UNION OF SCIENTISTS IN BULGARIA
SECTION BIOLOGY

INSTITUTE OF BIODIVERSITY AND ECOSYSTEM RESEARCH – BAS

SEMINAR OF ECOLOGY - 2016

with INTERNATIONAL PARTICIPATION

21-22 April 2016

Програма/Program
Абстракти/Abstracts

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The Seminar of Ecology is organized by Section Biology of the Union of Scientists in Bulgaria and Institute of Biodiversity and Ecosystem Research, BAS, Sofia.

Many thanks for financial support of LKB-Bulgaria EOOD and BULGAP БИЗНЕС КОНСУЛТАНТСКИ УСЛУГИ.

"SEMINAR OF ECOLOGY – 2016"
WITH INTERNATIONAL PARTICIPATION

21-22 April 2016

PROGRAM

21 April 2016

8^{00} - 9^{00} Registration (IBER-BAS)

9^{00} - 9^{30} Opening Ceremony

Family photo

THEMATIC SESSION I

BIODIVERSITY AND CONSERVATION BIOLOGY

Chairmen: Prof. Snezhana Grozeva and prof. Boyko Georgiev DSc

Plenary presentations

9^{30}-9^{45} – MAPPING AND ASSESSMENT OF SPARSELY VEGETATED LAND ECOSYSTEMS AND THEIR SERVICES OUTSIDE NATURA 2000 NETWORK IN BULGARIA *Svetlana Bancheva, Anna Ganeva, Petar Dimov, Vladimir Vladimirov* - **PL01_01**

Oral presentation

9^{45}-9^{55} – CURRENT STATE OF MICROSPORIDIA RESEARCH IN BULGARIA *Daniela Pilarska, Danail Takov, Leellen Solter* - **L01_01**

9^{55}-10^{05} COMPARATIVE ANALYSIS OF THE VASCULAR FLORA IN THE VALLEY OF RIVER STRUMA AND THE VALLEY OF RIVER MESTA FLORISTIC REGIONS, SOUTHWESTERN BULGARIA *Kiril Vassilev, Valentina Goranova, Hristo Pedashenko* - **L01_02**

10^{05}-10^{15} HOW LIZARDS MANAGE THEIR MICROHABITAT SELECTION IN DYNAMIC ENVIRONMENT? *Emiliya Vacheva, Nikiolay Tzankov* - **L01_03**

10^{15}-10^{25} **POPULATION DYNAMICS OF GOLDEN JACKAL (*CANIS AUREUS*) AND RED FOX (*VULPES VULPES*) IN BULGARIA DURING THE PERIOD OF 2000-2015** *Albena Vlasseva, Tzenka Chassovnikarova, Nasko Atanassov* - **L01_04**

10^{25}-10^{45} Discussion

10^{45}-11^{00} Coffee break

Chairmen: Prof. Elisaveta Stoimenova and Prof. Stephka Chankova

Plenary presentations

11^{00}-11^{15} BIODIVERSITY SCIENCE: PRIORITIES AND CURRENT CHALLENGES *Boyko Georgiev* - **PL01_02**

Oral presentations

11^{15}-11^{25} ISSR PRIMER SELECTION FOR GENETIC VARIABILITY ANALYSES WITH THE BULGARIAN ENDEMIC *VERBASCUM DAVIDOFFII* MURB. (SCROPHULARIACEAE) *Galya Petrova, Stefan Petrov, Svetlana Bancheva* - **L01_05**

11^{25}-11^{35} PINE MARTEN (*MARTES MARTES*, L) DISTRIBUTION, HABITAT PREFERENCE AND ACTIVITY IN NP VITOSHA, BULGARIA *Nikola Doykin, Elitsa Popova, Maya Paraskova,Valentin Zlatanov, Diana Zlatanova* - **L01_06**

11^{35}-11^{45} FLORA, VEGETATION AND HABITATS OF THE LESHNITSA RESERVE IN THE CENTRAL BALKAN RANGE, BULGARIA *Kiril Vassilev, Tenyo Meshinev* - **L01_07**

11^{45}-11^{55} FLORA, VEGETATION AND THE HABITATS OF CHAMDZHA MANAGED RESERVE IN THE CENTRAL BALKAN RANGE, BULGARIA *Kiril Vassilev, Anna Gavrilova* - **L01_08**

11^{55}-12^{05} ALGOCENOSIS OF LAKE RADONIQ (KOSOVO), DURING WINTER SEASON 2013 *Kemajl Kurteshi, Sali Maliqi* - **L01_09**

12^{05}-12^{30} Discussion

12^{30}-13^{00} Lunch

Chairmen: Prof. Elisaveta Stoimenova and Prof. Stephka Chankova

Oral presentation

13^{00} – 13^{10} DIVERSITY, DISTRIBUTION AND CONSERVATION STATUS OF THE AMPHIBIANS (AMPHIBIA) IN PROTECTED AREA „ORANOVSKI PROLOM – LESHKO" (BG0001022), BULGARIA *Nevena Malakova, Lidia Sakelarieva, Alexander Pulev, George Manolev, Lilia Filipova* - **L01_10**

13^{10}-13^{20} ORCHIDS ON MT FALAKRON, NORTH-EASTERN GREECE *Asen Asenov* - **L01_11**

13^{20}-13^{30} **WINTER ACTIVITY OF TWO TAILED AMPHIBIAN SPECIES (AMPHIBIA: CAUDATA) IN SOUTHWESTERN BULGARIA** *Alexander Pulev, George Manolev, Lidia Sakelarieva, Krasimir Stoyanov* - **L01_12**

13^{30}-13^{40} **FIRST DATA ON THE OLIGOCHAETA (ANNELIDA: CLITELLATA) COMPLEX IN SOME BULGARIAN EPHEMERAL WATER BODIES** *Galia Georgieva, Pencho Ivanov, Yordan Uzunov, Luchezar Pehlivanov* - **L01_13**

13^{40}-13^{50} **FIRST DATA FOR THE OLIGOCHAETA (ANNELIDA: OLIGOCHAETA) FAUNA FROM PRIEP REZERVOIR AND THE RIVER OREVOVECHKA REKA, R. MACEDONIA** *Galia Georgieva, Biljana Rimcheska, Ana Atanacković, Valentina Slavevska-Stamenković, Stoe Smiljkov, Momir Paunović, Yordan Uzunov* - **L01_14**

13^{50}-14^{00} **FIRST REPORT OF *BRANCHIOBDELLA KOZAROVI* SUBCHEV, 1978 (ANNELIDA: CLITELLATA) FROM THE WESTERN BULGARIA** *Biljana Rimcheska, Vanja Marković, Marija Ilić, Valentina Slavevska-Stamenković, Svetoslav Cheshmedjiev, Bela Csányi, Katarina Zorić, Momir Paunović, Mitko Subchev* - **L01_15**

14^{00}-14^{20} Discussion

14^{20}-14^{35} Coffee break

THEMATIC SESSION II

LANDSCAPE ECOLOGY

Chairmen: Assoc. Prof. Galina Radeva and Prof. Rumen Kalchev

Plenary presentations

14^{35}-14^{50} – LANDSCAPE ECOLOGY AND BIODIVERSITY *Assen Assenov* - **PL02_01**

Oral presentations

14^{50}-15^{00} **INDICATIONAL IMPORTANCE OF THE HEMEROBY INDEX IN THE LANDSCAPE ASSESSMENT AND MONITORING OF MALA PLANINA** *Borislav Grigorov, Assen Assenov* - **L02_01**

15^{00}-15^{10} **SPATIAL AND TEMPORAL ANALYSIS OF VEGETATION CANOPY AND THEIR RELATION WITH SLOPE PROCESSES IN ZEMEN GORGE (WEST BULGARIA)** *Petko Bozhkov* - **L02_02**

THEMATIC SESSION III

ECOSYSTEM RESEARCH, SERVICES AND ECOLOGICAL AGRICULTURE

Chairmen: Assoc. Prof. Galina Radeva and Prof. Rumen Kalchev

Plenary presentations

15^{10}-15^{25} THE ADVANTAGES OF ORGANIC FARMING ON THE ENVIRONMENT *Elisaveta Stoimenova* - **PL03_01**

15^{25}-15^{40} PALEOECOLOGICAL STUDIES OF LAKES IN THE RILA MOUNTAINS *Spasimir Tonkov* - **PL03_02**

15^{40}-15^{55} – MODELING OF FOREST ECOSYSTEM SERVICES *Mariyana Lyubenova, Alexandre Chikalanov, Yuri Pavlov* - **PL03_03**

Oral presentations

15^{55}-16^{05} MAPPING OF ECOSYSTEMS IN BULGARIA BASED ON MAES TYPOLOGY *Stoyan Nedkov, Svetla Bratanova - Doncheva, Boris Markov* - **L03_01**

16^{05}-16^{15} ARTIFICIAL REEFS IN THE BLACK SEA – A CASE STUDY OF THEIR ECOLOGICAL IMPACTS AND FUNCTIONS *Dimitar Berov, Stefania Klayn, Vasil Vasilev, Ioana Georgieva, Ventsislav Karamfilov* - **L03_02**

16^{15}-16^{25} NATURAL REGENERATION OF ORIENTAL BEECH (*FAGUS ORIENTALIS* LIPSKY) IN FOREST ECOSYSTEMS OF STRANDZHA MOUNTAIN, SOUTHEAST BULGARIA *Gergana Georgieva, Svetla Bratanova - Doncheva, Nesho Chipev* - **L03_03**

16^{25}-16^{35} ROTIFER COMPLEXES IN THE PLANKTON OF THE SREBARNA LAKE (BULGARIAN DANUBE FLOODPLAIN) *Veselka Tzavkova, Merlijn Jocque, Luchezar Pehlivanov* - **L03_04**

16^{35}-16^{45} WATER CHEMISTRY OF TWO RIVERS IN VITOSHA AS A PART OF THE ECOLOGICAL STATUS AND INTEGRITY ASSESSMENT *Lachezar Yakimov, Radka Fikova, Emilia Varadinova and Radostina Hristova* - **L03_05**

16^{45}-17^{05} Discussion

17^{05}-17^{25} Coffee break

17^{25}- 19^{00} Poster session I and Discussion
Chairmen: Assoc. Prof. Margarita Topashka-Ancheva, Assist. Prof. Radka Fikova, Assist. Prof. Petya Parvanova

POSTER SESSION I

BIODIVERSITY AND CONSERVATION BIOLOGY

P01_01 CONTRIBUTION TO THE KNOWLEDGE OF THE SPIDER FAUNA (ARANEAE) OF THE SKOPJE AND MALESH VALLEYS IN R. MACEDONIA *Dragan Matevski, Aleksandra Cvetkovska-Gjorgjievska, Dana Prelić, Christo Deltschev*

P01_02 *IN VITRO* CLONAL PROPAGATION OF *VALERIANA OFFICINALIS* L. (VALERIANACEAE) *Asya Kozhuharova, Boryanka Traykova, Marina Stanilova*

P01_03 FIRST RECORD OF *ENTYLOMA GAILLARDIANUM* (SMUT FUNGI) FROM BULGARIA *Teodor Denchev and Cvetomir Denchev*

P01_04 NEW RECORDS OF *OPHIOGNOMONIA* (*GNOMONIACEAE*, *DIAPORTHALES*) IN GREECE AND TURKEY *Dimitar Stoykov*

P01_05 NEW DATA ON THE DISTRIBUTION OF *DOTHIDEOMYCETES* AND *SORDARIOMYCETES (ASCOMYCOTA)* IN BULGARIA *Dimitar Stoykov*

P01_06 UNUSUALLY HIGH ARCHAEAL DIVERSITY IN VLASA HOT SPRING, VELINGRAD, BULGARIA, REVEALED BY PHYLOGENETIC ANALYSIS *Margarita Stoilova-Disheva, Dimitrina Lyutskanova, Ivanka Boyadzhieva, Nadja Radchenkova, Margarita Kambourova*

P01_07 MACROPHYTES MAPPING IN PROTECTED AREA "ALDOMIROVSKO BLATO" *Gabriela Petrova, Anita Tosheva*

P01_08 SEED GERMINATION AND *EX SITU* CONSERVATION OF *VERBASCUM ANISOPHYLLUM* MURB. (SCROPHULARIACEAE) *Ivanina Boycheva, Stoyan Stoyanov, Boryana Sidzhimova, Boryanka Traykova, Marina Stanilova*

P01_09 ECOLOGICAL STATUS OF THE DANUBE RIVER (SERBIAN STRETCH) BASED ON MACROINVERTEBRATE ASSEMBLAGES *Jelena Đuknić, Maja Raković, Nataša Popović, Jelena Čanak Atlagić, Stefan Anđus, Bojana Tubić, Nikola Marinković, Margareta Kračun-Kolarević, Momir Paunović*

P01_10 NEW SPECIES OF HYMENOPTERA FROM BELASICA MOUNTAIN FOR THE FAUNA OF REPUBLIC OF MACEDONIA *Kiril Arsovski, Aleksandra Cvetkovska-Gjorgjievska, Dana Prelić*

P01_11 DIVERSITY OF FRESHWATER GASTROPODS IN THE DANUBE WETLAND AREA DUBOVAČKI RIT, (1082 - 1085 RIVER KM) *Maja Raković, Nataša Popović, Aljoša Tansković, Jelena Đuknić, Jelena Tomović, Božica Vasiljević, Biljana Rimcheska, Momir Paunović*

P01_12 IDEA PROJECT FOR ORGANIZING THE TURKISH AQUATIC SITES IN BLACK SEA FROM THE ECOLOGICAL NETWORK NATURA 2000 *Nina Dyakova, Assen Assenov*

 **P01_13 NEW VARIATION OF *ORCHIS PAPILIONACEA* L. IN THE BULGARIAN FLORA** *Andrey Popatanasov, Asen Asenov*

P01_14 DIVERSITY AND DISTRIBUTION OF THE GENUS *CLADONIA* (LICHEN-FORMING FUNGI) IN BULGARIAN DRY GRASSLANDS *Veselin Shivarov, Steffen Boch, Kiril Vassilev, Hristo Pedashenko*

 **P01_15 HABITAT DIVERSITY OF STRUMESHNITSA RIVER WATERSHED, SOUTHWESTERN BULGARIA** *Sofia Kostadinova, Kiril Vassilev, Assen Assenov*

P01_16 FLORISTIC INVESTIGATION OF "RILOMANASTIRSKA GORA" RESERVE, RILA MTS, BULGARIA *Stoyan Stoyanov, Valentina Goranova, Nadezhda Apostolova-Stoyanova*

P01_17 DISTRIBUTION OF PEREGRINE EARTHWORMS (LUMBRICIDAE) DUE TO AFFORESTATION AND LAND USE IN SOFIISKA MOUNTAIN (PART OF WESTERN BALKAN MOUNTAINS, BULGARIA) *Hristo Valchovski*

P01_18 SPECIES RICHNESS OF *DENDROBAENA* (OLIGOCHAETA: LUMBRICIDAE) GENUS IN TURKEY AND BULGARIA *Mete Mısırlıoğlu and Hristo Valchovski*

P01_19 BIODIVERSITY IN REPUBLIC MACEDONIA *Biserka Dimishkovska, Jovan Dimishkovski, Nikola Dimishkovski*

LANDSCAPE ECOLOGY

P02_01 ASSESSMENT OF POTENTIAL ORGANIC POLLUTANTS IN LEACHATES FROM BULGARIAN LIGNITES *Angelina Popova, Stefan Marinov, Maya Stefanova*

ECOSYSTEM RESEARCH, SERVICES AND ECOLOGICAL AGRICULTURE

P03_01 ANTHROPOGENIC LOADING ON SOILS AND IMPACT OF LAND USE ON SURFACE AND GROUNDWATER QUALITY *Dimitranka Stoicheva, Tsetska Simeonova, Svetla Marinova,Totka Mitova and Vera Petrova*

P03_02 TAXONOMIC AND ECOLOGICAL CHARACTERISTICS OF THE COLLEMBOLA FAUNA IN DIFFERENT AGROECOSYSTEMS *Lilyana Koleva, Elena Tsolova, Georgi Dimitrov*

 **P03_03 USING RC DRONES FOR PLOTTING IN DIFFERENT ECOSYSTEM TYPES** *Petar Dimov*

P03_04 MONITORING NITROGEN LEACHING IN ARABLE FIELDS AND ECOLOGICAL ASPECTS *Tsetska Simeonova*

22 April 2016

THEMATIC SESSION IV

BIOTIC AND ABIOTIC IMPACT ON THE LIVING NATURE AND MECHANISMS OF ADAPTATION

Chairmen: Prof. Svetlana Bancheva and Prof. Daniela Pilarska

Plenary presentations

9^{00}-9^{15} ON THE POSSIBLE CONTRIBUTION OF HSP70B AS A MARKER FOR OXIDATIVE STRESS AND/OR FOR CELL PROTECTION *Stephka Chankova and Nadezhda P. Yurina* **- PL04_01**

9^{15}-9^{30} HAZARDS OF Cd CONTAMINATION *Galina Satchanska* **- PL04_02**

Oral presentations

9^{30}-9^{40} ROLE OF GENOTYPE AND EXPERIMENTAL DESIGN FOR *SACCHAROMYCES CEREVISIAE* DNA PROTECTION AGAINST ZEOCIN-INDUCED DOUBLE-STRAND BREAKS BY *CLINOPODIUM VULGARE* *Teodora Todorova, Daniela Miteva, Nadezhda Radovanova, Iviyana Ivanova and Stephka Chankova* **- L04_01**

9^{40}-9^{50} ASSESSING THE IMPACT OF UV-B RADIATION ON THE PHOTOSYNTHETIC APPARATUS OF TWO *PAULOWNIA* LINES GROWN IN SALINE SOILS *Martin Stefanov, E. Yotsova, Katya Ivanova, Y. Markovska, A. Dobrikova , E. Apostolova* **- L04_02**

9^{50}-10^{00} ANTIMICROBIAL EFFECT OF NANOSTRUCTERED THIN FILMS *Dragomira Stoyanova, Hristo Manolov, Orlin Angelov, Iliana Ivanova* **- L04_03**

10^{00}-10^{10} INVESTIGATIONS OF THE SENSITIVITY TO CADMIUM STRESS IN TWO WHEAT GENOTYPES *Ekaterina Yotsova, Svetlana Landjeva, Emilia Apostolova, Anelia Dobrikova* **- L04_04**

11^{10}-11^{20} ABIOTIC FACTORS INFLUENCING THE BEHAVIOUR OF MAMMALIAN MODEL SPECIES IN NP VITOSHA, BULGARIA *Elitsa Popova, Nikola Doykin, Valentin Zlatanov, Diana Zlatanova* **- L04_05**

10^{20}-10^{40} Discussion

10^{40}-11^{00} Coffee break

Chairmen: Prof. Svetlana Bancheva and Prof. Daniela Pilarska

Plenary presentations

11^{00}-11^{15} ARCHAEA ECOLOGY AND DIVERSITY IN HEAVY METALS AND RADIONUCLIDES CONTAMINATED AREAS *Galina Radeva* **- PL04_03**

Oral presentations

11^{15}-11^{25} GLOBAL CLIMATE CHANGES AS HOT SPOTS OF ECOTYPE VARIATION: A CASE STUDY WITH *PLATANUS ORIENTALIS* L. (PLATANACEAE) *Galya Petrova, Tsveta Ganeva, Silvia Fineschi, Francesco Loreto, Violeta Velikova* - **L04_06**

11^{25}-11^{35} STATUS-QUO OF VIRUS DISEASES ON TOMATO CROPS GROWN IN SOUTHERN REGIONS OF BULGARIA *Gancho Pasev, Vesela Radeva-Ivanova, Dimitrina Kostova* - **L04_07**

11^{35}-11^{45} DOES COMBINED TREATMENT WITH *CLINOPODIUM VULGARE* EXTRACT AND ZEOCIN PROTECT NUCLEAR DNA FROM ZEOCIN-INDUCED DAMAGES? *Nadezhda Radovanova, Iviyana Ivanova, Teodora Todorova and Stephka Chankova* - **L04_08**

11^{45}-11^{55} HOW THE CYTOCHROME b_6f COMPLEX GOVERNS THE SHORT-TERM ADAPTIVE MECHANISM STATE TRANSITIONS IN OXYGENIC PHOTOSYNTHETIC SPECIES *Radka Vladkova* - **L04_09**

