

Second International Conference on Zoology and Zoonoses: an Overview of Topics and Contributions

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Abstract: This review article summarises some of the contributions presented at the **International Conference on Zoology and Zoonoses** held in Hissar, Bulgaria, 26-28 October 2016. The current supplement of *Acta Zoologica Bulgarica* comprises 33 contributions covering the conference topics. They focus on a wide range of issues such as taxonomy, faunistics, genetics and molecular biology, evolution, phylogeny, biogeography, ecology, biomonitoring, applied zoology, vector-borne diseases and epidemiology. The results demonstrate recent achievements of the research community and the potential for further scientific cooperation.

Key words: zoology, zoonoses, International Conference on Zoology and Zoonoses, contributions

Introduction

The Department of Zoology at the Plovdiv University was honoured to host the Second International Conference on Zoology and Zoonoses. The conference, which was held on 26-28 October 2016 in Hissar, Bulgaria, was co-organized by the National Center of Infectious and Parasitic Diseases, the Bulgarian Food Safety Agency and the Southeast European Center for Surveillance and Control of Infectious Diseases. The Conference provided a forum for the presentation of long-term multidisciplinary research activities and discussions on various topics highlighting the taxonomy, faunistics, genetics and molecular biology, evolution, phylogeny, biogeography, ecology, biomonitoring, applied zoology, vector-borne diseases, epidemiology. The goal of the conference was to provide an opportunity for a dynamic exchange of information, ideas and scientific discoveries in light of recent climate changes and the associated epidemiological risk for public health.

The contributions and discussions during the conference covered the following scientific topics:

Population Genetics and Molecular Biology

Biodiversity, Ecology and Conservation Zoology

One health

The current volume of *Acta Zoologica Bulgarica* comprises 33 contributions within three of the scientific topics of the conference.

Topic 1: Population Genetics and Molecular Biology

There were 11 contributions to this first topic, focusing on molecular taxonomy and phylogeny, cytogenetic analysis and genome response of biomonitoring species.

Three studies (ANTOV *et al.* 2017, GEORGIEVA *et al.* 2017, STOYANOV *et al.* 2017) are devoted to the examination of polymorphisms and phylogenetic relations between populations through isoenzyme analysis. The first publication studied the degree of polymorphism and heterozygosity of three parasitoid species of the genus *Eupelmus*. Taxonomic markers for *Eupelmus* spp. are found. UPGMA

cluster analysis confirms that *E. vesicularis*, which belongs to the subgenus *Macroneura*, is distant from *E. urozonus* and *E. microzonus*, which belong to the subgenus *Eupelmus*. GEORGIEVA *et al.* (2017) demonstrate the genetic polymorphism of malate dehydrogenase (MDH-1) and esterase (EST-3) loci in selectively reared for production of bee queens and bee swarms local honey bee *Apis mellifera macedonica* in comparison with a group of honey bee colonies with indicative hygienic behaviour. Both of the studied loci are found to be polymorphic in all of the studied honey bee groups. The authors discuss the observed similarities and slight differences among honey bee groups under selective control and this with indicative hygienic behaviour. STOYANOV *et al.* (2017) provide new data on polymorphism and phylogenetic relations between the populations of *Messor barbarus* (Hymenoptera, Formicidae) from Bulgaria based on isoenzyme analysis. The seven enzyme and protein systems examined are found to be appropriate genetic markers for the characterisation of genetic variability within and between populations. The high value of the inbreeding coefficient demonstrates a high level of inbreeding in the studied populations.

The study by GEVEZOVA *et al.* (2017) is devoted to the development of PCR-based molecular diagnostic methods for rapid detection of bacterial pathogens causing economically important diseases in fish. The authors test different PCR-based methods for the detection of the most common gram-negative pathogenic bacteria: *Flavobacterium psychrophilum*, *Yersinia ruckeri* and *Aeromonas salmonicida*. A multiplex PCR (m-PCR) method offers increased efficiency and reduces costs, time and labour, and therefore it can be used for accurate and rapid identification of these bacteria.

In the study of genetic diversity and geographic distribution of Round Goby *Neogobius melanostomus* (Pallas), TZERKOVA *et al.* (2017) report data from molecular phylogeny analyses of the sequence variation in the mitochondrial DNA cytochrome b gene. The analysis provide information about the origin of each non-native population and gene exchange rate with other populations of *N. melanostomus* in the Black Sea, the Turkish Black Sea coastal area and the rivers Rhine and Mosel in Germany. Analyses reveal twenty-two haplotypes. Just one of these haplotypes comprises 80 % of the sequences and is therefore the most abundant in both Eurasia and North America. Other haplotypes demonstrate only local distribution.

