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The Fourth International Conference on One Health and Zoology: An Overview

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Abstract: This review article provides a concise overview of the subject matter, contributions, and results of the IVth International Conference on One Health and Zoology. The conference addresses the interconnections between ecosystem health, biodiversity, and human health. Here, we provide a synopsis of the papers presented at the meeting. The current volume of *Acta zoologica bulgarica*, Supplement 20, comprises 21 research papers covering two conference topics. The contributions focus on a wide range of contemporary concerns, including animal diversity, molecular genetics and taxonomy, morphology, physiology, ecology and conservation, ecosystem health, and zoomonitoring. The outcomes illustrate the scientific community's accomplishments and the potential for scientific collaboration within the One Health initiative.

Key words: One Health, Zoology, IVth International Conference on One Health and Zoology, contributions

Introduction

As highlighted in the IVth International Conference on One Health and Zoology, the One Health approach is not just a theoretical concept but a pressing need in our current world. The health of humans and animals is intricately linked to the health of the ecosystems they inhabit. The potential for future pandemics and other health risks is significant, underscoring the urgency for humanity to implement a comprehensive overhaul of its patterns of interaction with nature. The One Health approach represents a promising holistic solution that could help mitigate these risks. Therefore, it is of utmost importance to investigate the intricate interconnections between biodiversity, ecosystems, and human health to address the risks to human health comprehensively.

The close links between ecosystem health, biodiversity, and human health were on the agenda of the International Conference on One Health and Zoology, held between 27 and 29 September 2023 in Hisarya, Bulgaria. The scientific forum was organised by the University of Plovdiv "Paisii Hilendarski" - Department of Zoology, the National Center for Infectious and Parasitic Diseases, the Medical University of Plovdiv, the Bulgarian Scientific Society for Epidemiology of Infectious and Non-Infectious Diseases the Bulgarian Food Safety Agency with the support of the Ministry of Health and the Southeast European Center for Surveillance and Control of Infectious Diseases in Tirana (Albania). The conference focused on the idea that a healthy society requires a healthy environment, biodiversity, and ecosystems to function balanced and sustainably. The topic is especially relevant today in the face of climate change. Experts from various sectors, disciplines, and communities at different levels of society presented scientific findings and shared experiences. They discussed ideas related to the underlying causes of various health and environmental issues to develop long-term, sustainable solutions.

The total number of registered conference participants was 168, including active and passive participants and accompanying persons. More than 70 individuals have participated in the conference as active presenters of papers and posters. The conference welcomed participants from Albania, Bulgaria, Italy, Latvia, Poland, North Macedonia, Serbia, Turkey, and the Czech Republic. A total of 40 oral presentations and 49 poster presentations were delivered.

The wide breadth of zoological studies at the IV International Conference on One Health and Zoology

The current volume of *Acta zoologica bulgarica*, Supplement 20, comprises 20 contributions, which collectively address two of the conference topics:

Topic 1: Morphology, Physiology, Genetics and Molecular Taxonomy

This topic comprises nine contributions, which focus on the following areas: animal species molecular genetics, cytogenetics and epigenetic biodiversity, and the genome response of zoomonitor species. Some papers focus on aspects of the animal's physiological processes, such as oxidative stress, the influence of extremely high electromagnetic waves on haematological parameters, and the effects of probiotics on animals' well-being.

Boyadzhieva-Doychinova et al. (2024) proposed that the mitochondrial NADH1 gene could serve as a molecular marker for studying the biodiversity and phylogenetic relations of Clupeidae species. Following NADH1 gene sequencing, the bioinformatic analysis indicated the distribution of three groups in the genus Alosa and four in the genus Sprattus in the Bulgarian Black Sea.

The recent taxonomic reclassification of *Apodemus epimelas* in 2005 has prompted Chassovnikarova et al. (2024) to undertake research, which has yielded valuable insights into its cytogenetic characteristics, including the distribution of constitutive heterochromatin and the nucleolar organiser region (NOR). The species exhibits a diploid chromosome number of 2n=48, with FN=52. The karyotype comprises acrocentric chromosomes with only two small metacentric autosomal pairs. The species' cytotype is characterised by centromere heterochromatin localisation and nucleolus organiser regions (NORs) co-occurrence in both centromeric and telomeric locations.

Markov et al. (2024) evaluated the epigenetic variability and divergence of Bulgaria's Eurasian red squirrel populations through cranial polymorphism in various habitats. Similar epigenetic variability across different geographical groups was found, indicating the species' homogeneity in epigenetic characteristics and supporting the taxonomic concept of the subspecies status. The study also expanded the knowledge of the species diversity within its range.

The three papers under consideration relate to the genome response of zoomonitor species to a variety of environmental pollutants and stressors. Two of the studies were conducted to investigate the potential mutagenic effects of pesticides. Popova et al. (2024) found that the insecticide Coumaphos and oxalic acid used in beekeeping exhibit mutagenic and cytotoxic effects in the *Allium cepa* test. Coumaphos was cytotoxic and suppressed seed germination, while oxalic acid slowed germination and suppressed mitosis, with chromosomal aberrations observed even at lower concentrations. Vasileva et al. (2020) assessed the mutagenic potential of pesticides Actellic, Rival, Aminopielik, and organic contaminants (PBDEs) in common carp under lab conditions. The fish were exposed to varying chemical concentrations, and the micronucleus assay showed DNA damage in their erythrocytes. The highest DNA damage levels were observed after exposure to Rival and Aminopielik, with Actellic and PBDEs also demonstrating mutagenic effects to a lesser extent. Heredia-Rojas et al. (2024) conducted a study comparing the effects of antioxidants resveratrol and Mangifera indica L. extract on *in vivo* clastogenicity induced by extremely low-frequency electromagnetic fields. The research found that resveratrol significantly inhibited the *in vivo* clastogenic effect of 2.0 mT ELF-EMFs, while *Mangifera indica* L. did not exhibit radioprotective effects when used alone.