11^{55}-12^{15} Discussion
12^{15}-12^{45} Lunch

Chairmen: Assoc. Prof. Tzenka Chassovnikarova and Assoc. Prof. Assen Assenov

Oral presentations

12^{45}-12^{55}  ***IN VIVO* CALORIMETRIC CHARACTERIZATION OF PHYCOBILISOMES IN SYNECHOCYSTIS PCC6803** *Nia Petrova, Sashka Krumova, Svetla Todinova, Anna Sallai, Tomas Zakar, Gombos Zoltan, Stefka Taneva* - **L04_10**

12^{55}-13^{05}  **CALORIMETRIC CHARACTERIZATION OF THE ORDERED/DISORDERED THYLAKOID MEMBRANE STATE IN ARABIDOPSIS** *Nia Petrova, S. Todinova, W. Schröder, S. G. Taneva, S. Krumova* - **L04_11**

13^{05}-13^{15}  **METHODS, APPLICABLE TO THE ECOTOXICOLOGICAL BIOMONITORING OF TERRESTRIAL VERTEBRATES** *Peter Ostoich, Michaela Nedialkova, Roumiana Metcheva* - **L04_12**

13^{15}-13^{25}  **BIOCHEMICAL RESPONSES OF THREE GENOTYPES OF *PHASEOLUS VULGARIS* L. TO SINGLE AND COMBINED TREATMENT WITH POLYETHYLENE GLYCOL AND UV-B IRRADIATION** *Tsveta Angelova, Zhana Mitrovska, Petya Parvanova and Stephka Chankova* - **L04_13**

13^{25}-13^{35} HEAVY METAL CONCENTRATIONS IN VEGETABLES WITH GROWTH STAGEAND PLANT SPECIES VARIATIONS *Snezana Stavreva Veselinovska* - **L04_14**

13^{35}-13^{45} EVALUATION OF THE STATE OF THE WATERS OF THE STRUMESHNITSA RIVER ON BULGARIAN TERRITORY ACCORDING TO PHYSICO-CHEMICAL ELEMENTS FOR QUALITY *Svetla Ivanova* - **L04_15**

13^{45}-14^{05} Discussion

14^{05}-14^{25} Coffee break

THEMATIC SESSION V

ECOLOGY AND EDUCATION

Chairmen: Prof. Roumiana Metcheva and Assoc. Prof. Galina Satchanska

Plenary presentations

14^{25}-14^{40} ENVIRONMENTAL EDUCATION IN PARADIGM OF LIFELONG LEARNING *Nadezhda Raycheva* - **PL05_01**

Oral presentations

14^{40}-14^{50} PROJECT-BASED LEARNING ON "ECOVILLAGES" *Antoaneta Palahanska, Emilia Nikolova* - **L05_01**

14^{50}-15^{00} EDUCATION FOR SUSTAINABLE DEVELOPMENT – THE MODERN FACE OF THE ENVIRONMENTAL EDUCATION. THE TRANSITION IN HISTORICAL PLAN *Hristina Bancheva, Dilyanka Bezlova* - **L05_02**

15^{00}-15^{10} MODEL ON PROJECT-BASED TEACHING ON THE TOPIC OF: "GREEN BUILDINGS-THE NATURE IN OUR LIVES" *Ergyun Ibryam, Anna Krasteva, Cvetelina Ivanova* - **L05_03**

THEMATIC SESSION VI

OTHER RELATED TOPICS

Chairmen: Prof. Roumiana Metcheva and Assoc. Prof. Galina Satchanska

Oral presentations

15^{10}-15^{20} USE OF BIOMASS FROM ANTARCTIC YEAST STRAIN FOR THE REMOVAL OF METALS FROM AQUEOUS SOLUTIONS *Aleksandar Adamov, Snezhana Rusinova-Videva, Stefka Nachkova* - **L06_01**

15^{20}-15^{30} DATA INTEGRITY: A NEW LOOK AT AN OLD TOPIC *Anife Mahmud* - **L06_02**

15^{30}-15^{50} Discussion

15^{50}-16^{10} Coffee break

16^{10}- 17^{40} Poster session II and Discussion
Chairmen: Assoc. Prof. Marina Stanilova, Assist. Prof. Kalina Danova and Assist. Gergana Georgieva

POSTER SESSION II

BIOTIC AND ABIOTIC IMPACT ON THE LIVING NATURE AND MECHANISMS OF ADAPTATION

P04_01 ECOLOGICAL STATE ASSESSMENT OF THE WATERS IN THE BULGARIAN SECTION OF THE STRUMESHNITSA RIVER AND LUDA MARA RIVER *Marin Smilyanov, Emilia Varadinova*

P04_02 EFFECT OF NICKEL ON SEED GERMINATION IN TWO *ALYSSUM* HYPERACCUMULATOR SPECIES FROM SERPENTINES IN ALBANIA *Donaltina Vila, Kalina Vila, Dolja Pavlova, Aida Bani*

P04_03 THE EFFECT OF ORGANIC AND CHEMICAL FERTILIZERS ON THE YIELD AND DISEASE RESISTANCE OF TOMATOES – FIELD PRODUCTION *Sergey Bistrichanov, Ivanka Mitova, Zhelyu Avramov, Vanya Lozanova*

P04_04 MONITORING OF VIRAL DISEASES IN INDUSTRIAL VINEYARDS IN BULGARIA DURING THE PERIOD 2011 – 2015 *Mariyana Laginova, Zhelyu Avramov, Dora Panayotova*

P04_05 SPIDER COMMUNITY (ARANEAE) ON BELASITSA MOUNTAIN, SOUTH-EAST MACEDONIA *Aleksandra Cvetkovska-Gjorgievska, Marjan Komnenov, Dana Prelić, Valentina Slavevska-Stamenković, Milica Ristovska*

P04_06 GROWTH-TEMPERATURE RATES OF *PHYTOPHTHORA* ISOLATES OBTAINED FROM VARIOUS ECOSYSTEMS IN BULGARIA *Aneta Lyubenova, Slavtcho Slavov, Kaloyan Kostov, Ivaylo Tsvetkov*

P04_07 APPLICABILITY OF INDICATORS OF HYDROLOGICAL ALTERATION TO ASSESS THE CURRENT STATUS OF THE RIVER FLOW *Bernardo Lizama Rivas, Ivanka Koleva-Lizama*

P04_08 INVESTIGATION OF THE ZOOPLANKTON AND THE CHLOROPHYLL *A* LEVEL IN "DOSPAT" DAM *Doychin Terziyski, Vesselin Alexandrov, Veselka Tzavkova*

P04_09 ENVIRONMENTAL POLLUTION WITH TOXIC CHEMICALS – INFLUENCE ON THE BIOTA AND HUMAN HEALTH *Irena Bogoeva*

P04_10 LIPID COMPOSITION, PHOTOSYNTHETIC AND BIOLOGICAL ACTIVITY OF *LACTUCA TATARICA* (L.) C.A. MAY *Lilia Angelova, Albena Ivanova, Svetlana Momchilova, Iva Tsvetkova, Hristo Najdenski, Albena Momchilova, Liliana Maslenkova*

P04_11 STATISTICAL ANALYSIS OF METEOROLOGICAL FACTORS AND AIR POLLUTION IN SOFIA *Ludmila Gosteva, Mariana Doncheva-Boneva, Ivanka Koleva-Lizama*

P04_12 COMPETITION AMONG MIDDLE-SIZED CARNIVORES IN NP VITOSHA, BULGARIA *Nikola Doykin, Elitsa Popova, Neli Ivanova, Valentin Zlatanov, Diana Zlatanova*

P04_13 EFFECT OF SALT STRESS ON THE GROWTH AND ANTIOXIDANT DEFENSE OF TWO *LYCIUM* SPECIES *Velmira Dimitrova, Teodora Georgieva, Katya Ivanova, Yuliana Markovska*

P04_14 INFLUENCE OF A HERBIVORE INSECT, *ORCHESTES FAGI* L., ON THE ANTIOXIDATIVE STATUS OF COMMON BEECH LEAVES *Nadezhda Stefanova, Simona Georgieva, Svetoslav Anev, Petya Dimitrova-Mateva, Nikolina Tzvetkova, Miroslava Zhiponova, Ganka Chaneva*

P04_15 THE CHOLINESTERASES AS BIOMONITORING MARKERS IN CASE OF POISONING OF ORGANISMS IN ECOTOXICOLOGICAL ENVIRONMENT *Elitza Dencheva, Radoy Ivanov*

P04_16 Cu(II) AND Co(II) COMPLEXES WITH THE SAME LIGANDS EXPRESS DIFFERENT CYTOTOXIC/CYTOSTATIC ACTIVITIES *Desislav Dinev, Tanya Zhivkova, Lora Dyakova, Katya Popova, Boyka Andonova-Lilova, Abedulkadir Abudalleh, Gabriela Marinescu, Daniela-Cristina Culita, Luminita Patron, Radostina Alexandrova*

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ABSTRACTS

THEMATIC SESSION I

BIODIVERSITY AND CONSERVATION BIOLOGY

PL01_01

MAPPING AND ASSESSMENT OF SPARSELY VEGETATED LAND ECOSYSTEMS AND THEIR SERVICES OUTSIDE NATURA 2000 NETWORK IN BULGARIA

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Introduction: Sparsely vegetated lands are areas that include unvegetated or sparsely vegetated habitats (naturally unvegetated areas). Often these ecosystems have extreme natural conditions that might support particular species. They include bare rocks, screes, dunes, beaches and sand plains.
Aim: The present study aims to map sparsely vegetated land ecosystems on the entire territory of the country, situated outside NATURA 2000 network, and to assess their conditions and services in a manner consistent with the technical requirements of the National Biodiversity Information System.
Materials and Methods: The proposed typology of sparsely vegetated land ecosystems corresponds to the ecosystem classification of MAES (2013) combined with EUNIS habitat classification types. A set of relevant indicators was applied using the matrix developed during the predefined project BG03.PDP2 Methodological support for ecosystem service assessment and biophysical valuation.
Results: First estimation has been done based on the available data for national distribution of ten natural habitats listed in the EU's Habitats Directive. Data analysis indicates that 2719.40 ha are occupied by sparsely vegetated land ecosystems. The main activities include several steps of mapping the ecosystems types and checking and validation of the relevant indicators for assessment of theit state and services in order to obtain several map and GIS layers of the respective ecosystem sub-type.
Conclusion: The project results improve the integration of biodiversity considerations into sectoral policies, and especially in sparsely vegetated land management. The later will be based on evaluation of the goods and services which sparsely vegetated land ecosystems provide.

Acknowledgments: This work was supported by the Financial Mechanism of the European Economic Area 2009-2014, Contract № Д-33-88/28.08.2015.

Keywords: assessment; Bulgaria; Sparsely vegetated land ecosystem services

L01_01

CURRENT STATE OF MICROSPORIDIA RESEARCH IN BULGARIA

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Microsporidia are primary pathogens related to Fungi. They infect animals from all major taxa. This group is particularly important in insects and some species play an important role in the natural regulation of insect populations. Investigations of insect microsporidia in Bulgaria began in the early 1960s; however, systematic research on microsporidian species began in this millennium in close cooperation with scientists from Germany, the Czech Republic, Austria, Slovakia and the US. Approximately 25 microsporidian species from the genera *Nosema*, *Vairimorpha, Endoreticulatus*, *Amblyospora*, *Janacekia, Polydispyrenia, Thelohania, Bohuslavia* and *Chytridiopsi*s have been recovered from the insect orders Diptera, Lepidoptera, Orthoptera and Coleoptera, and two new species were described. Life history, morphology, host tissue specificity, virulence and prevalence of microsporidia from Bulgarian insect populations are reviewed. Special attention is paid to pathogens of the gypsy moth *Lymantria dispar*, one of the most important pests in Bulgarian broadleaf forests.

Keywords: microsporidia, insect pathogens, Bulgaria

L01_02

COMPARATIVE ANALYSIS OF THE VASCULAR FLORA IN THE VALLEY OF RIVER STRUMA AND THE VALLEY OF RIVER MESTA FLORISTIC REGIONS, SOUTHWESTERN BULGARIA

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Aim: Analysis and assessment of the similarity of local floras between the Valley of Mesta river and the Valley of Struma river floristic regions.
Materials and Methods: The subject of the comparative analysis is the vascular flora of both floristic regions. Analysis were performed with the use of data from Goranova et al. (2013) and Assyov et al. (2012), updated with data from recent years. The degree of similarity was assessed based on the taxonomic structure, life forms, biological types, floral elements and phytogeographical origin of species.
Results: At present the flora of the Valley of Mesta river consists of 1392 pteridiophyte and spermatophyte species (34.54% of the flora of the country) belonging to 105 families and 520 genera. The flora of the Valley of Struma river is represented by 1850 species (45.90% of species in the Bulgarian flora), 130 families and 644 genera. The most species rich families for both floras were *Asteraceae*, *Poaceae* and *Fabaceae*, whereas the most species rich genera were *Trifolium*, *Carex* and *Veronica*. The life form spectrum was prevailed by hemicryptophytes and therophytes. Herbaceous species dominate over trees and shrubs. Horological spectra are prevalence of sub-Mediterranean and Euro-Asiatic floristic elements. Both floras are dominated by species of South Continental Centre and Mountain Centre of origin and distribution.

Conclusion: Results show that the main indicators characterizing both floras have almost identical values. The high degree of similarity is determined by identical climatic and orographic conditions in both areas, contributing to the development of these specific floras of sub-Mediterranean type.

Keywords: *Local sub-Mediterranean flora*, *floristic elements*, *functional traits*

L01_03

HOW LIZARDS MANAGE THEIR MICROHABITAT SELECTION IN DYNAMIC ENVIRONMENT?

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Aim: Our main aim is to examine how the lizard density varies under the influence of environmental changes and even a natural phenomenon.
Materials and Methods: The study area is in the immediate vicinity of the Ogosta dam and is frequently being flooded due to heavy rain. A total of 786 individual locations of five lizard species were collected in period of 2013-2014. We classified the observed habitats in seven general types. We expressed the abundance as frequencies of occurrence per daily searching events and habitat types and compared by species, seasons and years. Datasets were analyzed with MANOVA.
Results: The present study presents some data about the dynamics of lizard populations regarding to their spatial relationships and habitat preferences and gives a good example for lizard flexibility in spatial niche occupation. Substantial dynamics in the lizard abundance is present about the different species for every year. Difference in the seasonal dynamics is present between each season, but also within the same seasons during the different years.

All of the species display attachment to a specific microhabitat. The wall lizard is the species greatly affected by losing the most occupied habitat – the dam's coast and it is forced to find new suitable places whereas most of the other species widen the bounds of their areas.
Conclusion: Each of the examined lizard species showed a differential response to local conditions in the study area and in spite of the competition among them managed their habitat preferences and showed their great ability for adaptation.

Keywords: abundance, Anguidae, flood, Lacertidae, Scincidae

L01_04

POPULATION DYNAMICS OF GOLDEN JACKAL (*CANIS AUREUS*) AND RED FOX (*VULPES VULPES*) IN BULGARIA DURING THE PERIOD OF 2000-2015

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The main goal of the present study was to investigate the impact of the expanding population of jackal (*Canis aureus*) on the population number of the red fox (*Vulpes* vulpes).

Materials and Methods: The population dynamics of both species was tracked using the available data from the official results of spring game counts, carried out by the Executive Agency for Forests (EAF) throughout the country, during the period of 2000-2015.
Results: Foxes and jackals as sympatric species in the lowlands and often compete directly or indirectly. As a result of competition the number of foxes in the recent years reduced unlike that of jackal's number. Elsewhere foxes retreated and occupied territories with greater altitude, obviously unsuitable for jackals, which prefer places with higher temperatures.
Conclusion: The present analysis illustrates the relationship and trends in the population dynamics of the two game species, and indicates a direction of their sustainable management.

Key words: golden jackal, red fox, population dynamics, game species, Bulgaria

PL01_02

BIODIVERSITY SCIENCE: PRIORITIES AND CURRENT CHALLENGES

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The term "biodiversity" has been used for the first time in the meaning, which is generally accepted today, in 1988. The International Biodiversity Research Program DIVERSITAS (1996) included 12 program elements: Effects of biodiversity on ecosystem functioning; Origins, maintenance and loss of biodiversity; Systematics: Inventory and classification of biodiversity; Monitoring of biodiversity; Conservation, restoration and sustainable use of biodiversity; Soil and sediment biodiversity; Marine biodiversity; Microbial biodiversity; Inland water biodiversity; Human dimensions of biodiversity; Global Invasive Species Programme; Global Mountain Biodiversity Assessment. These research directions have a long-term importance and provide the scientific basis for the development of biodiversity management policy at various scales, from global to local. The further developments of DIVERSITAS have been targeting to promote aspects of this research program, which are expected to help better to mankind to solve the problems associated with the biodiversity crisis. Phase 2 (2002-2011) aimed to built up an international framework for biodiversity science, grouping research efforts in three core projects: Discovering Biodiversity and Predicting its Changes Focus; Assessing Impacts of Biodiversity Changes; Developing the Science of the Conservation and Sustainable Use of Biodiversity. Phase 3 (2012-2020), entitled "Biodiversity and ecosystem services science for a sustainable planet", emphasises four main current challenges: Critical detrimental changes in biodiversity and ecosystem services; Capacity of social–ecological systems to adapt; Patterns, origins and changes in biodiversity; Build a global network of biodiversity science. This report will also discuss the development of the Bulgarian biodiversity research capacity, especially the opportunity to use the Operational Program "Education and Science for Smart Growth" for its further development.

L01_05

ISSR PRIMER SELECTION FOR GENETIC VARIABILITY ANALYSES WITH THE BULGARIAN ENDEMIC *VERBASCUM DAVIDOFFII* MURB. (SCROPHULARIACEAE)

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Introduction: Successful adaptation of plant species to environmental changes depends on their genetic diversity. Thus, its maintaining has a central role in conservation programs. ISSRs are dominant markers used in genetic diversity studies of endangered plants. An important step prior to genetic diversity analysis is the selection of appropriate primers in order to avoid those that either fail to amplify or generate only few fragments and low polymorphism levels.
Aim: The aim of the present study is to select appropriate ISSR primers for genetic structure analyses of Bulgarian endemic and critically endangered plant species *Verbascum davidoffii*.
Materials and Methods: Fourteen *V. davidoffii* individuals were sampled from the single world population of the species between the valleys of river Bunderitsa and Razlozhki Suhodol, Pirin Mts. DNA was extracted from young leaves following the modified CTAB – procedure. A total of 35 ISSR – primers were tested. For the analysis of amplified fragments, a binary matrix was constructed by visual criteria of presence and absence of every molecular weight observed with the respective primers.
Results: Of the 35 primers tested, 11 were informative, generating 111 bands, ranging from 200 – 3000 bp in size, of which 100% were polymorphic. The total number of amplified fragments in each reaction ranged from 7 to 16, with an average of 11 bands per primer.
Conclusion: The primers indicated herein are informative for genetic diversity analysis of *V. davidoffii*, and can be used in the characterization of nowadays population of this endangered species.

Acknowledgments: This work was supported by the Bulgarian NSF under Grant DFNI-BO2/18.

Keywords: *Verbascum davidoffii*, Scrophulariaceae, Selection of markers

L01_06

PINE MARTEN (*MARTES MARTES*, L) DISTRIBUTION, HABITAT PREFERENCE AND ACTIVITY IN NP VITOSHA, BULGARIA

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Aim: The objective of this work was to study the distribution, habitat preference and activity of the pine marten in NP "Vitosha".
Materials and Methods: Camera traps were placed on the territory of NP Vitosha according to a predetermined grid in 2013 and 2014. They were set up to record the day and time for each registration. For each camera trap location, a standard form was filled, containing information about habitat

characteristics: altitude, forest type and forest visibility. The resulting photos and videos were imported and processed through CameraBase 1.6. Habitat preference analysis was performed using Ivlev's electivity index.
Results: A total of 23 independent registrations of pine marten (*Martes martes*, L.) in 19 locations were recorded in the Vitosha mountain during the study period. The pine marten predominates in mixed forests with slight preferences towards broad-leaf and coniferous forests, and fully avoids scattered vegetation. The pine marten prefers open and closed forests, and avoids the border area between them. Although some registrations are at a lower altitude (below 1200 m.a.s.l) about 65 % are at an altitude between 1200 and 1600 m.a.s.l. The pine marten is mainly active during the day with very little crepuscular activity. It increases its activity between 7h and 10h and to a lesser extent between 13h and 18h and 20-22 h.
Conclusions: There are publications on the pine marten presence in the Vitosha mountain, but hard evidence was lacking till now. This study contributes to the better understanding of this species ecology in Bulgaria.

