches from the Sea of Japan.

Two new species of marine nematodes: *Metadesmolaimus inni* and *Rhynchonema pulchrum* are described and illustrated from intertidal sands of the Asiatic coast of the Sea of Japan. The genus *Metadesmolaimus* was established by Schuurmans Stekhoven (Schuurmans Stekhoven, 1935) and has recently been discussed by Guo, Chen, Lio (2016). *Metadesmolaimus* sp. nov. is morphologically similar to *M. canicula* and *M. varians* Lorenzen, 1972 but differs by its cuticular structure that exists between the labial and cephalic setae and the shape of very long and thin spicules. The new species can be easily distinguished by yellow brownish short body (815-877 μm), spicule length (143-120 μm) and long somatic setae of various lengths. The genus *Rhynchonema* was erected by Cobb (1920) with the type species *R. cinctum* from Salaverry, Peru. Currently, the genus *Rhynchonema* contains 36 species, mainly found in shallow waters. The morphology and morphometry of *R. pulchrum* was examined using light and confocal electron microscopy. *Rhynchonema pulchrum* can be easily distinguished from all known congeneric species in having a combination of the following features: greater body and spicules lengths and spicule length to anal body diameter ratio. The photomicrographs of the new species by confocal microscopy are presented with a detailed morphological description. – **Far Eastern Federal University, Vladivostok, 690922, Russia; e-mail: nfadeeva2006@yandex.ru.**

FALEYEV D.G. To the question of prevention and treatment of varroosis in apiaries of low mountains of Zailiyskiy Alatau.

The *Varroa destructor* mite is a malicious pest of honey bees both throughout the world and in south-east Kazakhstan. One of the peak death occurrences of bee colonies in the Almaty region fell in 2020, which, apparently, was due to a large extent to the activity of the tick. A short winter with frequent thaws and humid air in the foothills and low mountains of the Zailiyskiy Alatau (kaz. Ile Alatauy) also contributed to the weakening of bee colonies. The simplest method of counting ticks in pallets, under an anti-varroosis net, gave an idea of the presence and number of ticks on bees, and thereby provided timely accuracy or need for change in the prevention and treatment strategies of varroosis. In the conditions of the low mountains of the Zailiyskiy Alatau, the number of wintering ticks in a swarm on 5 frames can exceed 360 individuals (2023). The location of the hives on the hills, on the slopes of the southern exposure (compared to the lowlands, on the slopes of the eastern exposure) can greatly contribute to the prevention of varroosis and related diseases of the honey bee, by improving the microclimate of the apiary by providing better illumination, warming up, and reducing the humidity of the hives. At the same time, the average number of ticks in the winter and early spring period was 1.5-3 and 7 times lower, respectively, and the survival rate of swarms in the winter and early spring period can increase 2 (from 50 to 100%), and almost 1.5 times (from 66.7 to 100%), respectively. – **al-Farabi Kazakh National University, Almaty, 050040, Republic of Kazakhstan; e-mail: ex_eko@mail.ru.**

KALINKINA D.S., SUSHCHUK A.A. & MATVEEVA E.M. Changes of soil nematode community characteristics in the gradient of meadow overgrowth with the invasive plant species – *Heracleum sosnowskyi* Manden (from the example of the Leningrad Region).

The formation of new plant communities under the influence of aggressive invasive species, Sosnowsky's hogweed *Heracleum sosnowskyi* Manden, leads to changes in the structure and functioning of all components of natural communities. The aim of this study was to search the patterns and factors that determine them in the formation of diversity and structure of soil nematode communities under *H. sosnowskyi* invasion. Soil samples were collected from three sites (along the transect) on the territory of the Leningrad region: *H. sosnowskyi* monostand, the ecological boundary zone between the invasive plant community and native vegetation (transitional zone), and meadow biocenosis. The results of this study showed a decrease in total nematode abundance (from 2097 to 1694 indiv. (100 g of soil)$^{-1}$) along the transect from *H. sosnowskyi* to meadow. The highest total nematode diversity, as well as the diversity of most eco-trophic groups and high value of the Shannon index (H' = 4.24) were found in the transitional zone, which may be associated with the formation of an ecotone effect in the zone between two plant communities. The eco-trophic structure of nematode communities was characterised by a similar dominance series at all sites, with the highest proportion recorded for bacterial feeders (42.5-50.2%) and plant parasites (21.4-26.9%). The ratio of ecological indices characterised soil ecosystems as undisturbed. Analysis of soil characteristics showed a decrease of pH, mobile K, N and an increase of C in the direction from the *H. sosnowskyi* to the meadow. Statistical analysis showed positive correlations between the above-mentioned soil parameters and some nematological characteristics such as relative abundance of bacterial feeders, fungal feeders, ΣMI and CI indices; negative correlation was noted with phosphorus. Thus, the invasion of a plant species new to the region into natural communities affects the abiotic and biotic components of the soil environment, but does not lead to a significant decrease in nematode fauna diversity as might be expected in monodominant plant communities. – **Institute of Biology, Karelian Research Centre, RAS, Petrozavodsk, 185910, Russia; e-mail: kalinkinads@gmail.com.**

KANALBEK G.K., BOGUSPAEV K.K., FALEYEV D.G., AKILBEKOVA A.I., SISSEMALI K.R., NUSUPOV A.A. & MUTALKHANOV M.S. Development of nematocidal biological preparations: the nematodes as a part of the test system for determining the activity of predatory fungi.

The ability of a predatory fungus (PF) to attract nematodes during hunting (attractive activity) is an indicator of the effectiveness of the fungus strain and biological products based on it. In this regard, the testing of PF strains isolated in pure culture for attractive activity is one of the main stages in the development of nematicidal biological preparations. For testing in laboratory conditions, PF was cultured on a dense nutrient medium and a few drops of liquid with nematodes were placed in one Petri dish. The active migration of nematodes towards the fungus is an indicator of the high efficiency of the PF strain. In the Laboratory of Ecological Biotechnology of KazNU, work is underway to isolate PF strains from agrocenoses of Southern and South-Eastern Kazakhstan. From more than 100 agrocenoses of vegetable and grain crops, four PF strains were isolated. The testing of the isolated strains' attractive activity against the nematode *Meloidogyne incognita*, made it possible to identify the most promising nematophagous strain from the genus *Arthrobotrys*. These PF strains will become the basis of nematocidal biological products created for the regions of Southern, South-Eastern Kazakhstan and adjacent territories (Support: grants of the Ministry of Education and Science

of the Republic of Kazakhstan AR 15473383 and AR 14871628). – **al-Farabi Kazakh National University, Almaty, 050040, Republic of Kazakhstan; e-mail: gulzat.kanalbek95@gmail.com.**

KHUSAINOV R.V. Fauna of soil nematodes in stone fruit orchards on the territory of the North Caucasus.