CHASSOVNIKAROVA *et al.* (2017) present the first cytogenetical study of the harvest mouse (*Micromys*

minutus Pallas, 1771) in Bulgaria. The authors report the diploid chromosome number, the fundamental number and the fundamental number of autosomes. They describe the morphology of the sex chromosomes and the C-banding pattern in this species.

MARKOV *et al.* (2017b), in their study on genetic diversity of the European roe deer (*Capreolus capreolus*) in South-eastern Europe, reveal that the populations in the Pannonian mixed forests ecoregion and the Rilo-Rhodope biogeographical region represent distinct gene pools as assessed by mtDNA markers. The authors recommend not admixing the populations in the two examined European biogeographical regions by introducing roe deer from abroad.

Three papers are related to genome response of zoomonitor species to various environmental pollutants (ILKOVA *et al.* 2017, MITKOVSKA *et al.* 2017, HEREDIA-ROJAS *et al.* 2017). ILKOVA *et al.* (2017) examine the effects of heavy metal pollution in two Polish rivers on the genome of the phylogenetically different species of the family Chironomidae. The authors report genome instability as assessed by somatic and inherited chromosome aberrations. The results show that the species of different genera have a species-specific genome reaction to stress agents in the environment. The data obtained support the idea that these species can be useful in biomonitoring studies in aquatic ecosystems. In their paper, MITKOVSKA *et al.* (2017) present data on the genotoxic and cytotoxic potential of nickel and lead concentrations, considered safe by regulatory agencies, in young common carps (*Cyprinus carpio* L.). The comet assay parameters indicate statistically significant genotoxic damage for both metals. Increased levels of micronuclei are not observed in carp erythrocytes, but significant increases in other nuclear abnormalities are found. This demonstrates cytotoxic effects and confirms the use of nuclear abnormalities as an effective biomarker. The obtained results confirm the genotoxic and cytotoxic effects of Ni and Pb, even at low permissible levels, and illustrate the need for additional studies in order to reduce the allowable concentrations of heavy metals in water basins. Modern life subjects organisms to a constant exposure to electromagnetic fields generated by human-made technologies. HEREDIA-ROJAS *et al.* (2017) report the potential genotoxic effects induced in mice exposed to electromagnetic fields. The evaluated cytological endpoint includes the frequency of micronucleated polychromatic erythrocytes in bone marrow. The authors demonstrate the *in vivo* susceptibility of mammals to the genotoxic potential of electromagnetic fields.

Topic 2: Biodiversity, Ecology and Conservation Zoology

There are 20 contributions to the second topic; these present information on taxonomy, faunistics, biogeography, ecology and biomonitoring of Balkan fauna.

TASEVSKA *et al.* (2017) present their study on rotifer and zooplankton assemblages in three reservoirs that differ in size and trophic state in the Republic of Macedonia. They report considerable differences among reservoirs in the environmental parameters, zooplankton composition, and species diversity and abundance. High abundance and dominance of rotifers and higher species diversity is observed in eutrophic reservoirs in comparison to the oligotrophic one. Rotifers are detected as useful biological indicators of the ecological status of water for the significant correlation between trophic state index and rotifer abundance.

The study by YANCHEVA *et al.* (2017) presents results of *ex situ* effects of pesticide chlorpyrifos on the lysosomal membrane stability and respiration rate in Zebra mussel, *Dreissena polymorpha* (Pallas, 1771). The pesticide concentrations used represent 50 and 30%, respectively, of the maximum permissible level (100%) as set by national and EU legislation, and the exposure period is 72 hours. For all tested concentrations, destabilisation of the lysosomal membrane is found and the respiration rate is both time- and dose-dependent. The authors suggest that the results from such experiments can be successfully applied to risk assessment, monitoring programs and water policy, and the use of pesticide chlorpyrifos should be controlled very cautiously in plant protection and agriculture.

ŠAGANOVIĆ *et al.* (2017) investigate branchiopod crustaceans in Serbia and reports the first finding of *Lepidurus couesii* (Notostraca) in the Western Balkans. The evidence for the new taxon is derived from the level of development of the main body parts, which are considered diagnostic for this species. Since the bisexual population is recognised as highly female-biased, the authors will continue their study on the mode of reproduction in the Serbian population of *L. couesii*.

VASILEVA *et al.* (2017) investigated the morphometric variability, allometric growth and sexual dimorphism in narrow-clawed crayfish (*Astacus leptodactylus*) during ontogenesis. The weight - length relationship between the two sexes from different age groups is determined and allometric growth is observed in all individuals. Significant sexual dimorphism in 12 of the exterior characteristics studied is established.