Acknowledgements: This work was conducted with camera traps provided by the Directorate of NP Vitosha, through the Project № DIR-5113326-4-98 of Operational Program Environment 2007-2013.

Keywords: Pine marten, distribution, habitat preference, activity

L01_07

FLORA, VEGETATION AND HABITATS OF THE LESHNITSA RESERVE IN THE CENTRAL BALKAN RANGE, BULGARIA

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Aims: The main aim of the study is to establish the floristic, vegetation and habitat diversity in the study area as well as to assess the threats for their long-term protection. Additionally, another objective is the mapping of habitat types, medicinal plants and plant species of conservation concern on the territory of the reserve.
Materials and Methods: The study was conducted in the Leshnitsa reserve, situated in the central Balkan Range, close to Yasenovo village and covering 388.95 ha. The reserve was declared for protection of woodland ecosystems and the habitats of rare and endangered plant and animal species. The flora was studied using the transect method and field working was done in June and July 2014. Vegetation was sampled applying the Braun-Blanquet approach and later on collected data was statistically analyzed. Habitats are classified according to Directive 92/43/EEC.
Results: On the territory of the Leshnitsa reserve 428 vascular plants belonging to 74 families were established. About 48% of them (205 species) were referred as medicinal plants and 13 were of conservation concern. Vegetation diversity was classified into 5 classes (*Querco-Fagetea*, *Quercetea pubescentis*, *Festuco-Brometea*, *Asplenietea trichomanes*, *Stellarietea mediae*) and 4 habitat types protected by the Habitat Directive 92/43/EEC.
Conclusions: The Leshnitsa reserve preserves a great floristic and syntaxonomical diversity. It is characterized by the dominance of xerothermic and xero-mesophytic woodlands.

Acknowledgements: The data was collected with the financial support of the project №DR-5113325-5-88 "Activities on sustainable management of reserve and managed reserve – exclusively state property on the territory of RIEW - Stara Zagora.

Key words: biodiversity, Bulgaria, mapping, Braun-Blanquet approach, protected species.

L01_08

FLORA, VEGETATION AND HABITATS OF THE CHAMDZHA MANAGED RESERVE IN THE CENTRAL BALKAN RANGE, BULGARIA

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Aims: The aim of the study is to establish the floristic, vegetation and habitat diversity of the Chamdzha managed reserve. Additionally, another objective is the mapping of habitat types, medicinal plants and plant species of conservation concern on the territory of the reserve.
Materials and Methods: The Chamdzha managed reserve is situated in the central Balkan Range, close to Yasenovo village and covering 388.95 ha. Field work was conducted in June and July 2014. The flora was researched using the transect method and on survey of already published data. Vegetation diversity was studied applying the Braun-Blanquet approach for collecting of relevés and later on their statistical analysis. Habitats were classified according to Habitat Directive 92/43/EEC.
Results: The flora comprises 299 vascular plants belonging to 51 families and 184 genera. One hundred and eleven medical plants and 7 species of conservation concern were found. The vegetation diversity is represented by 4 classes (*Erico-Pinetea*, *Querco-Fagetea*, *Koelerio-Corynephoretea* and *Festuco-Brometea*), 4 alliances (*Erico-Fraxinion orni*, *Carpinion orientalis*, *Quercion petraeo-cerridis* and *Festucion valesiacae*), 1 association, 5 communities and 5 habitat types protected by Directive 92/43/EEC.
Conclusions: The Chamdzha managed reserve preserves flora typical for siliceous terrains in the country and represents relict woodland vegetation characterized by the dominance of *Pinus nigra* and *Quercus dalechampii* forests.
Acknowledgements: Authors are grateful to the project "DIR – 5113325-12-109 Central Balkan – park for everyone", financed under Priority Axis 3 "Preservation and restoration of biodiversity", Operational Programme Environment, 2007 – 2013 and Bulgarian Government.

Key words: *Erico-Pinetea*, *Koelerio-Corynephoretea*, *Querco-Fagetea*, Bulgaria, Braun-Blanquet approach, endemic species.

L01_09

ALGOCENOSIS OF LAKE RADONIQ (KOSOVO), DURING WINTER SEASON 2013

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Aim: The main objective of this study is to determine the algocenosis of lake Radoniqi, nearby the city of Gjakova (Kosovo), and the quality of water, through algal bioindicators during the spring season of the year 2013.
Materials and Methods: Samples for algological analyses are collected in three localities along the river. Determination was done according to the algal keys.

Resuslts: During the investigation period we determined the different species of algae and bioindicators, through which the quality of water and class of bonity can be evaluated.
At the lake Radoniqi, during the winter we determined 77 species of algae. Of these species 29 were bioindicators, the dominating of which (20) belonged to Bacillariophyceae. The Chlorophyta bioindicators were 4, Euglenophyta bioindicators - 2 and Cyanophyta bioindicators species were 3 in number.
Conclusions: The Bacillariophyta dominated with 49 species (63.63 %), followed by Chlorophyta with 13 species (16.88%), Cyanophyta with 8 species (8%) and Euglenophyta with 7 species (9.10%).

Keywords: algocenosis, water, lake, winter, Radoniqi.

L01_10

DIVERSITY, DISTRIBUTION AND CONSERVATION STATUS OF THE AMPHIBIANS (AMPHIBIA) IN THE PROTECTED AREA „ORANOVSKI PROLOM – LESHKO" (BG0001022), BULGARIA

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Aim: The aim of the report is to supplement and summarize data about the diversity, distribution and conservation status of the amphibians in the Protected area BG0001022 „Oranovski Prolom – Leshko".
Materials and Methods: The studied area is a part of the Natura 2000 network in Bulgaria. It is situated in the northwestern part of the Blagoevgrad district and has been designated under the Habitats Directive (92/43/EEC). The new amphibian species and localities were registered during field trips in the period June 2008 – March 2016. The geographic coordinates have been determined with GPS, and the maps have been prepared with ArcGis.
Results: Totally 8 species have been found (4 reported for the first time) – one tailed and seven anurans. Most of the localities are situated in the eastern part of the protected zone. All localities (published and new) have been summarized in tables and marked on maps. All species are listed in the appendices II, III and IV of the Biodiversity Protection Act of Bulgaria. Six of the amphibians are protected according to the Habitats Directive, but only *Bombina variegata* is listed in the Annex II and its conservation requires the designation of special areas of conservation. All species are protected according to the Bern Convention and are included in the IUCN Red List of the Threatened Species.
Conclusion: The amphibian species that occur in the studied area represent 36.4% of the total number of amphibians (22) distributed in Bulgaria. All of them are protected according to the national and international legislation.

Key words: amphibians, diversity, new locality, conservation status, protected zone, Natura 2000

L01_11

ORCHIDS ON MT FALAKRON, NORTH-EASTERN GREECE

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Aim: Primary investigation of orchids on Mt Falakron.

Introduction: Falakron Mt (2232 m) is situated between Mt West Rhodope and Aegean Sea, North-Eastern Greece. Basic rocks are predominantly calcareous (marbles), soils are predominantly rendzinas. The climate is Transitional Mediterranean. Plant diversity is very rich.
Material and Methods: Field trips.
Result: Till now 7 genera and 17 species of orchids have been found.
Conclusion: Orchids on Falakron are growing from the foothills to the highest peaks, presented by single individuals or by vast fragmented, mosaic populations. More investigations will be made in order to discover the structure of their populations.

This project was financed by the author.

L01_12

WINTER ACTIVITY OF TWO TAILED AMPHIBIAN SPECIES (AMPHIBIA: CAUDATA) IN SOUTHWESTERN BULGARIA

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Aim: Data about the winter activity of the tailed amphibians in Bulgaria are rather scanty. Only a few records have been published so far. The aim of the report is to present new records and to summarize the available data of winter activity of Caudata species in Bulgaria.
Materials and Methods: Different areas in southwestern Bulgaria have been studied, mainly a part of the valley of the Blagoevgradska Bistritsa river, in two winter months (January and February) of three consecutive years (2014-2016). The weather conditions (sunny, cloudy, rainy) have also been recorded, as well as the temperature of air, of the asphalt on the road (when the specimens were alive), and of water (for the larvae).
Results: Two tailed amphibians - Fire Salamander *Salamandra salamandra* and Buresch`s Crested Newt *Triturus ivanbureschi* have been registered in the winter. The Fire Salamander has been observed 45 times, while the Buresch`s Crested Newt - only once.
Conclusion: The winter activity of the Fire Salamander has been confinmed. For the first time adults have been observed in the middle of winter (January). Activity has been recorded throughout the winter at positive temperatures and high humidity. The winter activity of the Buresch`s Crested Newt has also been confirmed, but it can occur very rarely during this period. This species probably does not interrupt its hibernation and can be found active at higher temperatures only at the beginning or at the end of winter in some years.

Keywords: tailed amphibians, *Salamandra salamandra, Triturus ivanbureschi*, winter activity, phenology, Bulgaria

L01_13

FIRST DATA ON THE OLIGOCHAETA (ANNELIDA: CLITELLATA) COMPLEX IN SOME BULGARIAN EPHEMERAL WATER BODIES

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Aim: The aim of the study was to determine which Oligochaeta species occur in the temporal water bodies and what environmental factors determine the content and density of the oligochaete complex.
Materials and Methods: The study represents data from 52 samples, taken in 2013-2015 from two temporary rivers, two temporary lakes and one artificial pond in the eastern and western Bulgaria. The samples were taken in 15 days intervals during the period May-August. Benthic sampling followed the European standard EN ISO 10870:2012. The main physical and chemical parameters of the water were measured *in situ* along with the nutrients concentrations *in lab*. The species content, seasonal distribution pattern and abundance of the oligochets were analyzed.
Results: A total of 24 taxa were identified (10 species of Naididae, 12 of Tubificidae and 2 of Lumbriculidae). The species composition shifted along the hydroperiod gradients. During the early stage of the newly formed water bodies the naidids species were the only representatives amongst/of oligochets. As a result of a quick parthenogenesis naidids appeared in high density. In temporary aspect the density of naidids decreased and they were replaced by tubificid species.
Conclusion: During the hydroperiod the dynamics of the depth and wetland size have a significant influence on the environmental factors, which may contribute to the positive relationship with the number of species. Macroinvertebrate richness and abundance increased linearly along the hydroperiod gradient in response to the changes of temperature and dissolved oxygen concentrations.

Key words: temporary lakes, temporary rivers, Oligochaeta, abundance, life strategy

L01_14

FIRST DATA FOR THE OLIGOCHAETA (ANNELIDA: OLIGOCHAETA) FAUNA FROM PRIEP REZERVOIR AND THE RIVER OREVOVECHKA REKA, R. MACEDONIA

Galia Georgieva[1], Biljana Rimcheska[2], Ana Atanacković[3], Valentina Slavevska-Stamenković[2], Stoe Smiljkov[2], Momir Paunović[3], Yordan Uzunov[1]

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Aim: The research presents the first qualitative and quantitative data about the species content, distribution patterns and abundance of the Oligochaeta fauna of Prilep Reservoir and the river Orevovechka Reka, Republic of Macedonia.
Materials and Methods: The survey was based on samples taken in the period March 2011 - March 2012, from the hydrographic basins of the reservoir (14 samples) and the river (18 samples). The oligochaete specimens from different substrates were collected by a Sürber net (mesh size 500 μm) and with an Eckman grab, following standard methodology for collection of the bottom fauna. The species content, seasonal distribution patterns and abundance of the oligochets were measured.

Results: A total of 14 (Prilep Reservoir) and 27 (River Orevovechka Reka) taxa were recorded. The family Tubificidae was presented with the higher number of species and it was the most abundant for both water bodies. The polysaprobic tubificid oligochets, committed to the soft substrate, were dominant in the samples near the dam lake along with the swimmer naidid *S. lacustris* (Linneaus 1767). *L. profundicola* (Verill 1871), *L. hoffmeisteri* (Michaelsen 1901) and *T. tubifex* (Műller 1774) were the most common species in all sampling points and seasons. The sampling point in the ecotone had the highest species density.
Conclusion: Our results correspond with investigation of water bodies with similar typology. It could be confirmed the poor water quality in the Prilep Reservoir according to the domination of the tubificid species.

Key words: Oligochaeta, Prilep Reservoir, Orevovechka Reka, Republic of Macedonia

L01_15

FIRST REPORT OF *BRANCHIOBDELLA KOZAROVI* SUBCHEV, 1978 (ANNELIDA: CLITELLATA) FROM WESTERN BULGARIA

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Aim: The aim of this study is to contribute to the knowledge of the distribution of *Branchiobdella kozarovi* in the Balkans and Europe, by providing new data from the western part of Bulgaria.
Materials and Methods: A hydrobiological field sampling of macroinvertebrates of the wetland Choklyovo Blato (N 42°24'4.70", E 22°49'29.48", 864 m.a.s.l.) was conducted during October, 2015. The sampling was done by a standard benthological hand-net. The content of the hand-net was water-washed in a bucket. Some larger captured macroinvertebrate specimens, including three female *Astacus leptodactylus* ESCHSCHOLTZ, 1823 were identified *in situ* and then released unharmed. The collected macroinvertebrate material was preserved in 80% ethanol solution.
Results: A total of 336 branchiobdellid worms were recorded during the laboratory processing of the collected material from the Choklyovo Blato. All branchiobdellid specimens were identified as *B. kozarovi*. Knowing that branchiobdellids are exclusively epibionts on crayfishes, it could be reasonable to assume that the discovered branchiobdellid worms were washed from the captured *A. leptodactylus* crayfishes.
Conclusions: By our finding the known range of *B. kozarovi* on the Balkan Peninsula is expanded westward.

Acknowledgements: The study was a part of the project 'Actualization of typology and classification system for assessment of surface water bodies from categories "rivers", "lakes" and "transitional waters" in the period of the First River Basin Management Plans', financed by Bulgarian Government and supported by UNESCO/Japan Young Researchers' Fellowship Programme, Japan Funds-in-Trust Project (REF.: ERI/MSP/PPF/ LZF/15.037).

Key words: *Branchiobdella kozarovi*, narrow-clawed crayfish, recent distribution, Bulgaria

P01_01

CONTRIBUTION TO THE KNOWLEDGE OF THE SPIDER FAUNA (ARANEAE) OF THE SKOPJE AND MALESH VALLEYS IN R. MACEDONIA

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Aim: Faunistic data concerning Araneae of the Skopje and Malesh valleys in R. Macedonia are presented.
Material and Methods: The research underlying this study was carried out in the period of April - August 2014, at six localities in the Skopje and Malesh valleys, with the use of pitfall traps.
Results: A total of 100 species of the suborder Labidognatha belonging to 19 families and 55 genera were registered. Seven species, *Hypsosinga sanguinea* (C. L. Koch, 1844), *Lathys humilis* (Blackwall, 1855), *Trachyzelotes adriaticus* (Di Caporiaco, 1951), *Zelotes harmeron* Levy, 2009, *Zora silvestris* Kulczynski, 1897, *Episinus maculipes* Cavanna, 1876 and *Titanoeca quadriguttata* (Hahn, 1833) are new for the Macedonian spider fauna, while three species, *Harpactea samuili* Lazarov, 2006, *Zelotes babunaensis* (Drensky, 1929), *Zodarion ohridense* Wunderlich 1973 are endemic for the Balkan fauna.
Conclusion: New data on the occurrence of spider fauna in Skopje and Malesh valleys are presented. The high number of new species for the Macedonian fauna emphasizes the need of further faunistic researches, especially in the northern and eastern parts of Macedonia.

Key words: faunistic data, Araneae, Skopje, Malesh

P01_02

IN VITRO CLONAL PROPAGATION OF *VALERIANA OFFICINALIS* L. (VALERIANACEAE)

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Aim: The aim of the study was to establish a reliable protocol for the *in vitro* clonal propagation of the medicinal plant valerian and to produce plants identical to the mother individual in order to initiate a pilot plantation.
Material and Methods: Segments of leaves, stems, raceme stalks and leaf-buds of one selected valerian plant in blossom were used as primary explants. *In vitro* cultures were initiated on eight agar-solidified medium variants: basal MS (control), six media supplemented with BAP or Kin alone or in combination with NAA, and a half-strength MS medium free of PGRs. Leaf and root explants excised from the *in vitro* obtained plantlets were sub-cultured on the same media. Plantlets were potted in soil mixture and *ex vitro* adapted first in growth chamber under strict control of the ambient conditions, then in a room phytotron, and finally acclimated to open field.
Results: The regeneration rate depended on both: type of the explant and medium composition. The best primary explants were the raceme stalks while root segments were the most productive among secondary explants giving rise to an average of four plantlets on medium supplemented with NAA and Kin. Calli also produced roots and plantlets. The *ex vitro* survival rate was high: 91.3% in the growth chamber and 100% in the phytotron. All 150 plants transferred to the field developed successfully and spent the winter.

Conclusion: *In vitro* clonal propagation was proved to be effective method for rapid multiplication of high productive valerian individuals and for establishment of commercial plantation.

Acknowledgements: Authors are grateful to Bioprograma EAD for the financial support of the study.

Keywords: Valerian, *In vitro* micropropagation, Medicinal plants

P01_03

FIRST RECORD OF *ENTYLOMA GAILLARDIANUM* (SMUT FUNGI) FROM BULGARIA

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Aim: a contribution to the taxonomy and distribution of the smut fungi in Bulgaria.
Material and Methods: A dried specimen from the Mycological Collection (SOMF) of the Institute of Biodiversity and Ecosystem Research was examined under light microscope (LM) and scanning electron microscope (SEM). For LM observations and measurements, spores were mounted in lactoglycerol solution on glass slides, gently heated to the boiling point to rehydrate the spores, and then cooled. For SEM, spores were attached to specimen holders by double-sided adhesive tape and coated with gold with an ion sputter. The surface structure of spores was observed at 10 kV and photographed with a JEOL SM-6390 scanning electron microscope.
Results: *Entyloma gaillardianum* is reported for the first time from Bulgaria. It is a neomycete in Europe, originating from North America.

Keywords: *Entyloma, Entylomataceae, Gaillardia,* smut fungi, taxonomy

P01_04

NEW RECORDS OF *OPHIOGNOMONIA* (*GNOMONIACEAE*, *DIAPORTHALES*) IN GREECE AND TURKEY

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Aim: The purpose of this work is to expand the knowledge about the diversity of the *Gnomoniaceae* in the adjacent to Bulgaria countries.
Materials and Methods: Known information about the current diversity of *Gnomoniaceae* from the adjacent Balkan countries is given, according to the published literature data. All collected specimens studied herein are conserved at the Mycological Collection of the Institute of Biodiversity and Ecosystem Research (SOMF). The size of the asci and ascospores used in the descriptions of the sac fungi are usually given in the form of minimum and maximum values. Measurements under LM were always taken in water with the help of specialized software for digital pictures Carnoy 2.0 (© Peter Schols, 2001). The microscopic features were examined in water, or in water solution of Cotton Blue. Color photographs were taken with the help of Canon PS A460 under Boeco 180/T/SP LM and Boeco BOE3500 dissecting microscope
Results: *Ophiognomonia melanostyla* is reported for the first time from Turkey on overwintered leaf of *Tilia*, while *O. setacea* represents a new record for Greece. *Quercus trojana* appears to be a new

substratum of *O. setacea*. The new findings are presented with detailed descriptions, including notes on their ecology and distribution.
Conclusion: During field trips arranged in 2007 and 2015 new data on two leaf-inhabiting fungi of the genus *Ophiognomonia* (*Gnomoniaceae*) from Turkey and Greece were observed. *Quercus trojana* appears as a new host plant for *Ophiognomonia setacea*.

Acknowledgements. The field trip in Turkey was carried out in the framework of the project 'Conservation and sustainable use of biodiversity in Mt. Strandzha' (MAB, UNESCO Contract no. 8759406/2006) of the former Institute of Botany, BAS.