Studies of soil nematodes fauna in stone fruit orchards on the territory of the North Caucasus were conducted in 2012-2016. Soil samples were collected in stone fruit plantations (with various intensity of cultivation) in Krasnodar and Stavropol territories, the Republics of Adygea and Kabardino-Balkaria. About 200 ha of plantations of apricot, peach, sour cherry, cherry, cherry plums and plums were surveyed by the route method. According to the results of ecological and taxonomic analysis, a total of 64 genera from 29 families of 11 orders were found. The ratio of environmental groups of nematodes was differentiated within samples. Samples usually contained 18-24 genera. No significant difference in the composition of nematode genera was observed between stone fruit species. Bacteria-feeding nematodes were the dominant group in soil samples (cephalobids, rhabditids, plectids, and other nematodes). The second group in frequency of occurrence was mycotrophic nematodes (aphelenchids and tylenchins, tylencholaimids). Polyphagous and predacious nematode groups were represented mainly by aporcelaimid, qudsianematid, dorylaimid and mononchid taxa. Plant-parasitic nematodes were represented by hoplolaimid, dolichodorid, anguinid, longidorid groups, and also *Paratylenchus*, *Pratylenchus*, *Paratrichodorus* and *Meloidogyne* species. The ratio of ecologo-taxonomic groups and its abundance were depended predominantly on the cultivation intensity and terrain. The fauna of soil nematodes in old orchards differed from the fauna of field crops in taxonomic composition. The structure of nematode fauna at high tree density (super-intensive technology) was closer to that of agrocenose field. – **A.N. Severtsov Institute of Ecology and Evolution, RAS, Moscow, 119071, Russia; e-mail: ren.khusainov@gmail.com.**

KHUSAINOV R.V. Mites in underground part of ornamental bulbous plants in the regions of the Central-European part of Russia.

The taxonomic diversity and harmfulness of mites inhabiting bulbs of ornamental cultures in the regions of the Central-European part of Russia was studied in 2019-2020. Bulbs of three ornamental cultures (tulip *Tulipa gesneriana*, chives *Allium schoenoprasum* and hyacinth *Hyacinthus orientalis*) were used as material for the study. Underground organs of onion cultures were collected in city parks and personal subsidiary holdings on the territory of four regions (Kaluga, Moscow, Tula and Voronezh regions). Bulbs were removed after completion of the flowering period, washed and dissected under a stereomicroscope. In total of 50-60 bulbs for each ornamental culture were analysed. According to the results of a survey, six species of mites from four families were found. Phytoparasites group was represented by four species: *Aceria tulipae* (fam. Eriophyidae), *Caloglyphus sphaerogaster* (fam. Acaridae), *Rhizoglyphus echinopus* (fam. Acaridae), *Tarsonemus* sp. (fam. Tarsonemidae). *Saprobiotic* species, *Acarus siro* (fam. Acaridae) and predator *Hypoaspis* sp. (fam. Laelapidae) were also noted. *Rhizoglyphus echinopus* (46%) and *A. siro* (35%) were the most frequently found species into the bulbs. *A. tulipae* was found in 8% of examined tulip and chives bulbs. Plants infected by *A. tulipae* or *R. echinopus* in 150-220 specimens cm^{-3}, lagged noticeably in growth, and bulbs had symptoms of necrosis and severe drying. – **A.N. Severtsov Institute of Ecology and Evolution, RAS, Moscow, 119071, Russia; e-mail: ren.khusainov@gmail.com.**

KULINICH O.A., ARBUZOVA E.N., CHALKIN A.A. & KOZYREVA N.I. Birch wood, *Betula pendula*, as a possible substrate for the propagation of the pine wood nematode *Bursaphelenchus xylophilus*.

The pine wood nematode (PWN) *B. xylophilus* causes pine wilt disease of coniferous forests in China, Japan, South Korea and Portugal, and there is a risk of introduction of this pathogen into the Russian territory. The vectors of PWN are long-horn beetles of *Monochamus* spp. In Russia, the white mottled sawyer *M. urussovi* is widespread, infecting conifers, but it can also attack birch. The aim of the study was to investigate whether PWN could survive and reproduce in birchwood and if nematode transmission from *M. urussovi* to birch occurred. Fifteen logs of birch (*Betula pendula*) and pine (*Pinus sylvestris*, control) infected with PWN (500 nematodes log^{-1}) were used in the experiment. Nematode abundance in all logs was found to be significantly higher at the end of the experiment than at the beginning. Nematodes multiplied most intensively in pine, with average numbers increasing steadily from 61 nematodes per 100 g of wet wood weight on the day of infection to 1,353 on day 80. Nematode numbers in birch also increased gradually, but the dependence was not linear: a significant increase in nematode numbers (2 times) was recorded after 30 days, and the maximum number was recorded on day 45 (402 nematodes $(100\ g\ of\ wood)^{-1}$). In another experiment with *M. urussovi* in cages, adults were observed actively feeding on birch twigs. The authors hypothesize that if PWN is transmitted by *M. urussovi* to birch, the nematodes will survive and reproduce in the plant. – **All-Russian Plant Quarantine Centre, Bykovo, Moscow Region, 140150, Russia; e-mail: okulinich1@gmail.com.**

LIKHACHEVA G.V. & CHERNEVA I.A. The first identification of parasitic nematodes in nemerteans.

Nemertines are a type of worm-like organism, the main feature of which is the presence of a trunk – an eversible structure lying in a special cavity above the intestine (rhynchocoeli). They are predominantly benthic predatory organisms. In July 2019, a benthic sample with *Arctostemma arcticum* (Uschakov, 1926) (Nemertea, Monostilifera) was taken by trawling near the Krestovy Islands in the White Sea. Two nemerteans were infected with nematodes. The parasites were located in the rhynchocoel. One nematode was measured, photographed and fixed in 96% ethanol for phylogenetics studies. Nemertean with a second nematode was sectioned and stained using the Azan method. The methods of classical identification and barcoding (*COI*) were used and both nematodes were identified as *Pseudoterranova bulbosa* (Cobb, 1888) in their late larval stages. The length of the nematodes was about 3.5 mm with a diameter of 0.12 mm. The final hosts of *P. bulbosa* are fish and marine mammals, and amphipods often are intermediate hosts. Hoplonemerteans like *Arctostemma arcticum* feed on amphipods. Thus, nemerteans could become infected with nematodes from their preys. The question remains whether this infection is accidental or whether fish are able to eat *Arctostemma arcticum* and, in turn, become infected with nematodes. – **Lomonosov Moscow State University, Moscow, 119991, Russia; e-mail: lihagayka@gmail.com.**

LOGINOVA O.A. Morphological differential diagnostics of the free-living stages of *Marshallagia*.

Nematodes of the genus *Marshallagia* of the (former) order Strongylida parasitise the gastrointestinal tract (GI) of ruminants. This is the reason for their veterinary importance both for farm animals (sheep, goats, camels, reindeer) and representatives of wild megafauna (Bovidae and Cervidae). There are coprolarvoscopic methods that allow the detection and differentiation of larvae of parasitic GI nematodes based on their morphology and morphometry; however, *Marshallagia* larvae have not been described in them. *Marshallagia* larva of the first stage (L1) has an intestine, in which large cylindrical cells are visible for two posterior thirds, lying in one row. The intestinal lumen is not visible. This is enough to distinguish it from L1 of small strongylids, whose intestinal cells are not differentiated, but a lumen is visible. L1 of *Nematodirus* and *Nematodirella* do not leave the eggs, so they do not need a differential diagnosis. *Marshallagia* larva of the third stage (L3) has 16 triangular intestinal cells lying in two rows. This distinguishes it from L3 of *Nematodirus* and *Nematodirella*, which have 8 cells each. The caudal end of the body does not have a spine/spike (unlike *Trichostrongylus*). The tail end of the sheath is short (in contrast to *Haemonchus*, *Cooperia* and *Ostertagia*). The total length is about 0.64 mm, which is significantly less than *Teladorsagia* (0.9 mm). – **A.N. Severtsov Institute of Ecology and Evolution, RAS, Moscow, 119071, Russia; e-mail: loginova_spb@bk.ru.**

LYUTIK E.V. Protective deities of China: Chong Wang – patron of insects.