BOYADZHIEV *et al.* (2017a) present data on hymenopteran egg parasitoids of the genus *Ooencyrtus* and their host *Thaumetopoea solitaria* (Lepidoptera: Notodontidae) in Bulgaria. Three species of the genus *Ooencyrtus*, *O. masii*, *O. pityocampae* and *Ooencyrtus* sp. nr. *indefinitus*, were reared in laboratory conditions. The sex ratio and dynamics of emergence of parasitoids are reported.

Two papers present descriptions of new species (BOYADZHIEV *et al.* 2017b, YEFREMOVA *et al.* 2017). *Stepanovia fructirosae* BOYADZHIEV, YEFREMOVA & TOZLU, 2017 is reared from galls of the cynipid wasp *Diplolepis fructuum* (Hymenoptera: Cynipidae) in the NE Turkey (BOYADZHIEV *et al.* 2017). The second new species belongs to the genus *Omphale* Haliday (Hymenoptera: Eulophidae) – *Omphale rodopiensis* YEFREMOVA, YEGORENKOVA & BOYADZHIEV, 2017 described for the Rhodope Mts., Bulgaria (YEFREMOVA *et al.* 2017).

The study by ZAEMDZHKOVA (2017) is devoted to the examination of ichneumonid parasitoids (Hymenoptera: Ichneumonidae) in tortricids (Lepidoptera: Tortricidae) in oak forests in the Sofia region. Twenty-four parasitoid species were reared from host insects. Among them, eight parasitoids are new records of the parasitoid complex of the hosts, and seven parasitoid-hosts associations are new in Bulgaria. Two ichneumonid species – *M. punctipleuris* and *Apophua genalis* (MOLLER) - have been only been found in faunistic studies in Bulgaria.

The article by GANEVA (2017) aims to study horse flies (Diptera: Tabanidae) in 47 localities on the territory of the Rila Mountains in Bulgaria during the active seasons of tabanids in 2010-2015. In total, 1401 tabanid specimens were collected and identified. From these, 34 species of 8 genera are identified and three species are reported for the first time in the Bulgarian tabanid fauna. The author reports 39 tabanid species for the Rila Mts. based on the data available in the literature and the results of the present study. In terms of the zoogeographic affiliation, the horsefly fauna of the studied region is predominated by Boreal-Eurasian species.

In their paper, GURGULOVA *et al.* (2017) present a study on gram-positive, spore-forming microorganisms isolated from samples taken from air and various surfaces in a silkworm rearing room. As a result, 22 bacterial isolates are identified and biochemically characterised as staphylococci and streptococci. Susceptibility of certain selected isolates to different drugs and resistance to important groups of antibacterials is detected.

The study by GECHIEVA *et al.* (2017) represents an assessment of the ecological status of the hypersa-

line Atanasovsko Lake in Bulgaria. The dynamics of environmental conditions, factors controlling water quality and ecological status (water chemical parameters and biological quality elements) were studied over the course of 3 years. As a result of their study, the authors conclude that the key factor for the lake is the salt production (salterns were created in 1906) and sea-freshwater exchange.

PEHLIVANOV *et al.* (2017) present a new index developed by using the data from a 15-year-long ichthyological investigation in the Srebarna Lake (Danube floodplain). The method is based on the comparison of composition and structure of the fish community with the reference model ichthyocenosis, as defined by historical data and data for specific hydromorphological features of the water body. Although the index is developed for the lakes of type L5/L-EC1, the methodology for ecological assessment could also be adapted for other lowland natural lakes in Bulgaria such as the lakes along the Black Sea coast.

STOYANOVA *et al.* (2017) investigate the effects of Ni and Pb exposure on the respiration rate and histological structure of common carp (*Cyprinus carpio* L.) gills. The results show a higher index of respiration rate in the fish for all experimental concentrations of both metals but this rate does not change with increasing concentrations of the metals. The authors report different histological changes in the gill epithelium, including proliferative and degenerative changes as well as changes in the circulatory system.

The morphological parameters of *Pelophylax ridibundus* populations (ZHELEV *et al.* 2017) provide a useful tool for the assessment of the ecological status of rice agroecosystems. Morphological analysis shows significantly different values of the index for fluctuating asymmetry and body condition factor in frogs. The work highlights the possible practical applications of integral indicator for developmental stability – the fluctuating asymmetry in the *P. ridibundus* populations in biomonitoring analyses.