Key words: fungal diversity, *Gnomoniaceae*, Greece, *Ophiognomonia*, Turkey

P01_05

NEW DATA ON THE DISTRIBUTION OF *DOTHIDEOMYCETES* AND *SORDARIOMYCETES (ASCOMYCOTA)* IN BULGARIA

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Aim: The purpose of this work is to present recently discovered country records of stromatic and non-stromatic Pyrenomycetes.
Materials and methods: The collected specimens studied herein are conserved at the Mycological Collection of IBER, BAS (SOMF). The size of microscopic characters, used in the descriptions of the fungi, are given in the form of minimum and maximum values. Measurements under LM were taken in water with the help of specialized software for digital pictures Carnoy 2.0 (© Peter Schols, 2001). The microscopic features were examined in water, or in water solution of lactophenol. Color photographs were taken with the help of Canon PS A460 under Boeco 180/T/SP and Boeco BOE3500 dissecting microscope.
Results: Notes on the known distribution of *Diatrypella quercina*, *D. favacea* (Xylariales), *Gnomonia geranii-macrorrhizi*, *Gnomoniopsis guttulata*, *Mamiania fimbriata, Ophiognomonia rosae, Plagiostoma apiculatum* (Diaporthales) and *Pleospora herbarum* (Pleosporales), according to the published data are given. All of the species, except *P. herbarum,* are reported from new localities in Bulgaria, illustrated and briefly described. *Pleospora herbarum* is found in the Sofia region on dead twigs of *Amorpha fruticosa* and *Buddleja davidii*, which are new host plants.
Conclusion: Seven pyrenomycetous fungi are reported with new localities (Forebalkan, Vitosha region, Sofia region, Rila Mts and Rhodopi Mts), while *P. herbarum* is collected on new host plants.

Key words: *Diatrypaceae*, fungal diversity, *Gnomoniaceae*, *Pleosporaceae*

P01_06

UNUSUALLY HIGH ARCHAEAL DIVERSITY IN VLASA HOT SPRING, VELINGRAD, BULGARIA, REVEALED BY PHYLOGENETIC ANALYSIS

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Aim: Representatives of the latest recognized domain of life, Archaea are distributed in virtually every niche of our planet posing this domain as ubiquitous; however they predominate in extreme environments. This study aimed revealing the real diversity in Archaea by investigation the community structure in one of the hottest Bulgarian spring, Vlasa, Velingrad (86°C).
Materials and Methods: Culture independent approach including DNA extraction followed by PCR amplification, subsequent cloning and sequencing of 16S rRNA genes, was used to reach the structure of the archaeal community in the Vlasa hot spring. The obtained sequences were compared to the closest relatives in the NCBI GenBank database. The phylogenetic analysis was conducted using the *MEGA* version 4.1 and the Neighbor-joining method.
Main results: The phylogenetic analysis revealed unusual high for an extremophilic environment archaeal diversity in a terrestrial hot spring Vlasa, Velingrad that significantly differed from the previous investigations in the high number of the presented groups and identification of previously undiscovered 16S rRNA sequences. The archaeal clones were referred to 72 groups. Most of the sequenced clones showed closest similarity with the unculturable representatives from the thermophilic niches. More than a half of the retrieved sequences referred as new, some of them showing very distant relation with known taxa and their position in the constructed phylogenetic tree was doubtful.
Conclusions: The sequences retrieved from the Vlasa hot spring demonstared that this environment harbors one of the richest in presented taxa archaeal community and contribute in enlarging the view on archaeal diversity in thermophilic environments.

Acknowledgement: This work was supported by EEA Bg09 grant, Project D03-100/2015.

Key words: thermophilic archaeal diversity; 16S rRNA gene analysis; microbial ecology; terrestrial hot spring

P01_07

MACROPHYTES MAPPING IN PROTECTED AREA "ALDOMIROVSKO BLATO"

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The aim of the study is to make an inventory of the diversity of aquatic vascular plants in the protected area "Aldomirovsko blato".
Materials and Methods: The Aldomirovsiko blato marsh is a protected area, part of a wetland of international significance - the karst complex "Dragoman marsh" (Ramsar Convention), western Bulgaria. This swamp is an interesting object of study, because it dried up several times. The abundance and species composition of the aquatic macrophytes were studied between May and November 2015. The

observations were carried out at 5 main representative sampling stations and are based on transect monitoring data.
Results: A total of 42 aquatic vascular plants were found in the marsh (11 submerged and 31 emergent). They belong to 26 genera and 20 families. Most of them are representatives of the families Cyperaceae (12%), Juncaceae (12%), Poaceae (10%), Typhaceae (5%), Alismataceae (5%), Haloragaceae (5%), Lemnaceae (5%), Potamogetonaceae (5%) etc. Widespread species are *Potamogeton natans, P. lucens, Persicaria amphibia, Myriophyllum spicatum* (submerged), *Phragmites australis, Schoenoplectus lacustris, Eleocharis palustris* (emergent). The data collected were used to produce a map of the macrophytes distribution in the protected area.
Conclusion: The map prepared shows the current status of the macrophytes flora and the changes after the swamp has dried up a several times.

Acknowledgment: The financial support through Project "Plant biodiversity in the protected area "Aldomirovtsi marsh" provided by BBF is gratefully acknowledged. The authors are grateful to Spas Uzunov and project “Salt of life” on BBF for the photos made by drone.

Keywords: macrophytes, mapping, “Aldomirovsko blato” marsh

P01_08

SEED GERMINATION AND *EX SITU* CONSERVATION OF *VERBASCUM ANISOPHYLLUM* MURB. (SCROPHULARIACEAE)

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Aim: *Verbascum anisophyllum* is a Balkan endemic plant with a total of 3 populations (2 in Bulgaria and 1 in Serbia) covering a very restricted area of less than 50 km^2. The species is critically endangered according to the IUCN criteria, included in the Red Data Book of Bulgaria, and protected by the Biodiversity Act. The present study aimed to evaluate the germination potential of the seeds and to obtain plants for *ex situ* conservation of the species.
Material and Methods: A monitoring of the Bulgarian populations was done in 2015. Seeds were gathered and their germination rate was assessed *in vivo* on wet filter paper in petri dishes, and *in vitro* on agar-solidified basal medium MS, in parallel. To stimulate seed germination, seeds were pretreated with 0.35% GA_3, 0.35% Kin or 0.2% KNO_3 solutions for 22 hours; control seeds were soaked in distilled water. Seedlings were potted in soil mixture and *ex vitro* adapted in a phytotron.
Results: The conservation status of the two visited populations in 2015 was favorable. Both young rosettes and individuals with blossoms and fruits were observed. The stimulating effect of the gibberellic acid was significant causing an average of 84% *in vitro* and 95% *in vivo* germinated seeds, versus 6% and 16% in the controls, respectively. Seedlings were easily *ex vitro* adapted.
Conclusion: Seed germination of *Verbascum anisophyllum* was successfully enhanced under laboratory conditions. The obtained plants are suitable for *ex situ* conservation of the species and for *in situ* reinforcement of its natural populations.

Acknowledgements: This research was supported by the Bulgarian National Science Fund, Bulgarian Ministry of Education and Science (project DFNI-BO2/18).

Keywords: *Verbascum*, Endemic plants, *In vivo* and *in vitro* germination

P01_09

ECOLOGICAL STATUS OF THE DANUBE RIVER (SERBIAN STRETCH) BASED ON MACROINVERTEBRATE ASSEMBLAGES

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Aim: This study was carried out to assess the ecological status of the Danube throughout Serbia based on the macroinvertebrate assemblages.
Materials and Methods: The research was performed in April and September 2011 at 11 sampling sites. Samples were collected with the Van Veen type of grab. The total number of taxa, Diversity Index, Saprobic Index, BMWP and ASPT Scores were used for the ecological status assessment. All indexes were calculated using the ASTERICS software package.
Results: A total of 69 taxa were recorded. Chironomidae with 24 identified taxa, followed by Mollusca (18) and Oligochaeta (16) were found to be the dominant groups. Ledinci was the site with the highest number of taxa both in April (25) and in September (19). The highest diversity was recorded at Ram (2.67 - April) and at Ledinci (2.46 - September). The values of the saprobic index varied from 2.25 (Tekija - April; Kladovo - September) to 3.21 (Kusjak - April; Tekija - September). The BMWP Score varied from 3 at Kusjak (most downstream site) to 37 at Ledinci (the most upstream site) during April, while the ASPT value ranged from 1.5 at Kusjak to 4.83 at Novi Sad.
Conclusion: The ecological status in the year 2011 varied from good (class II) at most upstream sites to generally poor (class IV) in Iron Gate stretch. The higher diversity and abundance of macroinvertebrates were recorded in April (high water level) in comparisson to September (low water level).

Key words: macroinvertebrates, the Danube, ecological status

P01_10

NEW SPECIES OF HYMENOPTERA FROM BELASICA MOUNTAIN FOR THE FAUNA OF REPUBLIC OF MACEDONIA

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Aim: Hymenoptera in Macedonia are poorly known although they consist of over 1000 species. This work provides data for nine new species of Hymenoptera for the fauna of Republic of Macedonia from Belasica Mt.
Material and Methods: The material was collected using pitfall traps, Malaise traps, dish traps, net catching and hand collecting from 10 localities on Belasica Mt. (southeast Macedonia) in the period April 2014-June 2015 with monthly dynamics.
Results: In total, 61 species of Hymenoptera from 12 families (Apidae, Chrysididae, Crabronidae, Formicidae, Ichnoumonidae, Mutillidae, Pompilidae, Scelionidae, Scoliidae, Sphecidae, Tenthredinidae and Vespidae) are recorded in Belasica Mt. From the total number of species, nine species of four families are new for the fauna of Macedonia: *Ammophila heydeni* Dahlbom, 1845 (Sphecidae), *Bembecinus peregrines* Smith, 1856, *Bembix bidentata* Vander Linden, 1829 (Crabronidae),

Smicromyrme ruficollis Fabricius, 1793, *Stenomutilla bizonata* Smith, 1856 (Mutillidae*), Cryptocheilus egregious* Lepeletier, 1845 (Pompilidae*), Chrysis inaequalis* Dahlbom, 1845, *Chrysis germari* Wesmael, 1839 (Chrysidae*)* and *Tropidodynerus interruptus* Brullé, 1832 (Vespidae).
Conclusion: The new records of the nine species in the Macedonian fauna were expected since all of them were already known for the neighboring countries, due the lack of data and research for the order Hymenoptera from R. Macedonia.

Key words: new species, Macedonia, Hymenoptera, Belasica Mt.

P01_11

DIVERSITY OF FRESHWATER GASTROPODS IN THE DANUBE WETLAND AREA DUBOVAČKI RIT, (1082 - 1085 RIVER KM)

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Aim: This study provides data about the freshwater gastropods of the Danube wetland area Dubovački Rit (1082 - 1085 river km), aiming to contribute to the knowledge of this taxa group, its assemblage composition and species abundances.
Materials and Methods: The study of freshwater gastropods was performed in the Dubovački Rit at the left bank of the Danube River. Sampling was performed in 2010, 2011 and 2014, four times per year using benthological hand net and a Van Veen type of grab. The yotal number of taxa, species composition and abundance were calculated using the ASTERICS software package.
Results: During the research a total of 12 species were recorded, all belonging to the Planorbidae family. The most abundant species were *Segmentina nitida* (M., 1774) – 16 specimens, *Physella acuta* (D., 1805) – 12 specimens, *Hippeutis complanatus* (L., 1758) – 11 specimens, *Ferrissia fragilis* (T., 1863) – 10 specimens and *Anisus vortex* (L., 1758) – 9 specimens. Other species were represented with less than 5 specimens (*Gyraulus albus*, *G. crista*, *Bathyomphalus contortus*, *Planorbarius corneus*, *Planorbis planorbis*, *Acroloxus lacustris* and *Lymnaea stagnalis*). Two species (*P. acuta* and F. *fragilis*) are non-native to the Danube River. At the site inavasive macrophyte *Paspalum paspaloides* (Michx.) forms underwater meadows.
Conclusion: The majority of the observed species are phytophilous taxa. Seasonal differences in macrophyte density and community composition additionally contribute to the habitat complexity. On this specific the habitat dominated by invasive *P. paspaloides* two alien species of snails were recorded.

Key words: Gastropods, the backwater, Danube, Serbia

P01_12

IDEA PROJECT FOR ORGANIZING THE TURKISH AQUATIC SITES IN BLACK SEA FROM THE ECOLOGICAL NETWORK NATURA 2000

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Aim: The current research shows an idea project for organizing the Turkish NATURA 2000 network in the aquatic in Black Sea.
Material and Methods: Our south neighbor – Turkey is excels in the implementation of mandatory points, by procedures for joining the European Union, despite that the different opinions on the question is it really going to join, the probability this to happen is big. Just because of this reason, the country, after eventually joining the Union, will have to pass certain requirements on two acts – the Directive on the birds and the Directive on the Habitats and to build its own network of protected zones.
For the target on the known research are took in mind the common events in two Directives and the building of the network of the protected zones in the aquatic of Bulgaria. Furthermore they have in mind the specific features of the Turkish shelf and the biodiversity, within comparison with the Bulgarian NATURA 2000 zones. For formation and showing the results have been used GIS based method.
Results: The studied territory has the Turkish aquatic in Black Sea and part of Marmara Sea. The identified zones are continuation of NATURA 2000 zones "Strandzha" (BG0001007), and the zones meeting the requirements for presence of important for biological diversity animal and plant species, and the types of natural habitats, included in the annexes of the Directive of the Habitats and the Directive of the Birds. Zones are determined for the protecting of the findings of the seal monk in the Marmara Sea.
Conclusion: Determined zones would be used for building the ecological network NATURA 2000 in Turkey, as their adoption would be decisive for keeping one of the important kinds on the Directive of Habitats – seal monk, and other prioritized for keeping the species.

Keywords: Directive 92/43/EEC, Directive 2009/147/EC*, NATURA 2000 sites, Black sea, Marmara sea, seal monk.*

P01_13

NEW VARIATION OF *ORCHIS PAPILIONACEA* L. IN THE BULGARIAN FLORA

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Aim: Investigation of the variation of *Orchis papilionacea* in Bulgaria.
Materials and Methods: Morphometric analysis was performed during the flowering phase. Afterwards manual cross-pollination with consequent fruit and seed collection and analysis was done between the individuals in the same population.
Results: The labellum is shorter and thicker. The spurs of the discussed plants are horizontal and straight differing from *O. paplionacea* since its spurs typically initially are horizontal and afterward bent downwards. One possibility is for such a key morphological discrepancy is that the populations consist of hybrids between *Orchis papilionacea* and *O.morio* (also known as Anacamptis x gennariii), since *O.morio* usually have horizontal to vertical spurs. The population of *O.morio* was found on the same

meadows. To check this hypothesis we performed manual cross pollination since *O. papilionacea* and *O.morio* have different chromosomes number: 2n = 32 for *O.papilionacea* and 2n = 36 for *O.morio* which means that even if hybridization occurs then the next generation most probably will be sterile. The reports of such hybrids confirm that they are sterile. The investigation of the fruits and seeds showed that the plants are fertile. Also the plants were distinct morphologically from the recorded hybrids differing in flower and labellum morphology and coloration pattern, so we assume that a new variation was found.

Key words: *Orchis papilionacea*, variation, Bulgaria

P01_14

DIVERSITY AND DISTRIBUTION OF THE GENUS *CLADONIA* (LICHEN-FORMING FUNGI) IN BULGARIAN DRY GRASSLANDS

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Aim: The aim of this study was to give further information about the diversity and distribution of *Cladonia* species in Bulgarian dry grasslands.
Material and Methods: 456 specimens from different localities were examined for this study. They were collected between 2008 and 2015 from 17 floristic regions in Bulgaria. For the identification and macrophotographs of the samples, we used a Windaus Labortechnik D-38678 dissecting microscope equipped with a Canon PowerShot A630 digital camera. The taxonomically important micro features were observed under Boeco BM-180/T/SP microscope. The materials collected before 2015 were examined with a Wild M38 (Herrenburg, Switzerland) dissecting microscope and an Olympus CH2 microscope. Some of the specimens were tested for colour reactions with the following reagents: K, C, KC, CK, Pd, I and K/I. The colour responds to ultra-violet light (UV) were tested with a UV lamp.
Results: Twenty-five species are reported for the first time from fifteen floristic regions. *Cladonia rei* is a new record for Bulgaria. All information about the examined species was included in the Balkan Vegetation Database (EU-00-019) and the Balkan Dry Grassland Vegetation Database (EU-00-013).
Conclusion: The members of genus *Cladonia* are among the most common and dominant lichen-forming fungi in dry grasslands. Their study is important because on one hand they have a significant ecological role during the succession, soil formation and are preventing erosion processes, and on the other they have essential diagnostic value in dry grassland communities (e.g. classes *Festuco-Brometea, Helianthemetea guttati, Thero-Brachypodietea* and *Koelerio-Corynephoretea* incl. *Sedo-Scleranthenea*).

Key words: *Cladoniaceae,* lichens, dry grasslands, vegetation databases

P01_15

HABITAT DIVERSITY OF STRUMESHNITSA RIVER WATERSHED, SOUTHWESTERN BULGARIA

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Aim: Analysis and characteristics of habitat diversity of Strumeshnitsa river watershed on the territory of Bulgaria
Material and Methods: The aim of our study was to analyze the habitat diversity according to the Habitat Directive 92/43/EEC by applying of GIS methods. We used the available information about NATURA 2000 sites, which are following into the study area (BG0000167 Belasitsa, BG0001023 Rupite-Strumeshnitsa and BG0000225 Ograzhden-Malashevo). In addition, we also used information about the vegetation diversity from the Balkan Vegetation Database (EU-00-019) and the Balkan Dry Grassland Vegetation Database (EU-00-013) for territory out of NATURA 2000 network.
Results: The study area is covering 441 km^2 and only 29% of it is falling into NATURA 2000 network in Bulgaria. Totally 21 habitat types protected by the Habitat Directive 92/43/EEC were found and are covering 12773.5 ha. Woodland vegetation has widest distribution (8448.3 ha) as *Asperulo-Fagetum* beach forests (9130), Pannonian-Balkanic turkey-oak-sessile oak forests (91M0) and *Castanea sativa* woods (9260) occupy the largest area. Shrubbland and grassland habitat types are covering 2231.2 ha. Totally they covered 10679.5 ha or 24.2% from the study area.
Conclusion: The Strumeshnitsa river watershed is characterized by a great diversity of habitat types, which is determined by a wide variety of abiotic conditions (altitude, slope, geology, soil types, etc.). This analysis shows the existing distribution and state of analyzed habitat types and what is the gap of information about this.

Keywords: Directive 92/43/EEC, NATURA 2000 sites, vegetation, spatial distribution

P01_16

FLORISTIC INVESTIGATION OF "RILOMANASTIRSKA GORA" RESERVE, RILA MTS, BULGARIA

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Aim: The aim of the study is to investigate the diversity of Pteridophytes and Spermatophytes on the territory of "Rilomanastirska gora" reserve with reference to development of its management plan.
Material and Methods: The information was collected during field trips using the transect sampling method. During the analysis and summary of the results we took into account all available data from the literature as well as the data from the herbarium collections.

Results: A total of 816 species of Pteridophytes and Spermatophytes were established on the territory of "Rilomanastirska gora" reserve, belonging to 81 families and 356 genera. The biggest group is *Magnoliophyta*, numbering 782 species. *Polypodiophyta* were represented by 20 species, *Pinophyta* by 10 species and 2 species for each *Lycopodiophyta* and *Equisetophyta*. The most species-rich families were *Asteraceae* (101), *Poaceae* (64), *Caryophyllaceae* (50), *Rosaceae* (50), *Fabaceae* (41). The most rich in numbers of species were the genera *Carex* (14), *Festuca* (13) and *Trifolium* (13). The species with conservation concern from the reserve were 90. They were separated in the following groups: 39 protected by the Bulgarian Biodiversity Act; 44 included in the Red List of Bulgarian plants (critically endangered – 8, endangered – 14 and vulnerable – 22 species); 26 species appear in the Red Book of Bulgaria. Furthermore, 10 Bulgarian and 52 Balkan endemics were encountered.
Conclusion: The group of Pteridophytes and Spermatophytes in "Rilomanastirska gora" reserve can be considered as relatively well studied, despite the fact that due to the difficult terrain where the data are scarce or absent.

Acknowledgments: The study was conducted within the project "Development of a management plan for "Rilomanastirska gora" reserve.

Keywords: Bulgarian flora, floristic analysis

P01_17

DISTRIBUTION OF PEREGRINE EARTHWORMS (LUMBRICIDAE) DUE TO AFFORESTATION AND LAND USE IN SOFIISKA MOUNTAIN (PART OF WESTERN BALKAN MOUNTAINS, BULGARIA)

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"N. Poushkarov"

Aim: The aim of this work is to describe the distribution of peregrine earthworm species in different biotopes due to afforestration and land use of Sofiiska Mt. (part of Western Balkan Mts.).

Materials and Methods: Earthworms were collected by the diluted formaldehyde method complemented with digging and hand sorting. Specimens were described and dissected under low power microscope.