Protective deities traditionally accompany the Chinese throughout their lives. A separate place is occupied by deities who help in agriculture and protect crops, which include Chong Wang, the patron of insects. His early images are inextricably linked with the mythical bird that protects the fields from insect attacks. Since the era of the Song Dynasty, the image of Chun Wang has been identified with a real person, General Liu Qi (1098-1162), who, according to legend, was able to save the fields from the invasion of locusts. The cult of the patron saint of insects is widespread in China and Vietnam. The report, based on field research, material in Chinese and Vietnamese, provides a comparative analysis of the image of Chun Wang and the surviving similar cults in the North of Vietnam. – **Research Institute of Vietnam at the Pedagogical University of Guangxi Province, Guilin, China; e-mail: tokyolutik@yandex.ru.**

MORDUKHOVICH V.V.[1, 2], EFIMOVA K.V.[1] & ZOGRAF J.K.[1] Two new species of *Trileptium* Cobb, 1933 (Enoplida: Thoracostomopsidae) from the east coast of the Kamchatka Peninsula.

Nematodes of the family Thoracostomopsidae are ubiquitous in the World Ocean. The family currently includes 21 genera, which Lorenzen (1981) grouped into three subfamilies: Thoracostominae, Enoplolaiminae and Trileptiinae. The subfamily Trileptiinae is represented by the single genus *Trileptium*, which includes 12 valid species. Two new species have been found in subtidal bottom sediments of the eastern coast of the Kamchatka Peninsula: *Trileptium* sp.1 sp. nov. and *Trileptium* sp.2 sp. nov. The new species differ from others in the genus by a very large body length (more than 20,000 μm for *Trileptium* sp. 1 nov. and more than 10,000 μm for *T.* sp. 2 nov.), values of the index *c*, the stoma armature, the presence of a pronounced belt of short cervical setae, gubernaculum structure, spicule length. Data on the nucleotide sequences of the 18S rRNA and D2-D3 region of the 28S rRNA genes were obtained. A phylogenetic analysis of the family Thoracostomopsidae was carried out using data on the nucleotide sequences of nuclear DNA of representatives of all subfamilies (Thoracostominae, Enoplolaiminae and Trileptiinae) (Support: RSF 23-24-00273). – **[1]A.V. Zhirmunsky National Scientific Center of Marine Biology, FEB RAS, Vladivostok, 690041, Russia; e-mail: zojulia@yandex.ru; [2]Far Eastern Federal University, Vladivostok, 690922, Russia; e-mail: vvmora@mail.ru.**

NEKOVAL S.N., CHURIKOVA A.K. & CHERNYAKOVICH M.N. Species diversity of *Meloidogyne* nematodes on tomato in the south of Russia and the search for effective elements of protection against them.

Meloidoginosis on vegetables is caused by the nematodes *Meloidogyne incognita*, *M. hapla*, *M. javanica*, *M. arenaria*, *M. chitwoodi* and *M. fallax*. These species cause significant damage to the crop, yield losses exceed 30%. We found that root-knot nematodes, which are harmful to open ground and greenhouse tomatoes in the Rostov Region, Krasnodar Krai, and Volgograd Region, belong to the species *M. hapla* Chitwood, 1949. Nematodes belonging to the species *M. incognita* (Kofoid & White), 1919 have been identified in the greenhouses of farms in the Republic of Dagestan. In order to find effective methods for protecting tomato against *Meloidogyne*, we studied resistant plants and microorganisms with nematicidal activity. Under artificial infection, one mutant line (Mo) with immunity to *M. hapla* (Mo 147) and five moderately resistant (Mo 329, Mo 353, Mo 417, Mo 638, Mo 739) were isolated from the tomato collection samples of the FSBSI FRCBPP. Under *in vitro* and *in vivo* conditions, screening of 12 liquid cultures of strains of the microorganisms, from the collection of Biotechagro LLC and the BRC of the FSBSI FRCBPP State Collection of Entomoacariphages and Microorganisms, was carried out on greenhouse tomatoes. Three strains of predatory fungi and one strain of antagonist bacteria were found to be promising against root-knot nematodes. The research was carried out in accordance with the State Assignment of the Ministry of Science and Higher Education of the Russian Federation within the framework of the research work on the topic no. FGRN-2021-0001 "Development of technologies for integrated protection of crops, taking into account the immunological characteristics of the variety. Monitoring and study of harmful objects, assessment of biorational means and development of elements of protection technologies". – **Federal State Budgetary Scientific Institution "Federal Research Center of Biological Plant Protection", Krasnodar, 350039, Russia; e-mail: s.nekoval@yandex.ru.**

NTIDI K.N.[1], DANEEL M.[2] & FOURIE H.[3] Participatory approaches towards identifying and managing plant-parasitic nematodes (PPN) in developing agricultural systems in South Africa.

Crop and quality losses as a result of plant-parasitic nematode (PPN) infestations are usually more serious in areas where food is scarce than in first world countries, which is particularly the case in subsistence, resource-poor farming communities. PPN are not perceived as economically important parasites of crops since above-ground damage inflicted by these parasites is usually absent or confused with other limiting factors such as drought or nutrient deficiencies. Research, awareness-raising, training and technology transfer efforts about the presence and impact of PPN had thus been conducted to target particularly developing farmers. A nematode survey was conducted at 67 sites located in the eastern and western regions within the developing agricultural sector. Forty weed species and 36 PPN genera were identified as hosts of weeds of which 26 species and 13 genera were for the first time reported to parasite weeds. Root-knot (*Meloidogyne* spp.; RKN) nematodes, followed by lesion (*Pratylenchus zeae*), spiral (*Helicotylenchus dihystera* and *Rotylenchus unisex*) nematodes were the predominant PPN identified. On-farm experiments, including environmentally-friendly management strategies such as solarisation, compost, and kraal manure were also conducted to reduce RKN populations. With regard to technology transfer, training and awareness-raising, interactive training workshops were presented to extension officers, and farmer's days were held for producers. The aim of this project was to ultimately benefit producers, particularly in minimising crop production costs and simultaneously optimising crop yields. – **[1]Agricultural Research Council – Grain Crops Institute, Potchefstroom, 2520, South Africa; [2]Agricultural Research Council – Tropical and Subtropical Crops, Mbombela, 1200, South Africa; [3]North-West University, Potchefstroom, 2520, South Africa; e-mail ntidin@arc.agric.za.**

PEREVERTIN K.A. The problem of the sugar beet cyst nematode *Heterodera schachtii* – from the Napoleonic wars to the present.