The article by MIHTIEVA *et al.* (2017) examines the correlation between the choice of partner and the individual nesting territory in the Lesser Kestrel (*Falco naumanni*) as well as preconditions for polyandry. The authors establish a correlation between the ratio of male and female birds that had returned from migration, the choice of a partner and the occupation of the individual nesting territory. The gender roles in choosing the nest and partner are clearly demonstrated.

METCHEVA *et al.* (2017) determine the presence of organochlorine pesticides (Lindane and DDT) in moulting feathers of the two penguin species of the

family Pygoscelidae – *Pygoscelis antarctica* and *Pygoscelis papua* – from Livingston and Peterman Islands, Western Antarctic. The analyses of the total quantity of the chosen chlorinated pesticides shows significant differences between DDT and Lindane concentrations, where quantities of DDT were about six times more than those of Lindane.

The paper by ZORENKO & ATANASOV (2017) presents the results of an ethological analysis of mating behaviour as evidence for placing the narrow-skulled vole, previously assigned as a species of the subgenus *Stenocranius*, into the genus *Lasiopodomys*. The authors report clear differences between the sexual behaviour of the vole in comparison with the species of the genus *Microtus* (*Microtus s. str.* and *Sumeriomys*). The sexual behaviour demonstrates that *L. gregalis* is close to the species of the genus *Lasiopodomys*.

In their paper, MARKOV *et al.* (2017a) present epigenetic cranial polymorphism in eight forest dormouse populations, located along a transect line from the Central Anatolia to Central Southeast Europe, and inhabiting an area of suspected different subspecies taxa. The authors conclude that the mapping of the population epigenetic diversity of forest dormouse within the area of the classically described subspecies manifests some overlaps of their epigenetic distances with the geographic remoteness between them.

The paper by PANDOURSKI *et al.* (2017) is devoted to the habitat preferences, territorial distribution and relative activity of bats in the region of the Sakar Mountain, Bulgaria. Information based on the visits of appropriate roosts and analyses of ultrasounds of bats is presented. Out of the twenty bat species that are currently known, six species are new records for the mountain.

Microchiropteran bats, and in particular cave dwellers, are adversely affected by human activity. IVANOVA (2017) assesses the state of the bat colonies in relation to tourist abundance and behaviour in the Devetashka Cave, Bulgaria. Bat abundance, activity and adult and juvenile mortality are recorded in order to track the condition of the bat colonies. A strong positive relationship between the number of visitors to the cave and bat mortality is discovered. The extent of tourist influence on the bats is discussed and necessary measures to reduce it are suggested.

The feeding habits of the red fox (*Vulpes vulpes*) and golden jackal (*Canis aureus*) are studied in two regions in Bulgaria (Upper Thracian Lowland and North Eastern Dobrudzha) by VLASSEVA *et al.* (2017). Significant differences in the breadth of food niches of the two species are identified, with the

jackal food niche being wider. The level of overlap between the food niches is high for the two areas under investigation. This is likely to be the reason for the withdrawal of foxes in areas with higher altitude when jackals reach high density in sympatry.

Topic 3: One health

ARNAUDOV & ARNAUDOV (2017) investigate ixodid ticks on domestic ruminants in the Valley of the Maritsa River, Plovdiv Region. The species composition, distribution, seasonal dynamics and indices of infection of ixodid ticks on sheep, goats and cattle in four municipalities near Maritsa River were studied in 2011-2016. Eight ixodid tick species from domestic ruminants were identified. The authors observed some differences in the indices of infection and seasonal dynamics of the Ixodidae on different species of domestic ruminants.

The paper by CHRISTOVA *et al.* (2017) is focuses on a number of viral zoonoses in humans (zooanthroponoses) with similar clinical manifestation, Crimean-Congo hemorrhagic fever (CCHF) and hemorrhagic fever with renal syndrome (HFRS).

Natural reservoir hosts of CCHF virus include various wild and domestic mammals. Primary vector and reservoir hosts are ticks of the genus *Hyalomma*. Hantaviruses that cause HFRS are maintained in rodents, insectivores and bats. The authors provide insight and overview on the circulation of CCHF virus in livestock and ticks in Bulgaria and report the results from screening of rodents for hantaviruses.

Conclusion

The contributions presented at the Second International Conference on Zoology and Zoonoses cover a wide thematic area - taxonomy, genetics and molecular biology, evolution, phylogeny, biogeography, ecology, conservation biology, biomonitoring, applied zoology, vector-borne diseases and epidemiology. They add to the reply of interesting scientific questions and also help in finding solution of main societal challenges such as public health, food safety, pest control, quality of environment and biodiversity conservation.

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