Results: This paper focuses on presenting the first research results on earthworm (Lumbricidae) fauna from the Sofiiska Mountain (part of Western Balkan Mts., Bulgaria). During the investigations six earthworm species were recorded altogether. Earthworm communities were dominated by peregrine species: *Aporrectodea rosea* (Savigny, 1826), *Lumbricus terrestris* Linnaeus, 1758 and *Octolasion lacteum* (Örley, 1881). Autochthonous lumbricids were found only in the old-growth forests.

Conclusion: The exploration revealed that afforestation and agriculture lead invasion of peregrine earthworms. The invasion species were characterized with a wider ecological tolerance replacing the autochthonous earthworm fauna. The secondary deciduous and coniferous forests have dense populations of peregrine species. Endemic and native earthworms were almost entirely replaced by peregrine species.

Acknowledgments: I would like to kindly thank Dr. Miglena Zhiyanski (Department of Forest ecology, Forest Research Institute - BAS 132, Sofia, Bulgaria) for her useful comments.

Keywords: earthworms, Lumbricidae, afforestation, Balkan Mts., Bulgaria.

P01_18

SPECIES RICHNESS OF *DENDROBAENA* (OLIGOCHAETA: LUMBRICIDAE) GENUS IN TURKEY AND BULGARIA

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Aim: The aim of this work is to present a review on the species richness of earthworms from *Dendrobaena* genus (Oligochaeta: Lumbricidae) in Turkey and Bulgaria.
Results: The present study provided the first list of *Dendrobaena* earthworm taxa of Turkey and Bulgaria. In the explored region are recorded 33 earthworm species from *Dendrobaena* genus. 28 taxa are registered from Turkey. In Bulgaria are distributed 9 *Dendrobaena* species. Five taxa were registered both to the territory of Turkey and Bulgaria. The genus is highly endemic. Restricted and larger endemic earthworms take part with 14 taxa (42.4%). Peregrine species take part only with 3 taxa (9%).
Conclusion: Among the lumbricid genera on the territory of Turkey and Bulgaria *Dendrobaena* is the species richest genus. The exploration revealed that there is need of conservation strategy about the numerous groups of rare and endemic species from the *Dendrobaena* genus to prevent extinction. More detailed investigation is needed because large areas of Turkey and Bulgaria have not been yet explored properly for earthworm biodiversity.

Keywords: biodiversity, earthworms, *Dendrobaena*, Lumbricidae, Turkey, Bulgaria.

P01_19

BIODIVERSITY IN REPUBLIC MACEDONIA

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The abundance and heterogeneity of species and eco-systems are the main characteristic of the biological diversity in the Republic of Macedonia. Such conditions are the result of the specific geographical position, climatic, geological, geomorphological, hydrographic, pedological and other characteristics as well as the changes that took place in the past geological periods (end of Tertiary, the Glacial and the Post-Glacial period). All this has left deep traces on the recent flora, fungi and fauna which is proved by the many relics species and eco-systems. Such richness, according to the knowledge available at the moment, can be presented through an imposing number of over 18.000 taxons of flora, fungi and fauna out of which 900 taxons are Macedonian endemites as well as the great diversity of eco-systems within the frames of which over 260 plant populations are registered. According to the analyses of the abundance of the biodiversity of individual countries within the European continent, Republic of Macedonia is on the very top of the list of states known as "European Hotspots". Despite the fact that the diversity of the flora and fauna has still not been explored to a sufficient depth, still, according to the knowledge gained so far, it shows an enormous wealth. At certain localities, on a relatively limited area, the diversity of invertebrates can even be matched with the diversity of the coral rifts and is even greater in individual cases.
Key words: eco-systems, biodiversity, biological diversity, environment

THEMATIC SESSION II
LANDSCAPE ECOLOGY

PL02_01

LANDSCAPE ECOLOGY AND BIODIVERSITY

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Aim: The main objective of the paper is to reveal the relationship and interaction between hierarchical systems of biodiversity occurring in geographic space.

The international conventions and biodiversity directives, and their application in Bulgaria are analyzed. The hierarchical systems of the complex scientific category biodiversity in its genealogical and functional nature as genetic, species, syntaxonomic, ecological and landscape diversity are discussed. The existing classification systems for landscapes differentiation in Bulgaria are compared and analyzed. It is assumed that the inventory of habitat diversity in our country is crucial for landscapes differentiation. The existing possibility of overlapping of boundaries between a landscape type or an elementary landscape, and a habitat type should be seen as the exception, not the rule. It was found that the problem of creating a unified European system for the classification of landscapes meeting the priorities of the European Landscape Convention is not yet solved and the conclusion that the development of a universal classification system of landscape looks increasingly hardly realizable is made. The existing diversity of classification systems for differentiation of landscapes rather repels than attracts research interest in the field of landscapes and in that context the use of the European Classification System LANMAP2 has positive significance as a methodology for landscape studies in Bulgaria.

Keywords: Habitat type, Landscape differentiation, Directive 92/43/EEC, Landscape Convention.

L02_01

INDICATIONAL IMPORTANCE OF THE HEMEROBY INDEX IN THE LANDSCAPE ASSESSMENT AND MONITORING OF MALA PLANINA

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Aim: The main aim of the study is to analyze the importance of the hemeroby index in landscape assessment and monitoring of Mala Planina.
Materials and Methods: Investigating the significance of the hemeroby index as an indicator in landscape assessment and monitoring of mountain areas is crucial. Hemeroby levels are interpreted as degrees of anthropogenic transformation and defined in accordance with the hemeroby criteria basis. The investigation has theoretical and practical importance. Cameral and preparatory terrain research of the habitat types is done. The study is based on a landscape map and map of the habitats in Mala Planina.

Results: All possible factors for differentiation are considered. The presented map of the hemeroby points out the contrasts in Mala Planina.
Conclusion: The anthropogenic influence in Mala Planina is indisputable and it is proved by revealing the hemeroby index of the territory. The results can be used for the creation of plan for the development of this mountainous area.

Acknowledgments: This research is sponsored by the "National, European, and Civilizational Dimensions of the Culture – Language – Media Dialogue" Program of the "Alma Mater" University Complex for the Humanities at Sofia University "St. Kliment Ohridski ", funded by the Bulgarian Ministry of Education, Youth and Science Scientific Research Fund

Key words: hemeroby index, landscape assessment, habitats, Mala Planina

L02_02

SPATIAL AND TEMPORAL ANALYSIS OF VEGETATION CANOPY AND THEIR RELATION WITH SLOPE PROCESSES IN ZEMEN GORGE (WEST BULGARIA)

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The Zemen Gorge is one of the Struma River's 12 gorges, located between Konjavska and Zemenska Mountains in the Kraishte Region, part of the transition area between the Balkanides belt and the Rhodopes Massif. Its steep slopes are shaped by various processes such as rock falls, rock slides, gully erosion, sheet erosion, soil creep, etc.
Aim: The velocity, intensity, frequency and spatial distribution of slope processes are closely related to presence or absence of vegetation and its type – forest or grass canopy. Therefore mapping and monitoring of vegetated and not vegetated areas are considered to be aim of presented paper.
Materials and Methods: Multispectral imageries from satellites Landsat 5 TM, 7 ETM+ and 8 OLI/TIRS from 1990 to 2015 are used to derive Normalized Difference Vegetation Index (NDVI) in order to determine the level of greenness and to classify the land cover. This approach allows detection of changes in the land surface at a spatial resolution of 30 m.
Results: Non-vegetated areas are extracted and represented as a percent of total area of interest. The results are compared with open source aerial imageries (Bing maps, Google maps) and field observations.
Conclusion: Presented results show locally relevant information for land cover dynamics. They play important role for the stability of surface material, landscape management, ecoforcasting and sustainable territorial development.

Key words: slope processes, vegetation, remote sensing, NDVI, GIS

P02_01

ASSESSMENT OF POTENTIAL ORGANIC POLLUTANTS IN LEACHATES FROM BULGARIAN LIGNITES

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Aim: The aim of the study is characterization of leachates from Bulgarian lignites and subsequent appraisal as potential organic pollutants in groundwaters.
Materials and Methods: In this study, lignites from Maritza and Sofia coal basins, i.e. "Maritza-East" and "Stanianci" mines, were subjected to water sequential extraction at 25 ^{0}C for 8 weeks. The process was tracked by pH and conductivity. The freeze-dried products were characterized by yield, technical and elemental analysis. Leachates were characterized by a set of analytical techniques, i.e., X-ray photoelectron spectroscopy (XPS) and Infrared spectroscopy (IR).
Results: Chemical structural assignments of each component were made by curve-fitting method of the XPS, taking into account the binding energies reported for C-, N- and S- functional groups. The main surface species include carbon atoms in aromatic and aliphatic structures in Maritza and Stanjanci extraction residues and their contribution is 48-53 atomic % from all C 1s signal. In our samples the most intensive N 1s signal is for pyrroles and amines at 400 eV (1-3at. %). The main abundant sulphur form is for inorganic sulphates while the other ones are less than 1%. In this case the Maritza sample sulphatic sulphur content (13.6%) is almost seven times higher than the same for Stanjanci. The FTIR spectra of the fractions show mainly the existence of oxygen-containing functional groups.
Conclusion: The analysis at molecular level showed that the leachates contain compounds such as benzene carboxylic acids and their derivatives, short-chain aliphatic diacids, fatty acids and polyols.

Keywords: Lignite, Leaching, XPS, IR, Groundwater, Ecology

THEMATIC SESSION III

ECOSYSTEM RESEARCH, SERVICES AND ECOLOGICAL AGRICULTURE

PL03_01

THE ADVANTAGES OF ORGANIC FARMING ON THE ENVIRONMENT

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Many changes which occur in the environment, and have long-lasting occur slowly over an extended period of time. Organic farming provides medium- and long-term effect of the impact on the agro-ecosystem. It aims to produce food in conditions of ecological balance, preventing the depletion of soil fertility or the occurrence of pest problems. Organic farming uses a preemption method, as opposed to the method of solving problems after they arose

Organic farming has a positive impact on natural resources; it contributes to the processes of interaction within the agro-ecosystem, which is vital for agricultural production, and for conservation.

Thus, a positive impact on the environment is factors in the formation, conditioning and stabilization of soil, waste management, carbon sequestration, nutrient cycling, pollination and protection of the environment. Choosing to store organic product, the consumer contributes to the development of the agricultural system, which is less polluting. In terms of natural resource degradation hidden costs of agriculture on the environment is now declining.

Key words: agro-ecosystem, pollination and protection of the environment

PL03_02

PALEOECOLOGICAL STUDIES OF LAKES IN THE RILA MOUNTAINS

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Lake sediments provide a reliable archive of the envinronmental, climatic and vegetation changes in the past. For the period 2000-2015 sediments from several lakes located in the Rila Mountains were investigated by pollen analysis, radiocarbon dating, macrofossil determination, diatom analysis, organic content, luminescence dating. The basic tasks of these studies were: to reconstruct the fossil flora, the vegetation dynamics and the trends in tree taxa migration during the postglacial time; to establish a regional radiocarbon chronology of the paleoenvironmental changes recorded; to distinguish which climatic fluctuations had influenced the transformations in the vegetation and the development of the lakes; to evaluate the degree of the anthropogenic impact on the plant cover since the Neolithic time. The results revealed that sedimentation in the glacial lakes had started about 18000 years ago after the retreat of the cirque glaciers. The Lateglacial interval (15000-11600 years ago) was characterized by the alternation of cold/warm/cold phases with relevant responses of the vegetation at high-mid altitudes. The onset of the Holocene climatic amelioration started with afforestation by birch, groups of pines and mixed oak forests (11600-7900 years ago), followed by the formation of a coniferous belt (7900-5200 years ago) dominated by fir and pines. The last tree immigrants 3400 years ago were spruce and beech. Indications of human activities in the Rila Mountains were recorded since the Late Bronze Age (3400 years ago). The data from these studies could be successfully applied in palynological, paleoecological and paleoclimatical reconstructions and for simulation models of future environmental changes.

Keywords: lakes, paleoecology, vegetation, radiocarbon chronology, paleoclimate, Rila Mountains

PL03_03

MODELING OF FOREST ECOSYSTEM SERVICES

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Aim: The study deals with development of formal models for ecosystem assets and supply assessment as well as ecosystem services valuation and adaptive usage management. Mathematical models for valuation of ecosystem services are developed (Lyubenova, 2016) etc. The main objective in ecosystem services assessments should be to provide decision makers some macro-level information that supports understanding the relative state and importance of different ecosystems. Usually, there will be a limited set of resources available to influence ecosystem condition and capacity and hence choices must be made

among a range of investment options (Lyubenova, 2014). One of the latest attempt to create a web- and software based decision-making system that integrates two models – supporting forest management model and supporting forest state assessment was published by Lyubenova et all. (2015 a b c) that was realized during the ForEco project (FIWARE). The published models cover a part of the material ecosystem services. Detailed models that are web-based, given possibilities to calculate the available assets of ecosystems and cash equivalents as well as support environmental management of forest resources (DSS) are extremely necessary.

Materials and Methods: The developed ForEco system consists of three original models: 1) mathematical model for ecosystem asset, supply and services assessment and valuation**;** 2) web based model for forest ecosystem state and climate impact assessment by SP-PAM application and Value based model (VBM) for integrated assessment. The model (2) is based on dendrochronology analyses and SP-PAM software. The model (3) represents a multiattribute utility function, developed on the Decision making theory, Utility theory and stochastic approximation technic used as machine learning. The utility functions were calculated using the preferences of the Decision maker (DM), professional in forest ecology and environmental protection. The detailed methodology was published by authors (Lyubenova et al. 2015 a b).

Results and Discussion: The set of formal definitions and functions are developed in model (1) related with evaluated ecosystem unit (EU) - Natural capital value function and Ecosystem service function: Tree reserves and Total tree value function (Timber value function, Wood chips value function and Firewood value function); Herbal reserves and Herbal value function; Mushroom reserves and Mushroom value function; Game reserves and Game value function; Fruit reserves of an Ecosystem unit and Fruit value function; Soil type and Soil value function; Rock type and Rock value function. For (2) the set of indicators were involved for the forest state assessments: number of eustress periods; their duration, frequency and depth; eustress years (unfavorable climatic type of years), reactive tree functional type and eustress-climatic predictive patterns. For (3) we accept tree indicators (sub-objectives or factors) adequately describing the main objective of investigation: X_1 - timber reserves ($m^3.ha^{-1}$) as representing criteria for the assessment of economic effects or material services; X_2 - species richness ($n.ha^{-1}$) as representing criteria for the assessment of ecological effect, or regulating and supporting services and X_3 - percentage of population employed in the forestry sector as representing criteria for the assessment of social effect or services. The model is developed as multiattribute utility function with the three factors mentioned. The coefficients of function were calculated using the preferences of ecology and environmental professional.

Conclusion: ForEco was developed to extract human knowledge and decision making patterns. The models are applied to simulate the decision making process of ecology and environmental professional to maximize the utility function for a clearly defined goal. ForEco system support adaptive ecological management of forest areas to achieve their sustainable development and operation as a natural source of ecosystem services. Potential ForEco users are policy makers, governmental and municipal organizations (forest and landscape planners), experts from the Green Economy, Agricultural and Forestry sector, as well as the research and innovation organizations. The access will provide to citizens, educational organizations and NGOs, who are interested and engaged in the project area of applications.

Acknowledgements: The research and the article are the results of joined efforts of a cross-functional team financed by the Finodex accelerator.

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L03_01

MAPPING OF ECOSYSTEMS IN BULGARIA BASED ON MAES TYPOLOGY

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According to Action5 of the EU Biodiversity strategy until 2020 the member states have to map and assess the state of ecosystems and their services in their national territories. A Working Group on Mapping and Assessment on Ecosystems and their Services (MAES) was set up to underpin the effective delivery of the strategy. MAES provided the methodological framework which includes the typology for mapping of ecosystems at the European scale. Its main part is organized in two levels and its structure enables applying the CORINE Land Cover (CLC) data for spatial delineation. It is relevant for EU policies and it is compatible with global ecosystem classifications.

The main objective of this paper is to present the spatial distribution of the ecosystems in Bulgaria based on MAES typology and their dynamics for a 20 year long period. We utilize CLC data to delineate and map ecosystems in Bulgaria. The information of ecosystems was organized in GIS database which includes data about four time series: 1990, 2000, 2006 and 2012. The ecosystems' dynamics for the periods 1990-2000, 2000 – 2006 and 2006-2012 were analyzed.

The results show that *Cropland* and *Woodland and forest* ecosystems are the most spread in the country with 48% and 38% respectively. *Grassland* ecosystems occupy about 7%, *Urban* ecosystems about 5% while the others occupy less that 1% of the country's area. The area of *Urban* ecosystems show a steady increase until 2006 while the area of *Woodland and forest* ecosystems gradually decreases during the whole studied period.

Key words: Biodiversity strategy, CLC, ecosystem dynamics, GIS

L03_02

ARTIFICIAL REEFS IN THE BLACK SEA – A CASE STUDY OF THEIR ECOLOGICAL IMPACTS AND FUNCTIONS

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The purpose of this study was to monitor and quantify the development and the ecological effects and potential impacts of a novel artificial underwater installation in the coastal zone of the Bulgarian Black Sea.
Materials and Methods: The study combined scuba samplings of the development of the reef epibiota, with monitoring of physical, chemical and biological water quality parameters, sampling of sediments and infauna communities around the reef area, and surveys of the ichtyofauna.
Results indicate that the reef provides optimal conditions for the development of *Mytilus galloprovincialis*, which had colonized up to 95% of the reef surface 9 months after its deployment at sea, with a total biomass of 620 kg. The mussel bioceoenosis hosted a well developed zoobenthic (20 species) and ichtyofaunal communities (5 fish species, 2 invertebrates), and had a substantial influence on water column properties, due to the high mussel water filtering capacity (~464 m^3. $hour^{-1}$), plankton removal rates ($5{,}48*10^{12}$cells.$hour^{-1}$), and release of N-NH_4 ($1{,}08*10^3 g.h^{-1}$). This coincided with an increased nitrate, phosphates and chl-*a* concentration, a 'cloud' of phytoplankton downstream from the reefs, and is probably a direct result of the release of nutrients by the reefs' *M. galloprovincialis* coenosis. Despite this increased activity, no change in the sediment OM content and abundance, diversity and ecological state of zoobenthic communities in stations adjacent to the reefs was detected.
Conclusion: The studied artificial reefs provided suitable conditions for the development of an active benthic biocenosis with pronounced local effects on the water quality and pelagic ecosystem.

Acknowledgements: This study was financed by the Bulgarian Biodiversity Foundation project Research and Restoration of the Essential Filters of the Sea (REEFS) 1.2.1.65869.86 MIS-ETC 280 / grant contract no.40921/30.05.2012, which is a pilot project financed and implemented in the frame of The Black Sea Basin Joint Operational Programme 2007-2013

Key words: artificial reefs, Black Sea, *M. galloprovincialis*

L03_03

NATURAL REGENERATION OF ORIENTAL BEECH (*FAGUS ORIENTALIS* LIPSKY) IN FOREST ECOSYSTEMS OF STRANDZHA MOUNTAIN, SOUTHEAST BULGARIA

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The aim of this study is to analyse the rate of natural regeneration of Oriental beech forests and the possible role of basic environmental factors in a view of the sustainable management of the forest ecosystems.
Materials and Methods: The study was conducted in Oriental beech forests (*Fagus orientalis* Lipsky) in the "Strandzha" Nature Park, in the Bulgarian part of the Strandzha Mountain, Southeast Bulgaria. The

natural regeneration of Oriental beech was studied on 27 permanent research plots, which were sampled during three successive years - from 2012 to 2014. They were distributed in four conditionally different types of forest stands, regarding to the understory cover. The species composition, quantity, quality and height classes of seedlings and samplings were assessed according to the transect method. Data on the basic climatic, site and forest stand characteristics was gathered and tested for significant effects on the number of seedlings and their height classes.
Results: The results obtained indicated, that the number of seedlings varied significantly among the PRPs, ranging from considerable density of the seedlings to the complete absence of any. The distribution of the Oriental beech seedlings among the studied height classes indicated, that the highest number of individuals fell into the first two height classes. The results from the statistical analyses clearly indicated, that the set of the studied climatic variables significantly affected both the total number of Oriental beech seedlings/m^2 and the number of seedlings in the studied height classes
Conclusions: In conclusion, the rate of natural regeneration of Oriental beech forest in Strandzha Mt. is in general very low. The successful regeneration will depend on the correct and adaptive ecosystem management methods, assisting natural regeneration, especially under conditions of a changing climate.