The sugar beet, as well as the co-evolutionarily-related *Heterodera schachtii*, originate from the Mediterranean focus. By the end of the 18th century, the needs of Europe were almost completely satisfied by colonial cane sugar. The Napoleonic wars led to a continental blockade, in connection with which the beet sugar industry developed rapidly. After the blockade was lifted, the states of Germany, which did not have colonies, continued to cultivate beets around the sugar factories, and by the middle of the 19th century there was a "beet exhaustion" caused by *H. schachtii*, which led to the closure of the factories. Experimental station in Halle (Saxony) created to solve the problem – the world's first plant protection institute. In Soviet times, sugar beet exhaustion was the reason for the liquidation of the industry in Kazakhstan and Kyrgyzstan. In the 1990s, Russian factories switched to cheap cane imported raw materials (Cuban, later Brazilian), which led to the cleansing of the former sugar beet fields from the nematode. In the 2000s, beet growing began to revive, and in 2017 Russia became a sugar exporter for the first time in its history. At present, the density of soil contamination is again threateningly growing. The problem is exacerbated by the fact that rapeseed is

also a host for *Heterodera*. Crop rotation remains the best means of control. – **A.N. Severtsov Institute of Ecology and Evolution, RAS, Moscow, 119071, Russia; e-mail: perevertink@mail.ru.**

POLYANINA K.S. & RYSS A.Yu. Xylobiont nematodes of deciduous woody plants.

Plant-parasitic nematodes cause damage to agriculture and forestry worldwide, with ten species listed as particularly harmful quarantine organisms. Nematodes cause wilt and dieback of the coniferous and deciduous trees. Helminths of coniferous trees are well studied, while the helminth fauna of deciduous trees has received insufficient attention. The study of xylobiont nematode fauna is of important practical importance; the relationships of entomochore nematodes with their beetle vectors are valuable for understanding the structure and function of saproxylic fauna. Systematisation of the types of relationships in 'beetle-nematode-plant-host' associations is important for the forestry management and control of woody plant pests. The study was aimed to identify the nematode fauna of infected deciduous trees with special attention to plant pathogens associated with saproxylic beetles, which are carriers of agents causing vector-borne plant diseases. A survey was carried out in 10 regions of Russia and Belarus: the number of collection areas with identified nematode species in the collection was 100 (out of a total number of locations *ca* 600); there were 368 studied samples of wood and insects; 561 collection slides were deposited in the UFK Nematode Collection of ZIN RAS; and 46 isolates of nematode cultures were set up *in vitro*. The faunae of three common species of the symptomatic deciduous trees were studied: elm (Dutch Elm Disease), ash (dieback), oak (wilt). Lists of faunae are as follows: *Ulmus laevis* and *U. glabra* – 15 species, *Fraxinus excelsior* – 11, *Quercus robur* – 20. A digital Atlas of xylobiont nematodes was compiled, and the classification of 10 nematode eco-groups based on the types of 'nematode-beetle' associations was proposed (Support: RFBR 20-04-00569 and 20-34-90101; State Assignment 122031100260-0). – **Zoological Institute, RAS, Saint Petersburg, 199034, Russia; e-mail: Kristina.Polyanina@zin.ru, nema@zin.ru.**

PORTNOVA D.A. & GARLITSKAYA L.A. The nematode community structure on the depth gradient in the East Siberian Sea.

Among the Russian polar seas, the East Siberian Sea is the most inaccessible and, accordingly, the least studied. Almost the entire year the East Siberian Sea is covered with ice, which greatly restricts the conduct of expeditions to this area. During a cruise in the East Siberian Sea at RV Araon in 2019, scientific material was collected on the shelf (40-65 m), slope (120-600 m), and in the area of the expected methane seeps at a depth 1300 m. As a result, 41 genera of nematodes were identified. Diversity at the genera level decreased with increasing depth. Nematodes comprised 88% of the total meiobenthos; the maximum density was at 48-62 m depths. However, with increasing depth along the shelf to the deepest station, the abundance decreased sharply, reaching minimum (34 indiv. 10 cm^{-2}) at 1316 m. The effect of methane on the structure of the nematode community could not be confirmed in any way. The genus *Sabatieria* was absent along the shelf, slope and deep-sea. The absence of the genus *Sabatieria* and the dominance of the genus *Molgolaimus* on the shelf in the eastern part is due to the hydrological and hydrochemical boundary separating the two regimes, eastern and western, by around 160° E for the water column and 170° E for the sediments (Semiletov *et al.*, 2005) (Support: RSF 23-27-00304). – **P.P. Shirshov Institute of Oceanology, RAS, Moscow, 117997, Russia; e-mail: daria.portnova@gmail.com.**

PRIDANNIKOV M.V. Phytoparasitological research in biological station "Tchernogolovka".

Since 2022, a large-scale phytoparasitological research initiative has been launched at the scientific-experimental station "Tchernogolovka" located in the Noginsk District of the Moscow region. These phytoparasitological studies encompass the following activities: 1) Conducting field experiments to assess effectiveness of chemical and biological agents against major nematode pest groups (root-knot, cyst-forming, stem, and root-lesion nematodes) on several agricultural crops; 2) Testing the resistance of various agricultural crop varieties to phytoparasitic nematodes; 3) Evaluating the harmfulness of phytoparasitic nematodes on agricultural crops; 4) Conducting vegetative experiments under controlled lighting and temperature conditions; and 5) Studying the harmfulness and biology of phytoparasitic mites. To facilitate these research efforts, a 0.4-ha area of land was cleared, rehabilitated and designated for these experiments. Additionally, a laboratory equipped with the necessary instruments and resources was established. Between 2022 and 2023, 20 experiments were conducted at this base. These experiments focused on evaluating the efficacy of eight chemical agents against various cyst-forming, root-knot, and stem nematodes, assessing the resistance of potato varieties to *Ditylenchus destructor*, and evaluating the harmfulness of *Meloidogyne hapla* on carrots, *Ditylenchus dipsaci* on strawberries, and *Meloidogyne incognita* on mint plants. – **A.N. Severtsov Institute of Ecology and Evolution, RAS, Moscow, 119071, Russia; e-mail: mikhail.pridannikov@yahoo.com.**

RYSS A.Yu. Saproxylic nematodes: fauna, phylogeny, diagnostics and associations.

Within the xylobiont nematode fauna, entomochore species are the most interesting for parasitological studies because they include true forest pathogens with polyxenic cycles. Studies of vector associations provide an opportunity to trace changes in the 'nematode-vector-tree host' associations in a geographic context, to make predictions of the invasion risks of new species in forest and park areas and to illustrate disease expansion scenarios with already known examples. Detection of entomopathogenic nematode species in natural refugia, with part of their cycle spent in the bodies of their insect vectors, opens the prospect of developing a biomethod to control transmissive forest diseases, in the likelihood of future success of mass cultivation of entomopathogens. The phylogenies of three xylobiont nematode lineages (Aphelenchoididae, Diplogastridae, Rhabditidae) are illustrated by examples of the working hypothesis of vector acquisition not at the final stage of evolution of parasitic or commensal's life cycles, but still in the ancestors of plant parasites associated with the detrital food web, before formation of obligate plant parasitism. Plant quarantine diagnostics should include not only true but also opportunistic pathogen species, using not only adult individuals, but also transmissive entomochore juveniles and survival larvae, as well as molecular diagnostics. Knowledge of the diversity of infection circulation pathways in forest ecosystems, including dauers and vectors, will enable an accurate risk assessment of epiphytotics (Support: by RFBR 20-04-00569 and 20-34-90101; State Assignment 122031100260-0). – **Zoological Institute, RAS, Saint Petersburg, 199034, Russia; e-mail: nema@zin.ru.**

SHESTEPEROV A.A., SHCHITKOV G.S., LYCHAGINA S.V., ZAKHAROVA V.V. & STAROSTINA E.S. Creation of a database for the development of a computer model for predicting the infection of potato tubers with the tuberous nematode *Ditylenchus destructor*.