Two distinct research studies were conducted to assess the physiological status of fish species. Alexandrova et al. (2024) investigated the redox status as a health indicator of five economically important fish species from the northern shelf of the Bulgarian Black Sea. The study found that fish of the same species responded differently to environmental stress depending on the sampling locations. Additionally, the research revealed differences in antioxidant defence and resilience among the investigated fish species. The influence of dietary probiotic *Paenibacillus alvei* on welfare and feed conversion ratio in common carp (*Cyprinus carpio* Linnaeus, 1758) reared in an intensive cage system was studied by Manevska et al. (2024). The welfare status assessment at the end of the experiment indicated an "excellent" status for the experimental groups, indicating that the rearing practices were of a high standard.

Topic: Biodiversity, Ecology, Conservation Zoology

A total of 11 contributions have been made to the second topic. These present information on a range of subjects, including taxonomy, faunistics, biogeography, ecology and biomonitoring of Balkan fauna.

The issue of habitat richness and the seasonal occurrence of large branchiopods (Crustacea: Branchiopoda) in the areas of the Ramsar site "Bardača Wetland" and the Donja Dolina in Bosnia and Herzegovina was explored by Miličić et al. (2024) through the lens of multi-year studies. The abundance of environmental factors and the specific seasonal fluctuations observed in the area indicate that a combination of ecological parameters exerts a greater influence on species richness than any single environmental factor in individual habitats.

Antov et al. (2024) described the parasitoid wasps associated with *Bruchophagus astragali* Fedoseeva and *Bruchidius marginalis* (Fabricius) on *Astragalus glycyphyllos* L. (Fabaceae) in Bulgaria. Ten species belonging to the Chalcidoidea were identified. Several of the reared parasitoids were found to have new associations with both seed-feeding species and liquorice milkvetch.

A significant proportion of the studies on this topic concern the biodiversity of the Balkan freshwater fish fauna. Trajchevski et al. (2024) studied the length-weight relationships of five endemic fish species from Lake Prespa (North Macedonia). According to FishBase, this study provides the first length-weight relationships for some of these species. The survey of Innal (2024) assessed the diversity of fish in the Manavgat River Estuary (Turkey). A total of 23 marine, eight freshwater, one migrant, and one brackish species belonging to 18 families were identified, and the dominant structure of the fish biozenosis was evaluated. Kostov et al. (2024) covered the biological, ecological, and taxonomic characteristics of the endemic species for the Balkan Peninsula and Europe, *Pelasgus minutus* (Karaman, 1924), from Belchishko Blato, Republic of North Macedonia.

Chipev et al. (2024) assessed the health and adaptive capacity of bivalve and fish species as bioindicators in ecological risk assessment of the Sozopol Bay (Bulgarian Black Sea coast), a submarine "petrified forest" exposed on the bottom of the bay from 7,000 years ago and representing a new specific habitat. The measured oxidative stress of 5 bivalve and 6 fish species showed that the studied species can tolerate the present environmental conditions of Sozopol Bay and maintain normal health status.

Two articles are devoted to the diversity of breeding birds. Pomorie Lagoon is one of Bulgaria's most important breeding sites for bird species of order Charadriiformes. Popov et al. (2024) surveyed key breeding species to evaluate the effect of conservation activities to restore vital infrastructure for hydrological regime management and habitat for breeding birds. Except for the Sandwich tern, all activities positively affect breeding birds. Therefore, managing the hydrological regime represents the most effective conservation measure for protecting breeding bird populations. The avifauna in the Upper Thracian lowland (South Bulgaria) forests has been studied by Hristova et al. (2024). The authors present a large dataset on the composition, species richness, and distribution of bird species within 15 managed plain forest fragments. This study revealed the importance of the last remaining plain forests in the country for bird conservation.

Dundarova et al. (2024) evaluate the percentage of cave-dwelling bats mounting an immune response against rabies in eight underground roosts in Bulgaria using two kits of ELISA (Enzyme-Linked Immunosorbent Assay) for qualitative analysis: the BioPro Rabies blocking ELISA Ab Kit (BioPro) and the Platelia® Rabies II Kit ad usum veterinarium (Bio-Rad). The research team analysed blood samples from 11 different bat species captured. They found positive results in 5.36% of the samples using the BioPro Rabies blocking ELISA Ab Kit and 1.08% using the Platelia® Rabies II Kit *ad usum veterinarium* kit.

In their study, Beltcheva et al. (2024) emphasise the importance of monitoring total β-activity radioactivity in high mountain ecosystems due to the increasing presence of natural and human-generated pollutants. The suitability of two types of rodents, the omnivorous *Apodemus sp*. and the herbivorous *Chionomys nivalis*, for this purpose and their potential for monitoring radioactivity in alpine ecosystems is discussed. Furthermore, the study examines the accumulation of radioactive substances along food chains in these sensitive ecosystems.

All three Black Sea cetacean species are listed in the IUCN Red List of Endangered Species. The Black Sea harbour porpoise and Black Sea bottlenose dolphin are considered Endangered, while the Black Sea common dolphin is classified as Vulnerable. We need data on their distribution to conserve these species and identify important habitats effectively. Popov et al. (2024) collected data on their summer distribution in Bulgarian shelf waters from 2020 to 2023. The distribution of porpoises shows a preference for deep waters, while common and bot-

tlenose dolphins exhibit different habitat preferences. The authors propose updated threshold values for marine conservation and identifying important habitats for these species.

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