Key words: natural regeneration, seedlings, Oriental beech forests, climate change

Acknowledgments: This study was supported by the Institute of Biodiversity and Ecosystem Research (BASc) and partly by Project RD 08-266 of Shumen University. We would like to thank Regional Forest Directorates in Malko Tarnovo, Kosti and Gramatikovo for their assistance in the fieldwork and providing historical data.

L03_04

ROTIFER COMPLEXES IN THE PLANKTON OF THE SREBARNA LAKE (BULGARIAN DANUBE FLOODPLAIN)

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Aim: The aim of this study was to describe the patterns of spatial distribution of the rotifer plankton community in the Srebarna Lake in respect to the seasonal changes of its composition and abundance.
Materials and Methods: Investigations cover the period from 1999 to 2011. Sampling was performed seasonally at 4 to 12 sites covering representative plankton habitats within the lake. Zooplankton samples were collected seasonally from the surface water layer with a depth up to 0.8 m. Some relevant parameters of the water were measured simultaneously. In the laboratory processing after the species identification of organisms their number was determined. The abundance was calculated as the number of individuals per 1 m^3.
Results: Maximum species richness of rotifers occurred in late spring and minimum – in winter when the maximum abundance occurred. Within the rotifer community were identified relatively compact groups of 2 and more genera and species called “rotifer complex”. The spatial distribution and species composition of these complexes changed throughout the seasonal succession of plankton community under the influence of the seasonal dynamics of water depth, temperature and transparency and of other environmental factors.
Conclusion: Rotifer complexes including 2 or more genera and species occur within the zooplankton community of the Srebarna Lake. They change throughout the seasonal succession of plankton community which generally follows the PEG model.

Acknowledgements. The investigations were carried out under the projects: “Complex ecological monitoring of the Srebarna Biosphere Reserve”, Biological Diversity of Wetlands Aquatic Ecosystems on the Flooding Terrace of the Lower Danube and Optimization of the Ecosystem Functions in Conditions of Climatic Changes”, “Models of interactions between neighboring lotic and lentic ecosystems along processes of the aquatic communities recovery and development in the terrace of the Lower Danube” and WETLANET.

Key words: Srebarna Lake, zooplankton, Rotifera, seasonal dynamics

L03_05

WATER CHEMISTRY OF TWO RIVERS IN VITOSHA AS A PART OF THE ECOLOGICAL STATUS AND INTEGRITY ASSESSMENT

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Aim: The national regulations for characterization of surface waters were applied aiming to evaluate the physico-chemical status of two rivers in Torfeno Branishte Reserve (TBR), Vitosha National Park as a part of complex ecological state assessment.

Material and Methods: Vitosha is the oldest natural park in Bulgaria and on the Balkan Peninsula, which supplies partially the City of Sofia with drinking waters. TBR protects some of the oldest and most valuable peat in Europe. Stream water chemistry at the reserve was assessed on the basis of available and “in-situ”data. Water samples were collected during a field campaign in 2015 from the two main rivers in TBR - Vladajska and Bojanska and analyzed for dissolved oxygen (DO), pH, conductivity, biological oxygen demands (BOD_5) and some major inorganic ions ($N\text{-}NO_3$ $N\text{-}NH_4$, Cl^- and SO_4^{2-}) according to the standard methods.

Results: Both rivers in the reserve were assessed in "high" physico-chemical status as regards parameters conductivity, BOD5 and nitrate content and "good" according to relatively low content of dissolved oxygen. The waters of Boyanska river met the "high" status for pH and "good" for ammonium nitrogen. Controversially, Vladayska river was in "high" status for ammonium nitrogen, but its waters were weakly acidic and corresponded to a "good" one for pH, according the national water regulation criteria.

Conclusions: The water chemistry results for TBR could serve as type specific reference conditions both in accordance with the requirements of FWD and for evaluating the ecological integrity of aquatic systems and their services.

Key words: water chemistry, Vitosha, Bojanska river, Vladajska river, ecological quality assessment

P03_01

ANTHROPOGENIC LOADING ON SOILS AND IMPACT OF LAND USE ON SURFACE AND GROUNDWATER QUALITY

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The aim of this study is to present the results on surface and ground water quality monitoring on the territory of a small watershed.
Materials and Methods: The pilot site is the Parvomaitsi village (near to the town of Veliko Tarnovo) in Northern Bulgaria. The fluctuation of the groundwater table was monitored at permanently build pipe wells and home wells. The samples for analysis of the surface water were taken at different sites of the Yantra River. The investigation has been conducted in 2013 year.
Results and discussion: It was established that the surface and ground water samples had neutral to alkaline reaction. The content of nitrate in the shallow groundwater varied in a large range. The calcium and magnesium concentrations did not exceed the maximum permissible level in the standard for drinking water. It was monitored a significant variation in the data for hydro-carbonates content. Clorine and sulphate contents in the groundwater could be characterised with a considerably low variation.
Conclusion: The information will be used as a methodological approach in further environmental impact assessment on a watershed level.

Acknowledgements: Part of this study was supported by the Ministry of Education and Science, Contract No DFNI – E01/3/2012.

Key words: anthropogenic loading, land use activities, monitoring, surface and ground water, chemical elements, environment protection

P03_02

TAXONOMIC AND ECOLOGICAL CHARACTERISTICS OF THE COLLEMBOLA FAUNA IN DIFFERENT AGROECOSYSTEMS

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Aim: The insects of order Collembola (Apterygota) as representatives of soil fauna have a strong influence on the soil processes which are of importance for agricultural crops. The aim of these studies was to investigate the Colembola fauna in different agroecosystems, by establishing the degree of divergence between its populations in different crops.
Materials and Methods: The results in this work are obtained on the basis of route surveys. The agricultural crops (strawberry plantation, raspberry plantation, cabbage crops) were selected during the vegetation period.
Results: In the studied agroecosystems, 37.1% of the identified species were hemiedaphic, 32.3% euedaphic and 9.3% atmobiont. The hemiedaphic life forms dominated in the cabbage crops. The euedaphic life forms were established in high population density in the strawberry and raspberry plantations. With regard to food sources the collembolans established species were divided into three

ecological functional groups: phytophage, predator and saprophage. The group of predators was the smallest, and the most numerous were the saprophage. The phytophage population of *Onychiurus* spp. has the highest density into the cabbage agroecosystems. The studies allow evaluating the found differences in the collembolans species composition in the monitored agroecosystems.

Keywords: Collembola, species composition, agroecosystems

P03_03

USING RC DRONES FOR PLOTTING IN DIFFERENT ECOSYSTEM TYPES

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Using radio controlled (RC) drones for aerial photography can give scientists additional possibilities for research in different ecosystem types. From quick estimating of plant cover to getting aerial images of swamps or steep cliffs and rocks, this technique proves to be efficient for small areas, also when plot sampling is the main research method.
The aim of the study is to test the potential of aerial photography, done by widespread camera-equipped RC drone models, for gathering information about plants in small areas or plots.
Materials and Methods include using a RC drone for shooting straight-down footages from altitude up to 400 m, and horizontal footages from a distance up to 150 m (for vertical surfaces or forest borders). Study areas are situated in Vitosha Mountain and areas of Northwestern Bulgaria. Images are used for modeling plants in GIS environment.
Results: Using images from RC drone is most useful when a successful georeferencing can be performed. All images contain spatial deformations, which vary in different image parts. Therefore it's recommended to make footages from maximum distance, depending on the specifications of the camera type, in order to receive clear high quality images. Also, only the central part of the image is being processed, where spatial deformations are minimal. The GIS models have been used for estimating the plant/tree canopy cover, plant number and dimensions (tree height and crown diameter, tuft/group size), density and distance between trees/tufts. Successful image analysis may result in separate modeling of each plant/tuft unit from a plot in a GIS geodatabase environment, where values for all indicators are organized as related attribute tables.
Conclusion: The study continues on with the aim to improve the methodologies for taking aerial footages and image processing in order to receive more accurate models of the plot area, and to increase the number of indicators which can be assessed within the GIS-modeling environment.

Acknowledgments: SPA-Ecoservices project

Keywords: aerial images, drone, GIS, plots, plant modeling

P03_04

MONITORING NITROGEN LEACHING IN ARABLE FIELDS AND ECOLOGICAL ASPECTS

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The purpose of this investigation is to study nitrogen leaching in arable fields and evaluation of the best management practice.
Materials and Methods: The pilot site is the Tsalapitsa village (near the town of Plovdiv) in Southern Bulgaria. The field experiment was conducted to assess the nitrogen leaching of arable Fluvisols. Potatoes crops were growing during the experimental 2014 year. Fertilizer of 100 kg P ha^{-1} and 100 kg K ha^{-1} was applied to each plot. The nitrogen rates were fallow: N_0, N_{60}, N_{100} and N_{140}. Leaching losses were determined using the Ebermeir lysimeters located at 0.5 and 1.0 m soil depth. Samples of lysimetric waters were collected at approximately 1-month intervals and analysed for nitrogen content by "Spectroquant Pharo-100".
Results and discussion: The data show that when growing potatoes on an alluvial soil the leaching of nitrate nitrogen is the greatest of the maximum fertilization rates N_{140} – 12.8 kg.ha^{-1} for the 0-50 cm soil layer and from variant N_{100} - 11.8 kg.ha^{-1} for the 0-100 cm soil layer.
Conclusion: Experimental data show an increase in loses of nitrate nitrogen from the variants of fertilization which have been observed at the maximum fertilization rates for potatoes crops.

Acknowledgements: The work was supported by the Agricultural Academy project POZM-158.

Key words: fertilization, potatoes, leaching of nitrates, lysimetric waters, agricultural practices.

THEMATIC SESSION IV

BIOTIC AND ABIOTIC IMPACT ON THE LIVING NATURE AND MECHANISMS OF ADAPTATION

PL04_01

ON THE POSSIBLE CONTRIBUTION OF HSP70B AS A MARKER FOR OXIDATIVE STRESS AND/OR FOR CELL PROTECTION

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The aim: In this review we have made an attempt to throw more light on the possible contribution of HSP70B as an early warning marker for oxidative stress and/or as a not specific cell defense mechanism.
Results and discussion: Consistent functional properties of HSP70B as a mechanism of thermo-tolerance in plant species are confirmed. Based on our own results and data of other authors it could be

reasonable to assume that: i) higher constitutive content and well expressed overproduction of HSP70B are probably among of the factors that allow *Chlorella vulgaris* to survive at the extreme Antarctic environment; ii) overproduction of HSP70B could be proposed as an early warning and sensitive short-lived biomarker of oxidative stress. Commonly members of other HSP families have been recommended as biomarkers. For the first time we identified homologue of chloroplast HSP70B in Chlorella chloroplasts.

Our experimental finding that HSP70B induction correlates with the magnitude of oxidative stress contributes to the still unresolved challenge for identification of reliable markers for screening of genotype resistance/susceptibility to oxidative stress. The development of plant-based biomarker test system corresponds to the strategies for protection biodiversity preservation and genome stability of plant populations.

Conclusion: Naturally, more data are needed to give a simple answer to all the questions we put here. However, the beginning was placed.

Keywords: Abiotic stress, Cell resistance, Heat shock proteins, Chloroplast chaperones, Antioxidant enzymes, Glutathione-S-transferase, Paraquat, Chlamydomonas, Chlorella, stress proteins.

PL04_02

HAZARDS OF Cd CONTAMINATION

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Cadmium contaminates the environment *via* the mining and smelting of lead, zinc and copper, polyvinylchloride and pigments production, nickel-cadmium batteries and anticorrosive agents manufacturing. In the nuclear power plants, cadmium serves as neutron absorber. Many phosphate fertilizers also contain high amount of this metal. Cigarette's smoke is one of the major sources of cadmium. In this paper, we summarized food containing cadmium and recent toxicological and epidemiological studies which show the harmful and carcinogenic effects of cadmium on human. Low cadmium concentrations damage the respiratory, gastro-intestinal, reproductive and nephrous systems. Additionally, cadmium leads to bone fractures, calcium dismineralization and is pronounced cancer inductor. Molecular mechanisms of zinc replacement by cadmium in the enzymes, inhibition of apoptosis, suppression of DNA-reparation mechanisms and the modification of the transmembrane glycoprotein – E-cadherin are major fields under investigation

Aim: Present study aimed investigation of Cd concentrations in soil and water samples collected in the area of biggest in the Balkan peninsulaPb-Zn smelter - KCM, near the town of Plovdiv, Bulgaria. Additionally, an overview of Cd toxicity on humans will be presented.

Materials and Methods: ICP-MS analyses

Results: Obtained results demonstrated pollution of both soils and waters in the area with Cd, exceeding the Maximum Permission Limit in times.

Conclusions: Recently built in KCM WWTP reduced significantly the heavy metal, incl. Cd release in the environment.

L04_01

ROLE OF GENOTYPE AND EXPERIMENTAL DESIGN FOR *SACCHAROMYCES CEREVISIAE* DNA PROTECTION AGAINST ZEOCIN-INDUCED DOUBLE-STRAND BREAKS BY *CLINOPODIUM VULGARE*

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Aim: The aim of the study was to evaluate the role of genotype and experimental design for revealing the DNA protective potential of *Clinopodium vulgare* leaf extract.

Materials and methods: Two *Saccharomyces cerevisiae* strains were used: haploid - 551 and diploid - D7ts1. Zeocin (100μg/ml) was used as a standard DNA damaging agent. Aqueous *Clinopodium vulgare* leaf extract was kindly provided by the colleagues from Chromana LTD. Three concentrations were tested - 10, 100 and 1000 μg/ml. Double-strand breaks induction and repair were evaluated by constant field gel electrophoresis. Several experimental designs were applied: combined treatment with/without recovery time (RT) at optimal conditions (t=30^{0}C, 200rpm) and on ice. Two additional designs were applied on strain D7ts1 - split treatment without inter-treatment time (ITT) and 30 min RT - design 2 and design 3 - split treatment with 45 min ITT and 30 min RT.

Results: Both strains showed similar susceptibility to single zeocin treatment. Lack of DNA damaging effect was obtained after single treatment with the tested concentrations. Similar repair capacity of both strains was observed after single zeocin treatment.

Oppositely, the repair capacity of D7ts1 after combined treatment was 1.15-fold higher than this of 551. The results obtained after combined treatment of D7ts1 were compared to those obtained after split treatment - design 2 and 3. Reduction of DSBs levels was observed despite of the design. The most pronounced one was obtained in design 1 for concentration 1000 μg/ml. The repair capacity was more than 2.5-fold higher than that calculated in design 2 and 3.

Conclusion: Based on our data it could be suggested that the experimental design should be always taken into consideration when applying treatment with natural products.

L04_02

ASSESSING THE IMPACT OF UV-B RADIATION ON THE PHOTOSYNTHETIC APPARATUS OF TWO *PAULOWNIA* LINES GROWN IN SALINE SOILS

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Aim: This study examines the effects of the UV-B radiation on the functional activity of the photosynthetic apparatus of two lines of *Paulownia* (*Paulownia tomentosa x fortunei, TF* and *Paulownia elongata x elongata, EE),* grown in soils with different salinity.
Materials and Methods: The effects of the UV-B radiation (90 min) on the isolated thylakoid membranes were studied by pulse amplitude modulated (PAM) chlorophyll fluorescence, 77K chlorophyll fluorescence and determination of the oxygen evolution by polarographic oxygen electrodes (Joliot-type and Clark-type). Thylakoid membranes were isolated from plants grown in two soil types: with the electrical conductivity 6.3 mS/m^2 and 14.0 mS/m^2.
Results: The experimental results showed that the UV-B radiation leads to: (i) an inhibition of the quantum yield of primary photochemistry of photosystem II (Fv/Fm decrease) as a result of a decrease of the ratio of photochemical to non-photochemical processes (Fv/Fo); (ii) an impact on the interaction between Q_B with the plastoquinone pool and the kinetic parameters of the oxygen evolution; (iii) an increase of the energy transfer to the photosystem I; (iv) an influence on the energy transfer between pigment-protein complexes in the photosystem II. The impact of the degree of salinity on the UV-B induced changes were detected in *TF* line, but not in *EE* line.
Conclusion: Data in the present investigation revealed that high salinity increases the UV-B induced changes only in *Paulownia tomentosa x fortunei*.

Acknowledgements: The work was supported by the Bulgarian Academy of Sciences

Keywords: *Paulownia*, PAM chlorophyll fluorescence, oxygen evolution.

L04_03

ANTIMICROBIAL EFFECT OF NANOSTRUCTERED THIN FILMS

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Aim: To study antimicrobial activity of nanostructured thin films, deposited by r.f. magnetron sputtering for application in nanomedicine.
Materials and Methods: Thin films of Al_2O_3, Al_2O_3/Ag, TiO_2, Ag and bacterial strains *S. epidermidis*, *P. putida, B. cereus*, *E. coli* were used. Two methods for assessment of the antimicrobial activity of thin films were applied: diffusion assay and determination of the bacterial growth in dynamic regime. Two different methods for determination of the toxic effect – classical Koch’s method and optical density measurement were applied.
Results: The effects of different thin films were compared. As a result Al_2O_3/Ag bilayer thin films were the most effective against *P. putida.* Against *E. coli* they have bacteriostatic effect. The individual Ag

thin film had a pronounced antibacterial effect, during an extended adaptive phase of bacteria to 5 hours but the final effect was not bactericidal. The individual Al_2O_3 film had no effect against *E. coli*.
Conclusions: Some of nanostructured materials in this study have a potential for application as an antimicrobial agent. Synergy effect of Al_2O_3/Ag bilayer films in (formation of oxidative species on the sur in contact with the bacteria could be a reason for their bactericidal effect but in-depth study is further necessary.

Keywords: Al_2O_3, Al_2O_3/Ag, TiO_2, Ag thin films, antibacterial effect, nanomedicine

Acknowledgements: This work was performed with the partnership of Sofia University "St. Kliment Ohriski" and CL SENES, Bulgarian Academy of Sciences.

L04_04

INVESTIGATIONS OF THE SENSITIVITY TO CADMIUM STRESS IN TWO WHEAT GENOTYPES

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Aim: This study aims to examine the sensitivity of two wheat genotypes with different *Rht-B1* alleles: *Rht-B1a* (tall, control) and *Rht-B1c* (dwarfing, mutant) to cadmium stress.
Material and Methods: The effects of 100 μM $CdCl_2$ on the growth parameters and the photosynthetic activity of wheat seedlings grown hydroponically were studied by pulse amplitude modulated (PAM) chlorophyll fluorescence measurements, determination of the oxygen evolution by polarographic oxygen electrodes (Joliot-type and Clark-type) and pigment analysis.
Results: The obtained result showed that the wheat mutant (*Rht-B1c*) is more tolerant to cadmium stress compared with the control (*Rht-B1a*) as shown by the less inhibition of: (i) the photochemical activity of photosystem II expressed by the effective quantum yield (Φ_{PSII}), the photochemical quenching (qP) and the electron-transport rate through photosystem II (ETR); (ii) the photochemical activity of photosystem I; (iii) the oxygen evolution measured with and without the exogenous electron acceptor benzoquinone. In addition, the Cd-induced growth inhibition and pigment reduction are more pronounced in the control plants than in the *Rht-B1c* mutant.
Conclusion: The present study suggests possible contribution of the *Rht-B1* locus in the adaptive responses of wheat seedlings to heavy metal stress.

Acknowledgements: The work was supported by the Bulgarian Academy of Sciences

Keywords: Cadmium, photosynthetic activity, wheat seedlings

L04_05

ABIOTIC FACTORS INFLUENCING THE BEHAVIOUR OF MAMMALIAN MODEL SPECIES IN NP VITOSHA, BULGARIA

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Aim: The objective of this study was to determine how abiotic factors such as ambient temperature, humidity, rainfall, wind speed, atmospheric pressure and moon phase influence the behaviour of wild mammals.
Materials and Methods: To test this, we placed camera traps in two areas of NP Vitosha according to a predetermined grid between May and November 2015. The camera traps were set up to record the day, time, temperature and moon phase for each registration. We also obtained detailed information on the weather variables for each day of the study period. The four most frequently registered species were selected for analysis – roe deer (*Capreolus capreolus*, L.), red fox (*Vulpes vulpes*, L.), wild boar (*Sus scrofa*, L.) and red deer (*Cervus elaphus*, L.) and the number of independent registrations was used as a measure of their activity. The impact of each factor was assessed by applying generalised additive models (GAMs) in R.
Results: The results indicated that ambient temperature and atmospheric pressure influence the activity of the red fox and the roe deer. Humidity showed a significant effect on the behaviour of the red fox and wild boar (which was also influenced by rainfall). Wind speed affected only the roe deer's behaviour while moon phase showed no significant impact on the number of registrations of any of the species. There was no evidence to suggest that red deer was affected by any of these factors.
Conclusions: Different abiotic factors alter the behaviour of the focal species and these influences can vary in strength and direction.