The database includes original material based on the results of tuberous analysis of potatoes in collective and personal subsidiary farms in the Vladimir Region for 25 years. The dynamics of tuber infestation will be presented. Based on our own and literary data, an information database of more than 150 pages has been created. According to the methodology of Shesteperov A.A. *et al.* (2017), verbal, conceptual and mathematical models of the prediction of potato tubers infestation with tuberous nematode depending on environmental factors will be developed. Meteorological indicators will be analysed from abiotic factors: air temperature, soil, precipitation, relative humidity, soil surface condition, soil freezing depth, snow cover height, *etc*. Biotic factors include the development of 'ditylenkhosis' and associated diseases of tubers, depending on the variety and growing conditions in the agrofirm and personal subsidiary farms. Anthropogenic factors include storage conditions, temperature, humidity during the storage of tubers, varietal characteristics, differences in the storage of seed, commodity and chip potatoes, and growing conditions in an agricultural firm and personal subsidiary farms. After correlation and regression analyses, a predictive mathematical model will be developed. If the model is accurate enough, it can be converted into a computer dialog model that should be user-friendly. – **VNIIP – branch of the FSBI FNC RES RAS, Moscow, 117218, Russia; e-mail: secretar@vniigis.ru.**

SERGEEVA N.G. & REVKOVA T.N. The first data on fauna of free-living nematodes at the underwater grottoes of Karadag (Crimea, Black Sea).

In July 2021, for the first time, studies of the fauna of free-living nematodes of biofouling were carried out in two underwater grottoes, Revushchiy and Morozovoi, located in the depths of the rock massif of the extinct volcano Karadag. In the Revushchiy grotto, 35 species representing 28 genera, 22 families and 8 orders were recorded as a part of the nematode fauna. In the Morozovoi grotto, 25 species, 20 genera, 15 families and 7 orders were found. The variability of species richness and quantitative distribution of nematodes along the cavity of the grottoes along the light gradient was analysed. The taxocene of the apex part of the Revushchiy grotto was 13 species in single individuals, and 24 species in its middle part, with *Linhomoeus hirsutus* Bastian, 1865 clearly dominant and *Enoplus quadridentatus* Berlin, 1853 subdominant. In the area where the grotto exits to the sea, 25 nematode species were found, with *Draconema ophicephalum* (Claparède, 1863) Filipjev, 1918 dominant and *Anticoma acuminata* (Eberth, 1863) Bastian, 1865 subdominant, that were not recorded in other parts of the grotto or were found as single individuals. In Morozovoi grotto, the species richness from the apex to the sea outlet varies from 15 to 20 species. The dominant species were *A. acuminata* and *Oncholaimus campylocercoides* De Coninck & Sch. Stekhoven, 1933. Species new to the Black Sea were recorded in the grottoes: *Thalassomonhystera cuspidospiculum* (Allgen, 1932) Jacobs, 1987 and *Th. denticulata* (Timm, 1952) Jacobs, 1987, as well as two genera: *Leptepsilonema* Clasing, 1983 and *Synonema* Cobb, 1920 (Support: State Assignments of IBSS RAS 121040500247-0 and 121030100028-0). – **A.O. Kovalevsky Institute of Biology of the Southern Seas, RAS, Sevastopol, 299011, Russia; e-mail: nserg05@mail.ru, alinka8314@gmail.com.**

SPIRIDONOV S.E.[1] & GICHIKHANOVA U.A.[2] The nematodes of the genus *Angusticaecum* Baylis, 1920 from *Testudo graeca* turtles of Dagestan.

During the examination of *Testudo graeca* turtles in the vicinities of the Shalasi village of Dakhadaevsky district of Dagestan (N 42°21'27.86", E 47°54'52.84", 137 m a.s.l.), large nematodes were found in the mouth of one turtle. The nematodes were fixed with 90% alcohol at the site. The nematodes were identified as *Angusticaecum holopterum* (Rudolphi, 1819) Baylis, 1920 according to external features and were sent to the Laboratory of Systematics and Evolution of Parasites of the IPEE RAS for further study. Anterior and posterior ends were cut off from two specimens of nematodes (male and female) and used for study in the SEM. Fragments of the reproductive tubes were used to isolate DNA. The study of samples in SEM, as well as examination of whole samples of males under light microscope confirmed their original identification as *A. holoptera*: *e.g.*, such identification is supported by the very long spicules of males (approx. 2.5 mm). Partial nucleotide sequences of *Cox*I mtDNA, ITS rDNA, and LSU rDNA were obtained for these Dagestani samples. The GenBank data for the genus *Angusticaecum* are limited to a single *Cox*I mtDNA (FM178546) sequence for *A. holoptera* from *Testudo hermanni* collected near Palermo, Sicily, Italy. The difference between these two samples, nominally belonging to the same species, was 14 bp for alignment of 549 bp length. No differences were found in the amino acid composition for this mitochondrial gene between Dagestani and Sicilian samples. Analysis of the phylogenetic relationships of *Angusticecum* based on *Cox*I mtDNA and ITS rDNA is not very informative due to the high variability of these sequences. Judging by the analysis of LSU rDNA, studied *Angusticaecum* nematodes demonstrate a phyletic relationship with various members of Ascarididae family (Support: RSF 19-74-20147). – **[1]A.N. Severtsov Institute of Ecology and Evolution, RAS, Moscow, 119071, Russia; e-mail: s_e_spiridonov@rambler.ru; [2]Dagestan State University, Makhachkala, 367000, Russia; e-mail: uzlipat92@mail.ru.**

STAROSTINA E.S.[1], SHESTEPEROV A.A.[1] & KRYUCHKOVA V.A.[2] Distribution of the stem nematode *Ditylenchus dipsaci* in strawberry plantations in the territory of Moscow.

The purpose of the work was to study the prevalence of the stem nematode *Ditylenchus dipsaci* in the areas of strawberry cultivation in Moscow. The tasks were to take samples of plants with symptoms of ditylenchosis. Sampling was carried out in an experimental strawberry field of RGAU-MSHA named after K.A. Timiryazev; experimental strawberry plot of VNIIP; a collection of strawberry varieties in the Tsitsin Main Botanical Garden RAS; plots of horticultural associations of strawberries in the village of Bogoyavlenie, Moscow, as well as in strawberry plots in Gagino, Gaginsky district, Nizhny Novgorod region. Strawberry plant samples were taken in July-August 2023. In five samples of strawberries taken in the Nizhny Novgorod region, the stem nematode was not found. In three out of five horticultural associations in the village of Bogoyavlenie, the stem nematode was found. On the strawberry plots of the experimental field of the of RGAU-MSHA, more than 60% of plants were infected with the stem nematode. On the experimental site of strawberry of VNIIP, where garlic infected with the stem nematode was grown nearby, strawberry plants were also affected by ditylenchosis. In the Main Botanical Garden, the collection of strawberry varieties included 135 varieties growing in pots in volume of 35 l of sterilised soil. In plants of 17 varieties with symptoms, the stem nematode *D. dipsaci* was found. In Petri dishes, the number ranged from 5 to 400 specimens per 5 g of plant tissue. When nematodes were extracted by the funnel method, the number of stem nematodes ranged from 2 to 1800 specimens. – **[1]VNIIP – branch of the FSBI FNC RES RAS, Moscow, 117218, Russia; e-mail: eliz.starostina@yandex.ru, aleks.6perov@yandex.ru; [2]Tsitsin Main Botanical Garden, RAS, Moscow, 127276, Russia; e-mail: INFO@GBSAD.RU.**

SUBBOTIN S.A.[1, 2] Phylogeography of plant-parasitic nematodes.

Phylogeography is a relatively new discipline that deals with the study and understanding of relationships found among organisms and their location on Earth. Analysis generally uses genetic information to examine genealogical history and patterning within species and populations and infer relationships of biogeographic areas and species histories. Phylogeography also could be considered a branch of phylogenetic biology with special focus on population history and demography. Mitochondrial DNA, maternally inherited, has been usually chosen as a marker for reconstructing historical patterns of populations and phylogeographical reconstructions. Although many articles on phylogeny of plant-parasitic nematodes have been published, only a few included comprehensive phylogeographic analysis. Examples of such studies describing history and distribution patterns for some species of the genera *Globodera*, *Heterodera*, *Aphelenchoides* and *Xiphinema* are discussed. Several origin and refuge areas with high level of genetic diversity for plant-parasitic nematodes were also revealed. Nematology surveys conducted in different world regions would give more light on the time of origin and locations of centers of origin and diversification of various plant parasitic nematodes. – **[1]A.N. Severtsov Institute of Ecology and Evolution, RAS, Moscow, 119071, Russia;**

[2]Plant Pest Diagnostic Center, California Department of Food and Agriculture, Sacramento (CA), 95832, USA; e-mail: sergei.a.subbotin@gmail.com.

SUVOROVA I.V.[1] & SPIRIDONOV S.E.[2] Walrus dirofilariasis in the aquarium: new host for *Dirofilaria immitis*.

Dirofilaria immitis is a nematode, the final host of which is most often domestic and wild canids. The intermediate hosts for *D. immitis* are mosquitoes of the genera *Anopheles*, *Culex* and *Aedes*. In rare cases, *D. immitis* can parasitise cats, ferrets, bears, real seals, sea lions, fur seals and humans. However, data on infection and clinical signs of dirofilariasis in various species of pinnipeds are few. During the pathoanatomical autopsy of a twelve-year-old female pacific walrus (*Odobenus rosmarus divergens*) kept in the Anapa dolphinarium and died with a background of chronic renal failure, 20 nematodes were found in the right ventricle and pulmonary artery. Identification of the parasites was carried out by morphological and molecular genetic methods. For two specimens, nucleotide sequences of the 3'-site of the first subunit of the cytochrome oxidase (*COI*) gene of mitochondrial DNA were obtained using primers JB3_F and JB7_GED (Bowles *et al.*, 1992). A BLAST search in the GenBank showed almost complete similarity with the sequences of *Dirofilaria immitis*: a difference was observed only in one position (0.2%). Differences from *D. repens* accounted for at least 7% of the compared sequences. The case of *D. immitis* infection of the pacific walrus has been described for the first time and presents important information for veterinary specialists of aquariums and zoos. Due to the possibility of infection of walruses with dirofilariasis, it is necessary to make appropriate adjustments to preventive and diagnostic programmes. – **[1]Center of Oceanography and Marine Biology "Moskvarium", Moscow, 129344, Russia; e-mail: i.suvorova@moskvarium.ru; [2]A.N. Severtsov Institute of Ecology and Evolution, RAS, Moscow, 119071, Russia; e-mail: s_e_spiridonov@rambler.ru.**

SUDARIKOVA S.V., KHUDYAKOVA E.A. & BUTOVA K.B. Viability of the rice leaf nematode *Aphelenchoides besseyi* in rice seeds.

The rice leaf nematode *Aphelenchoides besseyi* causes yield losses of up to 20-30% in rice. In infested rice seeds, dormant *A. besseyi* nematodes are located under the grain film and can spread with seed products to new areas. Information in the literature indicates that under optimal storage conditions, nematodes remain viable for 3 to 5 years under the grain film. A herbarium sample of rice ears infested with the rice nematode *A. besseyi* with characteristic seed lesions was stored in the laboratory of helminthology of FGBU "VNIIKR" for 8 years. Nematodes were isolated from individual infested seeds of the sample by modified Baermann technique in a Petri dish after 5 and 8 years of storage. The nematodes stored for 5 years were viable and started moving within the first day after the seeds were placed in water. After 8 years of storage of the herbarium sample, the nematodes were also viable. However, they did not start moving in water until the 3rd day. The isolation method was optimised so that the water containing the seeds was kept fresh. The identity of the isolated nematodes to the species *A. besseyi* was confirmed by morphological method and molecular genetic method using primers 1770 (forward) and 1772 (reverse) developed by Polish researchers Rybarczyk-Mydłowska *et al.* (2012). The ability of nematodes to infect plants was not tested. The conducted studies showed that the rice nematode *A. besseyi* is able to maintain its viability for 8 years in rice seeds. – **All-Russian Plant Quarantine Centre, Bykovo, Moscow Region, 140150, Russia; e-mail: sudarikovah@mail.ru.**

SUSHCHUK A.A., KALINKINA D.S. & MATVEEVA E.M. The first data on soil nematode fauna and community structure in the Vodlozersky National Park.

The first data on soil nematode fauna and community structure of various biocenoses in the Vodlozersky National Park (NP) (Republic of Karelia) was presented. Cowberry pine forest with larch, spruce forest and flood meadow were investigated. The results showed that the highest value of nematode taxonomic diversity was found in spruce forest, and the lowest one was in pine forest. The soil nematode population density had similarly low values in all types of biocenoses studied. Bacterial- and fungal feeders were the dominant trophic groups in coniferous forests, and plant parasites and bacterial feeders were dominant in meadow soil. On the base of ecological indices, the soil ecosystems of pine forest and meadow were assessed as degraded with simplified food web (*SI* and *EI* < 50). The spruce forest, by contrast, was characterised by an undisturbed soil ecosystem with complex food web. Organic matter decomposition occurs with the predominant participation of bacteria in forests (*CI* = 21.8-37.1) and soil fungi in meadow soil (*CI* = 80.3). The revealed values of the *CI* index are not typical for the same types of biocenoses in other regions of Karelia (RK): in forests, the fungal-dominated decomposition pathway is more typical, in meadows the bacterial pathway is typical. Comparison of other nematological parameters with the average values for the RK showed that the pine forest in the NP has lower nematode density, diversity, *H'*, *ΣMI*, *SI*, *EI*, but has a typical community structure. The meadow in the NP is characterised by a higher relative abundance of plant parasites (52.8%), than upland and flood meadows in the

RK as a whole. The spruce forest in the NP, despite the low nematode density, is characterised by a higher diversity and *ΣMI*, *SI* values, when compared with the RK, which taken together indicates favourable conditions for the habitat of soil nematodes (Support: State Order to KarRC RAS 122032100130-3). – **Institute of Biology, Karelian Research Centre, RAS, Petrozavodsk, 185910, Russia; e-mail: anna_sushchuk@mail.ru.**

TCHESUNOV A.V.[1], MOKIEVSKY V.O.[2] & ESKANDARI A.[3] Free-living nematodes of mangroves of the Persian Gulf (Qeshm Island, Iran).