Acknowledgements: This work was supported by project „Ecological and behavioral aspects of representative species of reptiles and mammals in model Natura 2000 zones" (Contract № 167/17.04.2015), funded by the Fund for Scientific Research of Sofia University. Camera traps were provided by the Directorate of NP Vitosha, acquired through Project № DIR-5113326-4-98 of Operational Program Environment 2007-2013.

Keywords: mammals, climate, activity, camera trap

PL04_03

ARCHAEA ECOLOGY AND DIVERSITY IN HEAVY METALS AND RADIONUCLIDES CONTAMINATED AREAS

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Archaea were relatively recently identified as a different kingdom of life. Some of them were previously analysed in an ecological context as bacteria. However, because their ecological niches often differ significantly from bacteria, Archaea diversity has only started to be explored in the last two decades. Until

now Archaea roles in ecosystems have only been unravelled to varied extents. The goal of this study is to expose recent research findings on the ecology and diversity of Archaea in heavy metal and uranium contaminated areas. The long-term impact of uranium and other metals on archaeal diversity at the former uranium- mining sites will be discussed. *Thaumarchaeota* were found to dominate in heavy metal and uranium contaminated areas, indicating their high metal resistance. Archaeal communities shifted their composition to adapt to heavy metal contamination, and all these changes were dependent on environmental characteristics, including pollution levels. Since ammonia-oxidizing archaea (AOA) are now thought to be an important ammonia-oxidizing population in natural environments. The presence of ammonium oxidizing *Thaumarchaeota* was documented by phylogenetic analysis of the sequences of an ammonia monooxygenase subunit A (*amoA*) gene in heavy metals and uranium mining sites. Our studies have suggested that archaeal nitrification processes in heavy metals and uranium affected areas are under the control of the same key factors controlling archaeal diversity.

L04_06

GLOBAL CLIMATE CHANGES AS HOT SPOTS OF ECOTYPE VARIATION: A CASE STUDY WITH *PLATANUS ORIENTALIS* L. (PLATANACEAE)

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Background: Current climate change is increasing the number and frequency of extreme weather events that will- and already do- affect the plant performance and distribution. *Platanus orientalis* L. (Platanaceae) is one of ecologically dominant tree in temperate regions in Europe and Asia. The phenomenon of its enhanced thermotolerance by isoprene has been recently proved, and may represent a potential adaptive trait to contrasting environmental conditions. Exposure of *Platanus orientalis* plants to elevated CO_2 results in substantial reduction of isoprene emission and the negative effect of high CO_2 concentration is strong enough to reduce significantly the stimulation of isoprene emission due to elevated temperature.
Hypothesis: With wide distribution of *Platanus orientalis* species, we expect high ecotype variation in its drought tolerance and local adaptation. Understanding ecotype variation will help predict how this species may respond to current and predicted future climate change. Because genetic diversity may be crucial for predicting a species ability to adjust to climate change, we investigated genetic and phenotype variation among five geographically distributed populations across Eurasia.
Results and Conclusion: The obtained results indicate high differentiation among populations, thus supporting our hypothesis that climatic disturbances may represent “hotspots” of evolutionarily significant genetic variation in *Platanus orientalis*. Our data showed that "isolation by environment" played a more important role than "isolation by distance" in population differentiation. The knowledge provided here will be used for future strategies for conservation and effective use of available genetic resources of the species.

Acknowledgments: This work was supported by the Bulgarian NSF under Grant DFNI-BO2/8.

Keywords: *Platanus orientalis*, Platanaceae, ecotype

L04_07

STATUS-QUO OF VIRUS DISEASES ON TOMATO CROPS GROWN IN SOUTHERN REGIONS OF BULGARIA

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Aim: The aim of this study is to identify the virus species currently spread on tomato crops grown in southern regions of Bulgaria using biological, serological and molecular methods.
Materials and Methods: Leaves and fruits samples with virus-like symptoms were collected from several tomato fields in southern regions of Bulgaria. The identification of virus agents was determined by DAS-ELISA. Antisera against eight of the most spread and dangerous viruses in temperate climatic zone were used. Virus isolates were characterized biologically by number of indicator plants. RT-PCR was applied also for differentiation of ToMV and TMV isolates.
Results: Based on DAS-ELISA results five viruses (CMV, ToMV, TMV, PVY, and TSWV) were identified in 60 out of total collected 79 samples. The most spread CMV and ToMV shared the same percent of distribution (27%). The both viruses were established in single as well as in a mix-infection with other viruses. Positive for PVY, TMV and TSWV were 17%, 8% and 2% of investigated samples, respectively. The ToMV and TMV isolates were successfully distinguished by a new degenerate and specific primer pair.
Conclusion: CMV and ToMV appear to be the most economically important viruses on tomato for the period of investigation. In view of the nature of the both viruses, easily transmitted mechanically (ToMV, CMV) and by vectors (CMV) emphasis must be paid on measures for controlling vector populations and phytosanitary procedures.

Acknowledgement: The authors acknowledge the financial support of grant № B02/4-2014 for project entitled: „Ecological methods and measures for control of viral and bacterial diseases of vegetable crops from *Solanaceae* family for quality production", funded by National Science Fund under Bulgarian Ministry of Education and Science.

Keywords: ELISA, indicator plants, RT-PCR, tomato

L04_08

DOES COMBINED TREATMENT WITH *CLINOPODIUM VULGARE* EXTRACT AND ZEOCIN PROTECT NUCLEAR DNA FROM ZEOCIN-INDUCED DAMAGES?

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Aim: to determine whether aqueous leaf extract of *Clinopodium vulgare* would reduce the damaging effect of zeocin after combined treatment.
Materials and methods: test-system - *Saccharomyces cerevisiae* strains 551 (haploid) and D7ts1 (diploid). *Clinopodium vulgare* aqueous leaf extract was kindly provided by the colleagues from Chromana LTD. Three concentrations of the extract - 10, 100 and 1000 μg/ml and 100μg/ml zeocin as a standard radiomimetic were used. The effect of combined treatment was evaluated using several endpoints: pro-oxidative/antioxidant activity - quantitative measurement of superoxide anions;

genotoxic/antigenotoxic - cell survival; mutagenic/antimutagenic potential- gene conversion, reverse mutation, mitotic crossing-over; DNA damaging/protective effect – levels of double-strand breaks (DSBs); carcinogenic/anticarcinogenic potential-Ty1 retrotransposition.
Results: Lack of pro-oxidative, genotoxic, DNA damaging, mutagenic and carcinogenic effect was observed after single dose treatment with the extract.
Combined treatment with zeocin resulted to 2-fold increase in cell survival and well expressed decrease in the levels of superoxide anions (3-fold), gene conversion (3-fold), reverse mutation frequency (10-fold), mitotic crossing-over (4-fold). The levels of DSBs were comparable with those in the control sample after combined treatment with all the concentrations. The carcinogenic effect of zeocin measured as transposition was reduced twice.
Conclusion: DNA protective effect was obtained after combined treatment with *Clinopodium vulgare* extract and zeocin. Relationship was established between extract concentrations and the antimutagenic and anticarcinogenic potential.

Key words: DNA damage/protection, superoxide anions, gene conversion, reverse mutation, mitotic crossing-over, transposition

L04_09

HOW THE CYTOCHROME b_6f COMPLEX GOVERNS THE SHORT-TERM ADAPTIVE MECHANISM STATE TRANSITIONS IN OXYGENIC PHOTOSYNTHETIC SPECIES

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The cytochrome b_6f complex is known to trigger the short-term adaptive mechanism state-transitions in oxygen-evolving photosynthetic species (cyanobacteria, algae, plants). State transitions balance the distribution of the excitation light energy to photosystem II and photosystem I in response to changes in the redox state of the plastoquinone pool upon environmental variations. However, until recently, it was unclear how the cytochrome b_6f "senses" the plastoquinone pool redox changes, how this signal is transduced across the membrane and how it leads to activation of structural reorganizations, which accompany the state transitions.
Aim: In this presentation, we will present examples from our recent work illustrating the benefits from both the analyses of the diversity of cytochrome *bc* crystal structures and the application of the hydrophobic mismatch concept for answering the above questions.
Materials and Methods: The available cytochrome bc_1 and b_6f X-ray crystal structures in the Protein Data Bank were analyzed.
Main Results: The molecular volume of the single chlorophyll *a* molecule in the cytochrome b_6f is different in the variety of b_6f crystal structures. It correlates with conformational changes at both membrane sides of the complex, and with its hydrophobic thickness. No such changes were observed in the bc_1 crystal structures.
Conclusions: The chlorophyll *a* molecule is the crucial redox sensor and transmembrane signal transmitter in the cytochrome b_6f complex. The driving force for membrane reorganization is the hydrophobic mismatch induced by the changed hydrophobic thickness of the cytochrome b_6f upon changes in the redox state of the plastoquinone pool.

Acknowledgements: This work was supported by the Bulgarian Academy of Sciences.

Keywords: oxygenic photosynthesis, environmental stresses, state transitions, cytochrome b_6f complex, X-ray crystal structures, hydrophobic mismatch

L04_10

IN VIVO CALORIMETRIC CHARACTERIZATION OF PHYCOBILISOMES IN SYNECHOCYSTIS PCC6803

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Aim: Phycobilisomes are supramolecular pigment-protein complexes that serve as light-harvesting antennae in cyanobacteria and are peripherally attached to the thylakoid membrane, in close contact with photosystem II or photosystem I. In this work we characterize their thermodynamic performance *in vivo* in Synechocystis PCC6803 wild type cells that are abundant in intact phycobilisomes (consising of phycocyanine cylinders and allophycocyanine core proteins) and in the CK mutant cells that lack phycocyanin rods and contain only allophycocyanin cores.
Materials and Methods: Isolated wild type and CK phycobilisomes (in native and disassembled configuration) and intact cells were analyzed by means of differential scanning calorimetry. The thermograms were recorded on highly-sensitive DASM-4 calorimeter, applying 1 ºC/min scanning rate.
Main results: For the first time we identify the thermal transitions originating from phycobilisomes denaturation in living cells – in the wild type the intact phycobilisomes give rise to a transition at 63 °C while in the CK mutant the truncated phycobilisomes melt at 65 ºC. Freezing-induced dismantling of the phycobilisome ultrastructure allowed for determination of the stabilizing effect of the phycobilisome assembly on its individual protein components (phycocyanine and allophycocyanine units).
Conclusions: We demonstrate that the thermodynamic behavior of intact and truncated phycobilisomes can be studied in their native cellular, membrane-bound environment. The presented results revealed distinct thermodynamic behavior of the phycocyanin rods assembled into an intact phycobilisome or detached from the allophycocyanine core. The presented data will be useful for future characterization of the factors that affect the stability and structural organization of phycobilisomes *in vivo*.

Acknowledgements: This work is supported by the bilateral Hungarian-Bulgarian academic exchange program 2016-2018 (S.K., Z.G.).

Keywords: phycobilisomes, differential scanning calorimetry, thermal denaturation

L04_11

CALORIMETRIC CHARACTERIZATION OF THE ORDERED/DISORDERED THYLAKOID MEMBRANE STATE IN ARABIDOPSIS

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Aim: In this study we aim at characterizing the energetics of stacking, unstacking and formation of ordered domains of photosystem II supercomplexes (macrodomains) in *Arabidopsis thaliana* thylakoid membranes.

Materials and Methods: Differential scanning calorimetry (DSC), a method for measuring thermally-induced conformational transitions of proteins and complex biological systems, were applied to isolated wild type (WT) thylakoid membranes that contain both ordered and disordered membrane domains and koPsbW thylakoids having randomly arranged photosystem II supercomplexes. Thylakoid membranes isolated from plants grown at high (inducing macrodomains disruption) and low (triggering marcodomain expansion) light intensity were investigated in their stacked and unstacked condition.
Results: Both stacked and unstacked *Arabidopsis* thylakoids exhibited dramatically different thermodynamic behavior as compared to that of other plant species studied so far. Namely the transitions suggested to originate from membranes structural rearrangements upon unstacking (at 45 °C), and from monomerization of the major light harvesting complex of photosystem II (at 62 °C) have larger enthalpy, while the transition temperatures of the photosynthetic proteins denaturation (above 65 °C) are lower in the thermogram of *Arabidopsis* thylakoids compared to those of pea and barley. The effect of koPsbW mutation resembles that of WT thylakoids unstacking – disappearance of the first low temperature transition at 45 °C and reduction of the total thermograms enthalpy.
Conclusion: It was demonstrated that DSC is a suitable technique for the evaluation of the ordered macrodomains abundance. In *Arabidopsis* thylakoids the enthalpy of macrodomain formation was found to be higher than the enthalpy of membrane stacking.

Keywords: Arabidopsis thaliana, koPsbW mutant, differential scanning calorimetry

L04_12

METHODS, APPLICABLE TO THE ECOTOXICOLOGICAL BIOMONITORING OF TERRESTRIAL VERTEBRATES

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The present study is a review and critical assessment of ecotoxicological techniques.
During the recent years have seen an expansion in the scope and depth of ecotoxicological studies involving the environmental biomonitoring of different chemical and physical toxic agents (heavy metals, organic pollutants, natural and anthropogenic radioisotopes) heve been seen. The methodology applicable to such studies is a variation of the methods, applicable in human diagnostics and toxicology, though some of the methods are either modified or substituted. The objective of the current work is to provide an overview of the methods which can be used in ecotoxicological biomonitoring, and to assess their respective strenghts, shortcomings and applicability. Some of the methods include: morphophysiological indicators (measurement of size weight, weight of specific organs, hematological indicators), histopathological methods (analysis of organic lesions and tissue changes), cytogenetic methods (analysis of chromosomal aberrations and sister chromatid exchanges), methods from the field of molecular biology and DNA damage (comet assay, variations of the micronucleus test, alkaline elution), determination of the radiological and other toxic burden in whole animals and organs by means of different spectrometric methods (AAS, inductively coupled plasma mass spectrometry), and non-invasive sampling techniques. All the methods are reviewed critically and their strengths, weaknesses and utility are presented in the context of ecotoxicological biomonitoring studies. As a review, the article discusses these most important methods in ecotoxicological biomonitoring and provides a useful evaluation of these approaches to ecologists and other scientists involved in ecotoxicological biomonitoring.

Keywords: ecotoxicology, biomonitoring, methods, review

L04_13

BIOCHEMICAL RESPONSES OF THREE GENOTYPES OF *PHASEOLUS VULGARIS* L. TO SINGLE AND COMBINED TREATMENT WITH POLYETHYLENE GLYCOL AND UV-B IRRADIATION

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Aim: to compare the adaptive potential of three *Phaseolus vulgaris* L genotypes to single and combined treatment with PEG and UV-B irradiation.
Material and Methods: Seeds of three genotypes were germinated and grown at standard conditions to the cotyledon phase in a growth chamber. Mild stress to drought was simulated by 16% PEG treatment for 24h. UV-B irradiation with 100, 250, 500 J / m^{-2} was carried out in BLX 254 UV Cross-linker. Drought and three UV-B doses given on the twelfth hour of PEG treatment were applied. 10 days plants at the first leaf phase were used to measure MDA, H_2O_2, Pro and HSP70B contents.
Results: To clarify whether genotypes have overcome single and combined impacts the levels of H_2O_2 and MDA were evaluated. More pronounced adaptive potential demonstrated D7, where the values of H_2O_2 in treated samples were almost as in a control. In D2 and DR about 1.5 - 2 fold higher contents of H_2O_2 in treated samples than those in the controls were obtained. Based on the same biochemical markers it was also demonstrated that mild drought stress can increase the adaptive potential of both genotypes D2 and D7 to UV-B irradiation involving different strategies – overproduction of HSP70B and Pro. The same experimental scheme did not enhance the adaptive potential of DR genotype.
Conclusions: Water deficit to a certain scale is not harmful and more likely to have positive effects on plants, activating endogenous defense strategies as Pro and HSP70B overproduction. Despite the fact that genotypes are genetically closely related they differ in their adaptive potential and the main protective strategies. Pro accumulation probably is one of protective mechanisms for D7 and HSP70B for D2 and DR.
Acknowledgements: This study was funded by the projects: DDVU_02/87 "Complex morphometric, physiological, biochemical and molecular assessment of drought tolerance in Bulgarian common bean genotypes (*Phaseolus vulgaris* L.)" and „Ecological and genetic risk: methods and strategies for overcoming"– BAS.
Key words: *Phaseolus vulgaris* (L.), polyethylene glycol, UV – B, malondialdehyde (MDA), total hydrogen peroxides (H_2O_2), proline (Pro) and heat shock protein content (HSP70B)

L04_14

HEAVY METAL CONCENTRATIONS IN VEGETABLES WITH GROWTH STAGEAND PLANT SPECIES VARIATIONS

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Aim: Vegetables constitute an important part of the human diet since there contain carbohydrates, proteins, as well as vitamins, minerals and heavy metals. Heavymetals are one of a range of important types of contaminants that can be found on the surface and in the tissue of fresh vegetables (Bigdeli and Seilsepour, 2008). Anumber of elements, such as lead (Pb), cadmium (Cd), nickel (Ni), cobalt (Co), chromium (Cr), Copper (Cu) and Selenium (Se) (IV) can be harmful to plantsand humans even at quite low concentrations. Soil pollution is caused by misuse of the soil, such as poor agricultural practices, disposal ofindustrial and urban wastes, etc.

Materials and Methods: The research was conducted in order to see the concentration of heavy metals in leafy vegetables spinach –*Spinaci aoleracea*, garlic - *Allium sativum* and onion - *Allium cepa*. Spinach, garlic and onion seeds were sown on 23rd November 2014; samples for analysis of these plants were taken at different stages – 15, 30, 45 and 60 days after sowing.
Results: The results showed that the concentration of lead, zinc, cadmium, nickel, and cobalt increased with increasing age of the plant. The percentage of increase of heavy metals was higher from 20th to 30th day, compared to that between 30th and 40th day.

The concentration of heavy metals gradually increases in the early stage of the plant growth, and gradually declines in later stages of growth. The significant differences ($P < 0.01$) were observed between the mean metal concentrations in the three vegetables species. Higher concentrations of lead and cadmium were found in spinach, compared to garlic and onion. The order of heavy metal level in different vegetables was Cd<Co<Pb<Ni<Cr. The value of the correlation coefficient soil-plant was highest for cadmium and lowest for nickel.

The result indicated that there was significant difference ($P < 0.01$) in mean heavy metal content in the three vegetable species. The result showed significantly higher level of Pb concentration in amaranth compared to spinach and red amaranth. Spinach exhibited significantly higher levels of Cd and Cr than the other vegetables.
Conclusions: Heavy metal content in different leafy vegetables varies significantly. The content varies with time of harvesting and stage of maturity of crops. The Cd and Cr contents in leafy vegetables in this study were detected higher while Pb and Ni were within the permissible limits as per the WHO standard but all the metalswere within the maximum allowable level. The magnitude of time dependence of plant metal concentration variations differed among crop species and metals. Further research is needed to obtain more specific information about the effect of age of the plants on accumulation and distribution of the heavy metal in the different plant parts, variations in uptake between different plant species, cropping history and fertilization.

Keywords: Vegetables, soil, heavy metals, concentrations, plant species, correlation coefficient.

L04_15

EVALUATION OF THE STATE OF THE WATERS OF THE STRUMESHNITSA RIVER ON BULGARIAN TERRITORY ACCORDING TO PHYSICO-CHEMICAL ELEMENTS FOR QUALITY

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The aim of the report is to analyze the data from monitoring points and to assess the state of the Strumeshnitsa river on the territory of Bulgaria.
Materials and Methods: The paper focuses on the research of the Strumeshnitsa river during the period 2010-2015. It is based on the existing information from the monitoring carried out by statistical analysis and comparative analysis.
Results: Based on the gathered data from the monitoring programs, an analysis has been made of the data from the monitoring points situated along the Strumeshnitsa river. In addition, an evaluation has been carried out of the state of the waters of the Strumeshnitsa river according to physico-chemical elements for quality in accordance with the classification system, to Regulation № H-4 for characterizing of surface waters.
In the period of the research the Strumeshnitsa river flowed into Bulgarian territory in a not very good condition. The values of most indicators for organic materials are much higher than the norms of a good

condition. The content of N-$NO_{2,,}$N-total, P-PO_4, P-totalis was above the norm and did not suit the requirements of a good condition.
On Bulgarian territory the quality of the waters of Strumeshnitsa river is additionally deteriorated. It is a result of the flowing of waste waters combined from the sewerage of the town of Petrich and the outside sewer collector without direct purifying for the villages of Mihnevo and Karnalovo.
Conclusion. In the period 2010-2015 the Strumeshnitsa river was assessed in moderate condition to physico-chemical elements for quality.