Mangroves of the Persian Gulf are represented by only two species, one of them, *Rhizophora mucronata*, is on the western edge of the area of distribution and occurs only on the shores of the Strait of Hormuz; the second species, *Avicennia marina*, enters into the inner parts of the Gulf. Both species occur on the shores of Qeshm Island, where quantitative samples on meiobenthos were collected in 2021 at nine stations in five sites. A standard sampling scheme was implemented: in each location, samples were collected to 5 cm sediment depth and separated into two layers (0-1 and 1-5 cm). Each site (with one exception) was sampled under the crown of mangroves and 10 m apart on the bare sediments. In total, 187 putative species were identified; the alpha-diversity ranged from 16 to 56 with mean values about 30-32 species per sample in upper and low layers. Compared with other regions, the nematode community under the crowns of *Rh. mucronata* differed, whereas the nematodes composition in the vicinity of *A. marina* and on the bare sediments were similar. For *Rhizophora* samples the most common species were *Parethmolaimus minor*, *Terschellingia* ex gr. *longicaudata* and *Syringolaimus* sp.; dominant species on the bare sediments and under the avicennia were *Ptycholaimellus* sp., *Anoplostoma* sp. and *Sphaerolaimus* sp. (Support: RFBR 20-54-56038). – **[1]Lomonosov Moscow State University, Moscow, 119991, Russia; [2]P.P. Shirshov Institute of Oceanology, RAS, Moscow, 117997, Russia; e-mail: vadim@ocean.ru; [3]University of Zanjan, Zanjan, 45371-38791, I.R. Iran.**

YAKOVLEVA G.A. & LEBEDEVA D.I. Nematodes of gulls in the Ladoga Lake basin.

The little gull (*Hydrocoloeus minutus*), the black-headed gull (*Chroicocephalus ridibundus*) and the European herring gull (*Larus argentatus*) are widespread birds of Laridae on the territory of Karelia. In total, 53 bird specimens (*C. ridibundus* – 8, *L. argentatus* – 16, *H. minutus* – 29) were collected May-October 2011-2016 on the south-eastern coast of Lake Ladoga. Eight nematode species were identified – *Capillaria anatis*, *C. contorta*, *Cosmocephalus obvelatus*, *Paracuaria adunca*, *Porrocaecum semiteres*, *Rusguniella elongata*, *Tetrameres skrjabini* and *Tetrameres* sp. The most diverse fauna of nematodes was observed in Herring Gull – 5 species (*C. contorta*, *C. obvelatus*, *P. adunca*, *P. semiteres*, *R. elongata*), Lake Gull – 4 species (*C. contorta*, *C. obvelatus*, *T. skrjabini*, *Tetrameres* sp.), and little gull – 3 species (*C. anatis*, *C. contorta*, *P. adunca*). Mean abundance of the detected species was low. The diversity of species parasites of gulls is related to the difference in the diet of birds. *C. ridibundus* and *L. argentatus* are euryphagous, while *H. minutus* feeds mainly on invertebrates and rarely eats fish. The species *Capillaria contorta* was found in all three species of gulls. Specific species were nematodes of genus *Tetrameres* (*C. ridibundus*), *C. anatis* (*H. minutus*), *Rusguniella elongata*, *Porrocaecum semiteres* (*L. argentatus*). Most of the nematodes detected develop through various intermediate hosts, only species of the genus *Capillaria* have a direct development cycle. All nematodes of gulls identified in our study are typical parasites of these birds species, as well as being widespread in the Palearctic (Support: State Order FMEN-2022-0005). – **Institute of Biology, Karelian Research Centre, RAS, Petrozavodsk, 185910, Russia; e-mail: galina_il87@mail.ru, daryal78@mail.ru.**

YUSHIN V.V.[1], CLAEYS M.[2] & BERT W.[2] Study of male gametes in the order Plectida changes vision of the rhabditid pattern of spermatogenesis.

One of the most striking examples of aberrant male gametes is the amoeboid sperm of nematodes, which has been described in detail in hundreds of species. However, there is very little information on the structure of male gametes in the order Plectida, which is closely related to the order Rhabditida and includes diverse clades with unresolved relationships. This report presents the first comprehensive detailed TEM observations of sperm development and structure of a plectid nematode *Anaplectus granulosus* (Plectidae). Sperm development of *A. granulosus* resembles that of nematodes of the order Rhabditida, known as the rhabditid pattern of spermatogenesis. It includes formation of complexes of fibrous bodies (FB) with membranous organelles (MO), which appear in spermatocytes; the complexes dissociate in the spermatids; the mature spermatozoa are bipolar cells subdivided into a pseudopod and a main cell body containing a nucleus with nine singlet centrioles, peripheral mitochondria and MO. However, the development and structure of sperm in *A. granulosus* deviates remarkably from the common rhabditid pattern by the unusual early transformation of FB into large amorphous masses in the spermatids; the subsequent formation of a concentric structure of immature spermatozoa with a predominant amorphous mass around the central nucleus and thin peripheral cytoplasm with organelles (MO and mitochondria); and by the transformation of MO in mature spermatozoa into simple cisterns.

Thus, the pattern of spermatogenesis of *A. granulosus* supports the close relations of Plectida and Rhabditida, but specific peculiarities of the sperm development delineate Plectida from Rhabditida and other orders (Support: Russia Platform from Ghent University (2019 call); RFBR 17-04-00719-a and 20-04-00569-a). – **[1]A.V. Zhirmunsky National Scientific Center of Marine Biology, FEB RAS, Vladivostok, 690041, Russia; e-mail:vvyushin@yandex.ru; [2]Ghent University, Ghent, 9000, Belgium; e-mail: nini.claeys@ugent.be, Wim.Bert@UGent.be.**

ZAGAINOV A.[1, 2], MOKIEVSKY V.[1], TCHESUNOV A.[2] & SIMAKOVA U.[1] Restoring of validity of *Sabatieria clavicauda*.

The species *Parasabatieria clavicauda* Filipjev, 1918 (fam. Comesomatidae) from the Black Sea, was described in Filipjev's monograph with many other species from the Sevastopol's surroundings. Later Gerlach suggested this species as conspecific to *Sabatieria vulgaris* de Man, 1908 from the North Sea, which further was synonimised with *Sabatieria pulchra* (Schneider, 1906) from the Finish Bay. Our material was obtained from the Gelendzhik Bay in 2020-2021, from depths of 3-8m, from seven stations, where the density of *Sabatieria clavicauda* fluctuated from 11 to 1720 indiv. (10 cm^{-2}). Comparison of *S. clavicauda* and *S. pulchra* showed significant difference in morphological features. Hiatuses in features, associated with body length, and hiatuses in spicules lengths were revealed. The sequence similarity of 18S (696 bp) and 28S (653 bp) rRNA genes regions obtained for samples from the Black Sea (depth 3 m, hydrogen sulfide mud) was 99.7-100% and 99.4-100% respectively. At the same time, the similarity with other representatives of the genus *Sabatieria* (from the NCBI nucleotide sequences database) did not exceed 99.1 and 94.5%. Phylogenetic reconstruction based on the 18S rRNA gene sequence obtained using the maximum likelihood method (FastTree 2.1.11) showed that the Black Sea sequences form a single clade. *S. pulchra*, *S. mortenseni* and *S. punctata* are sister clades to it, as well as several precisely undefined representatives of S*abatieria* sp., *S. pulchra*, *S. punctata* and *Sabatieria* sp. from different areas of the North Atlantic (North Sea, English Channel, and Portuguese coast) appeared to be the closest to the Black Sea specimens. We believe it is necessary to restore the validity of the species *Sabatieria clavicauda* (Filipjev, 1918) for the Black Sea population. Perhaps, the merging of Black Sea and northern species that took place in the 20th century was not always justified, and the natural habitats of the 'old' widespread North Atlantic species require revision. – **[1]P.P. Shirshov Institute of Oceanology, RAS, Moscow, 117997, Russia; e-mail: vadim@ocean.ru; [2]Lomonosov Moscow State University, Moscow, 119991, Russia.**

ZINOVIEVA S.V. & UDALOVA Zh.V. Application of nanoparticles in plant protection against parasitic nematodes.

Nanotechnology is a modern trend in agriculture, especially relevant in the field of plant protection, including against parasitic phytohelminths. Due to the unique properties of nanoparticles (NP), there are wide opportunities for the targeted use of existing nematicides, and they can also have an effective nematicidal potential. An analysis of current data on the effect of NP on phytoparasitic nematodes in *in vitro* and *in planta* studies and on their effect on plants infested by nematodes has shown that many NP of metals, nonmetals, their oxides, and some other complex compounds can have a direct toxic effect on nematodes and reduce infestation of plants when pre-treated with seeds or when sprayed, lead to inhibition of the reproduction and development of the parasite in the roots, and the effectiveness of their action may exceed known commercial nematicides. Some NP have an immuno-stimulating effect on plants. An important mechanism of NP toxicity may be the generation of reactive oxygen species (oxidative stress). The effect of NP in nematodes increases the expression of target genes involved in oxidative stress and DNA damage repair. In addition, they can affect respiratory enzymes, cause cell lysis, and inhibit the activity of nematode proteases. There are several studies concerning the development of nanonematicides and nanocapsules that have demonstrated efficacy against endoparasitic nematodes. Of particular interest for use in agriculture are 'green' synthesis using biological systems, which makes it possible to create, for example, encapsulated NP; and the most chemically pure and narrow range of particles – the method of laser ablation. Despite their advantages, only a few NP-based products have been registered and have commercial applications in agriculture. This is mainly due to the lack of field trials. – **A.N. Severtsov Institute of Ecology and Evolution, RAS, Moscow, 119071, Russia; e-mail: zinovievas@mail.ru, zh.udalova@gmail.com.**

ZINOVIEVA S.V., UDALOVA Zh.V. & KHASANOV F.K. The effect of temperature on molecular genetic indicators of tomato plant resistance to *Meloidogyne incognita*.

The resistance of tomatoes to the root-knot nematode *M. incognita* is determined by the presence of the *Mi1,2* gene, the effectiveness of which is lost at temperatures above 28°C. A study was made of the molecular genetic features of the immune status of tomato plants infested with *M. incognita* (homozygous hybrid F1 'Solveig') grown at temperatures of 25° and 32°C. At a temperature of 32°C in resistant plants, a change in the activity of the transcriptome was noted

towards a decrease in the expression of the *Mi1,2* gene, as well as *PR1*, *PR2* and *PR5* genes associated with salicyl-dependent signalling, at the same time, the level of expression of the *PR6* gene associated with jasmonate-dependent signalling remained virtually unchanged. In the roots and leaves of tomatoes grown at elevated temperatures, the content of salicylic acid (SA) and the activities of phenylalanine ammonialyase (PAL) and lipoxygenase (LOG), enzymes involved in the synthesis of SA and jasmonic acid (JA), were reduced. Exogenous treatment with salicylic/jasmonic (SA/JA) acids has a modulating effect on the level of accumulation of protective gene transcripts: SA mainly stimulate the expression of *Mi1,2*, and *PR1*, *PR2*, *PR5* genes; JA mainly affects *PR6*. The treatment of plants with SA or JA did not completely restore the resistance of plants to the nematode lost at a temperature of 32°C; however, the damage to the roots decreased within 50-60%. – **A.N. Severtsov Institute of Ecology and Evolution, RAS, Moscow, 119071, Russia; e-mail: zinovieves@mail.ru.**

ZOGRAF J.K.[1], SEMENCHENKO A.A[2, 3] & MORDUKHOVICH V.V.[1, 3] New species of *Paramesacanthion* form the Far Eastern seas.

Free-living marine nematodes of the genus *Paramesacanthion* Wieser, 1953 (Nematoda: Thoracostomopsidae) are broadly distributed and have been found in various habitats. Within the genus we consider 13 species as valid. Five new *Paramesacanthion* species are described and illustrated with the aid of LM, SEM and LSM pictures. *Paramesacanthion* sp.1 nov. is closely related to *P. forceps* Bussau, 1995 but differs by smaller size, inner labial papilla instead of seta, and absence of cervical seta. *Paramesacanthion* sp.2 sp. nov. is similar to *P. abyssorum* Bussau, 1995 but differs by the longer seta, smaller amphids, spicula structure and longer tail. *Paramesacanthion* sp.3 sp. nov. is similar to *P. abyssorum* и *P. forceps* Bussau, 1995 but differs in the body size, length of seta and spicules without denticles. *Paramesacanthion* sp.4 sp. nov and *Paramesacanthion* sp.5 sp. nov. are similar to each other by the most of the characters but the latter is smaller and forms well supported branch on the phylogeny tree. Data on the nucleotide sequences of the 18S rRNA and ITS, 28S rRNA and *COI* genes were obtained. It is shown that *Paramesacanthion* formed a monophyletic clade among Thoracostomopsidae and a sister group with *Mesacanthion* and *Enoploides* (Support: RSF 23-24-00273). – **[1]A.V. Zhirmunsky National Scientific Center of Marine Biology, FEB RAS, Vladivostok, 690041, Russia; e-mail: zojulia@yandex.ru; [2]Federal Scientific Center of the East Asia Terrestrial Biodiversity, FEB RAS, Vladivostok, 690022, Russia; [3]Far Eastern Federal University, Vladivostok, 690922, Russia; e-mail: mordukhovich.vv@dvfu.ru.**