Keywords: Strumeshnitsa river, monitoring, monitoring point, physico-chemical elements of quality, classification system

P04_01

ECOLOGICAL STATE ASSESSMENT OF THE WATERS IN THE BULGARIAN SECTION OF THE STRUMESHNITSA RIVER AND LUDA MARA RIVER

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Aim: The aim of this study was to assess the ecological status of waters in the Bulgarian section of the Strumeshnitsa River and Luda Mara River using one of the obligatory for the lotic ecosystems biological quality element macrozoobenthos.
Materials and Methods: The present study was carried out in the summer of 2015. Six macrozoobenthos samples from the different stretches of studied rivers were collected. An adapted version of the multi-habitat sampling method was applied in accordance to the standard BS EN ISO 10870:2012. Physico-chemical parameters like pH, dissolved oxygen ($mg.l^{-1}$), oxygen saturation (%) and conductivity ($\mu S.cm^{1}$) were measured in situ using portable Windaus Lab package. Ecological state was assessed based on two indices (Biotic index and total number of taxa) which were standardized in Bulgarian water legislation.
Results: Bulgarian part of the Strumeshnitsa River was assessed in moderate and poor ecological state. The ecological state of Luda Mara above Petrich was characterized as good, based on Biotic index and moderate according the total number of taxa. Values of physico-chemical parameters varied between high and good state.
Conclusion: The Bulgarian section of the Strumeshnitsa River is designated as nitrate vulnerable zone. The transport of pollutants from the underlying ground waters is the main reason for deterioration of the river ecological state. Availability of local impacts from adjacent settlements, especially the confluence of the Luda Mara River, in which are discharged wastewater of Petrich have an additional negative effect on the Strumeshnitsa River. Unfavorable impact on Strumeshnitsa River finds an expression in worsening of ecological situation of the water ecosystems.

Key words: Strumeshnitsa River, Luda Mara River, ecological state, macrozoobenthos

P04_02

EFFECT OF NICKEL ON SEED GERMINATION IN TWO *ALYSSUM* HYPERACCUMULATOR SPECIES FROM SERPENTINES IN ALBANIA

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Serpentine soils cover large areas in the Balkans and their plant biodiversity is high with a great number of interesting local and regional endemics. The plants used in this study belong to the genus *Alyssum* (Brassicaceae). Some *Alyssum* species are serpentine-endemics and invariably Ni hyperaccumulating; others show more complex distribution and Ni accumulating behavior. One of the interesting aspects of plant behavior on serpentine soils is the way of response to the elevated levels of Ni in the soil. The aim of this study was to compare the effects of Ni on seed germination in *Alyssum markgrafii* and *A. murale*, the former being an obligate Ni hyperaccumulator- serpentine endemic and the later a facultative Ni hyperaccumularor. These two species are important for phytomining. The germination rates of the seeds, root elongation and the growth of the hypocotyls were investigated after treatments with different concentrations of $NiCl_2$ $6H_2O$ (0.5, 1, 2, 4, 6, and 8mM) used as a source of Ni. The parts of the seeds (coat, radicle and cotyledons) checked separately before the treatments gave a positive reaction to DMG test for Ni detection. The seed coat demonstrated lower concentration of the metal compared to the radicle and cotyledons in most of the checked seeds. The inhibitory effect of Ni on seed germination and growth was confirmed in both species.

Acknowledgement: This study was realized within the ERASMUS contract between the Faculty of Biology at Sofia University and the Agricultural University of Tirana.

Keywords: *Alyssum*, nickel, seed germination, serpentines

P04_03

THE EFFECT OF ORGANIC AND CHEMICAL FERTILIZERS ON THE YIELD AND DISEASE RESISTANCE OF TOMATOES – FIELD PRODUCTION

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Tomatoes are one of the most valuable and widespread crops in terms of taste qualities and abundance in vitamins, antioxidants and polyphenols, minerals and organic acids. Good knowledge of the abiotic factors is a necessary prerequisite for their successful production. The following factors are essential for the crop: light; soil and air temperature, water, soil and soil reaction, nutrition.

This work aims to study the effect of different types of fertilizers (organic and chemical), their norms and methods of application, on the yield and disease resistance of Rio Grande canning tomatoes, late field production.

Materials and Methods: The experiment was performed on alluvial meadow soil in the village Tsalapitsa after pumpkins grown on the same area and according to the same scheme with the

following variants: (control – no fertilizer); 100% farmyard manure; 100% chemical fertilizer; 50% farmyard manure + 50% chemical fertilizer), according to the Latin Rectangle method. Conventional technology was adopted, including irrigation regime and treatment against pests.

The results demonstrated that the combined application of organic and chemical fertilizer is the most effective and results in the highest yield (4307.4 $kg.dka^{-1}$). In adverse climatic conditions and using standard crop protection schemes and products, there was a moderate development of economically significant diseases during growth (up to 25%), whereas the organic substance variants had a higher percentage of attacked leaf area.

Conclusion: This allows us to make the assumption that the combined application of organic and chemical fertilizer increases the total effectiveness, reflected in the crop yield, regardless of the growth of the leaf mass affected by disease.

Keywords: organic and chemical fertilizer, yield, diseases of tomatoes

P04_04

MONITORING OF VIRAL DISEASES IN INDUSTRIAL VINEYARDS IN BULGARIA DURING THE PERIOD 2011 – 2015

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During the last few years new industrial vineyards have been planted with European and traditional Bulgarian varieties. In order to help producers and prevent a possible spread of quarantine and economically significant diseases, the Bulgarian Food Safety Agency (BFSA) developed a monitoring programme for grapevine quarantine pests, including viral infections.

The aim of the study was to identify presence of quarantine viruses (ToRSV, TRSV) and to determinate spreading of the most important economical viral infections into all industrial viticultural regions on the territory of Bulgaria during the period from 2011 to 2015.

Materials and Methods: The Central Laboratory of Plant Quarantine (CLPQ) analyzed 629 plant samples of 20 Regional Directorates taken twice (in the spring and in the autumn) annually. The samples were analyzed through extraction of the viruses from the plant materials (leaves, shoots and petioles) in Grapevine Extraction Buffer \pH-8,2\ and using DAS-ELISA method for possible infections with ToRSV, TRSV, GFLV, GFkV, ArMV, GLRV1 and GLRV3.

Results: After performed in over 1440 analyses for viral infections, ToRSV and TRSV, which are quarantine pests for Bulgaria, were not found and identified. In two Plovdiv and Shumen regions the following viruses GFLV, ArMV, GFkV and GLR1,3 were identified. In 2011 and 2015 in 5 samples ArMV, GFkV, GFLV and GLR1,3 were identified in Plovdiv region. Two viruses in two samples in Shumen region - GFLV and ArMV were found in 2012. The monitoring results and the viral identification showed that common viral infection is present only in vineyards and assumed that two regions are potential sources of viral infections in grapevines – Plovdiv and Shumen.

Conclusion: This is point of the future strict control and greater attention is required during of the period for production of grapevine planting material in this regions.

Keywords: grapevine, monitoring, viruses

P04_05

SPIDER COMMUNITY (ARANEAE) ON BELASITSA MOUNTAIN, SOUTH-EAST MACEDONIA

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Aim: In this paper the composition and abundance of spider community along an altitudinal gradient and associated vegetation type on Belasitsa Mountain are presented.
Materials and Methods: Spider fauna was collected during the period of April-November 2010, at 14 sampling sites along an altitudinal gradient, by using pitfall traps.
Results: During the study, altogether 8771 specimens representing 29 families of Araneae were registered. The overall abundance of spiders was significantly increasing with increasing altitude, and consequently it was significantly higher in beech compared to oak forest habitats, while family composition of Araneae was without significant changes. The analyze of the dominance structure showed the presence of five dominant, four recedent and twenty subrecedent families. The abundance of the dysderids, linyphids, lycosids, gnaphosids, amaurobiids, hahniids, zorids and segestriids significantly increased, while the abundance of salticids, thomisids, nemesiids, anapids and leptonetids decreased along the gradient.
Conclusions: This study provides information regarding spider community in mountaneous ecosystem, emphasizing that elevation is the main factor influencing abundance and distribution of Araneae on Belasitsa Mountain.

Keywords: spider community, altitudinal gradient, Belasitsa Mt.

P04_06

GROWTH-TEMPERATURE RATES OF *PHYTOPHTHORA* ISOLATES OBTAINED FROM VARIOUS ECOSYSTEMS IN BULGARIA

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Introduction: The Oomycete genus *Phytophthora* is recognized as a rising thread for the forest and agricultural ecosystems in the world. Movement of plants and plant products by humans has facilitated the spread of those harmful organisms around the world. Among all environmental factors, the temperature was reported to have the greatest influence on growth, reproduction and pathogenesis of *Phytophthora* spp. This study deals with the influence of temperature on the mycelial growth of six species of *Phytophthora* sampled from various Bulgarian ecosystems.
Matherials and Methods: The effect of the temperature was investigated in vitro on mycelial growth of the *Phytophthora* isolates on vegetable agar. Isolates from the species *P. plurivora*, *P. cryptogea*, *P. cambivora*, *P. citricola*, *P. rosacearum* and *P. megasperma* were used. They were exposed to a range of temperatures varying from 5 ºC to 40 ºC at interval of 5 °C. The radial growth of the mycelial colony was measured and calculated per day. The obtained results were compared with referent data.

Results: General temperatures for mycelial growth of all isolates were determined. Maximum growth rate was between 25 °C and 30 °C. Although all isolates were affected in the same manner by increasing temperature, they were not all affected to the same extent. The results of this study demonstrated that temperature is an important environmental factor with different effects on mycelial mat growth of each tested Bulgarian *Phytophthora* species and could have an important role in the adaptation of the pathogens and their distribution in future changing climate conditions.

Keywords: *Phytophthora*, mycelial growth, temperature

P04_07

APPLICABILITY OF INDICATORS OF HYDROLOGICAL ALTERATION TO ASSESS THE CURRENT STATUS OF THE RIVER FLOW

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Aim: Hydrologic regimes play a major role in determining the biotic composition, structure, and function of aquatic, wetland, and riparian ecosystems. In this paper some components of the flow regimen with ecological importance on fluvial ecosystems were studied. A method for hydrologic alteration estimation has been examined and applied.
Materials and Methods: The method was applied to characterize and evaluate the hydrologic alteration of the Veleka River flow regime using discharge series. The region in concern belongs to the South Eastern climate and is mainly transitional Mediterranean climate. Hydrological perturbations associated with water abstractions, point discharges and the presence of a dam there are not in the study area. The used method, referred to as the "Indicators of Hydrologic Alteration - IHA method" is based upon an analysis of hydrologic data available either from existing measurement points within an ecosystem (such as at stream gauges) or model-generated data.
Results: The hydrological status of the Veleka River was assessed by comparing the two periods. The most significant results suggest changes in low-flows. The current flow regime shows a significant reduction in the magnitude of stream flows.
Conclusions: From this study we conclude that the indicators of hydrologic alteration proved to be a useful approach, capable of focusing, comparing and establishing levels of hydrologic disturbances.

Keywords: River Conservation, River Flow Regime, Indicators of Hydrologic Alteration, Reference Conditions, Veleka River.

P04_08

INVESTIGATION OF THE ZOOPLANKTON AND THE CHLOROPHYLL *A* LEVEL IN "DOSPAT" DAM

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The zooplankton and the chlorophyll *a* are important trophic links in the ecological food chains of all limnic systems. The development of different zooplankton taxons and the chlorophyll level depend on the specific environmental conditions in these systems.
Aim: The purpose of this study was to investigate the dam ecological status. We use the zooplankton and the chlorophyll *a* levels for the research.
Materials and Methods: The chlorophyll *a* quantity into the phytoplankton was determined according to ISO-1/1980 and ISO 5667-2/1991. The zooplankton and the chlorophyll *a* numbers were calculated by Dimov's method (1959). The biomass quantity was obtained by Prikryl's volume-weight method (1980). A vertical closing zooplankton net "Juday" (mesh size 50 μm, net mouth opening 36 cm (0,1 m^2) was used for the sampling.
Results: The investigation was conducted in the period between 2014 and 2015. According to the chlorophyll *a* level the major part of the dam was determined as mesotrophic. During the autumn (2014) and the beginning of the spring (2015) the dam status was eutrophic. During the rest of the vegetative period it was mesotrophic. The ratio between the basic three zooplankton taxons was untypical for a dam ecosystem. A cladocerans' prevalence over the other two taxons was detected. It was accompanied by a good trophic level of the phytoplankton.
Conclusions: The results indicated a low number of fish feeding on zooplankton and a possible risk for the dam ecological balance at low oxygen level (including the area with fish farming cages).

Key words: chlorophyll *a*, zooplankton, ecological status.

P04_09

ENVIRONMENTAL POLLUTION WITH TOXIC CHEMICALS – INFLUENCE ON THE BIOTA AND HUMAN HEALTH

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Abstract

The growing number of many different diseases during the last decades is a subject of a great concern for the medicine and scientists also. A lot of ecological problems are obvious, like contamination of water and soil and destruction of their inhabitants. Many factors may be suspected as a cause of these disturbing phenomena, but one of the most serious is the contamination of environment with toxic chemicals. The basic issue is that the main vulnerable groups are babies, children and pregnant women.

Pesticides are chemical substances, designed to protect crops and destroy pests; about 1200 – 1400 active substances are now available. Heavy metals are naturally occurring or segregated in various industrial processes. They are elements, noted for their potential toxicity. Mycotoxins are toxic chemicals, produced by fungi in crops. Most of them are associated with human and veterinary diseases.

Industrial/other contaminants: dioxins, benzopyrene, formaldehide, acrylamide, DMN (methylnitrosamine), perchlorate, melamine etc., appear in various industrial or natural processes. Veterinary Medicinal Products (VMP) are substances, intended for treating, mitigating, preventing illnesses or influence on specific body functions in animals.

Considerable amounts of all these chemical products are released into the environment, where several substances seem to be persistent and pose a risks for the biota and human health. Implementation of measures and alternative approaches for mitigation of environmental impact and to ensure safety for consumers are necessary, like: Good Agricultural Practices, Good Veterinary Practices, Integrated Pest Management (IPM), organic agriculture, genetic engineering and phytoremediation.

Key words: environment, contamination, toxic chemicals, ecological problems, mitigation measures

P04_10

LIPID COMPOSITION, PHOTOSYNTHETIC AND BIOLOGICAL ACTIVITY OF *LACTUCA TATARICA* (L.) C.A. MAY

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The aim of this study was to investigate the peculiarities of fatty acid composition of lipid membranes and photosystem II photochemisrtry of isolated chloroplatts that could contribute to the increased tolerance of *Lactuca tatarica* (L.) to salinity. Accordingly, biological activity of lipophylic extracts from the leaves was also characterized.

Materials and Methods: The plants were collected near the Pomorie Lake (soil salinity 330-350 mg salts in 100 g soil). The analyses of lipid composition were performed using thin-layer and gas chromatographic techniques. Photosynthetic activity was measured as thermoluminescence (TL) emission and O_2 evolution from isolated chloroplast membranes. The antibacterial activity of lipophylic extracts was determined.

Results: The main fatty acids were lauric, palmitic, linoleic and linolenic. TL B-band occurred at around 30^{o}C and TL and oxygen flash yields from isolated chloroplasts oscillate with a typical period of four. The total lipophylic extract had a high activity against *Bacilus cereus* and a moderate activity against *Staphylococcus aureus*.

Conclusion: The presence of a large amount of saturated fatty acids (30.6% of total) in lipid membranes in *Lactuca tatarica* provided a decrease of membrane permeability and allowed a better resistance against soil salinity. $S_2Q_B^-$ and $S_3Q_B^-$-state cycling of PSII reaction centers were typical for the higher plants. The data about antibacterial activity have shown *Lactuca tatarica* (L.) as a natural source of biologicaly active substances for a medical and pharmaceutical uses.

Acknowlegment. This work was completed in the frames of bilateral project between Ukrainian Academy of Sciences and Bulgarian Academy of Sciences (2014-2018).

Keywords: *Lactuca tatarica* L., lipids composition, photosynthetic activity.

P04_11

STATISTICAL ANALYSIS OF METEOROLOGICAL FACTORS AND AIR POLLUTION IN SOFIA

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Aim: The air pollution in urban areas has different characteristics on account of the changing meteorological factors. In recent years, due to the rapid increase in population density, building density and energy consumption, the outdoor air quality has deteriorated in the crowded urban areas in Bulgaria. Sofia city is influenced by air pollutants considerably. In this paper the problem of air pollution in Sofia was studied.
Materials and Methods: The air pollutant concentrations (nitrogen oxides, SO_2 and the particulate matters - PM10) and meteorological data such as wind speed, temperature and relative humidity for southwestern areas of the Sofia city (Hippodrome, Pavlovo, and Kopitoto) for the 2009-2013 period were used. In order to study the relationships between variables the statistical method has been used.
Results: The regression equations between meteorological parameters and air pollution concentrations were define separately for 2009-2013 years by linear regression analysis. According to the results of statistical analysis, it was found that there is a moderate level of relation between air pollutant concentrations and meteorological factors in Sofia city. The air is polluted mostly by particulate matters and nitrogen oxides.
Conclusions: In conclusion, it must be pointed out that the results from this study showed that there is no strong relationship between the meteorological parameters and ground level air pollutant concentrations in Sofia city.

Keywords: meteorological factors, air pollution, statistical analysis, SO_2, particulate matters - PM10.

P04_12

COMPETITION AMONG MIDDLE-SIZED CARNIVORES IN NP VITOSHA, BULGARIA

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Aim: The objective of this study was to investigate how the competition between middle-sized carnivores influences their habitat selection and activity patterns.
Materials and Methods: Camera traps were placed on the territory of NP Vitosha according to a predetermined grid in 2013 and 2014. The camera traps were set up to record the day, time, temperature and moon phase for each registration. For each camera trap location, a standard form was filled, containing information about habitat characteristics: altitude, forest type and forest visibility. The resulting photos and videos were imported and processed through CameraBase 1.6. Activity pattern and overlap analysis were performed using the *overlap* package in R.

Results: The results indicate that the stone marten (*Martes foina*, Erx.) and the European badger (*Meles meles*, L.) are more frequently registered in forests with low visibility (closed forests), while the wildcat (*Felis silvestris*, Schr.) and the red fox (*Vulpes vulpes*, L.) occur more often in high-visibility forests. The badger is the only species to prefer mixed forests while all of the others are observed mostly in broadleaved forests. The stone marten and badger exhibit predominantly nocturnal activity patterns, whereas the wildcat and red fox show diurnal activity as well.
Conclusions: The focal species apply different temporal and spatial adaptations to alleviate the negative effects of competition. This allows them to coexist in similar habitats, sharing the limited resources.

Acknowledgements: This work was conducted with camera traps provided by the Directorate of NP Vitosha, through Project № DIR-5113326-4-98 of Operational Program Environment 2007-2013.

Keywords: mammals, competition, activity patterns, camera trap

P04_13

EFFECT OF SALT STRESS ON THE GROWTH AND ANTIOXIDANT DEFENSE OF TWO *LYCIUM* SPECIES

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Aim: *Lycium barbarum* and *Lycium chinense* are two species belonging to the family Solanaceae from which the goji berry is harvested. The effect of salt stress on growth parameters and antioxidant defense in these species, grown *ex vitro* in hydroponic at three levels of salinity, 50 mM, 100 mM, 200 mM sodium chloride (NaCl) solution was evaluated. We look for the more sensible physiological markers of the salt tolerance in order to develop practicable strategie for *in vitro* selecting salt tolerant species, which were produced by BioTree Ltd., Bulgaria.
Materials and Methods: Seeds and *in vivo* explants from the species of *L. barbarum* and *L. chinense* were used for developing of *in vitro* multiplication protocol. *In vitro* propagated plants were transferred to nutrient solution for 48 days and were treated with NaCl solutions for 10 days.
The root and shoot dry mass of plants was measured gravimetrically after heating at 60^{o}C for 48 h to a constant weight. The activities of antioxidant enzymes SOD, POX, CAT, APX, GR, low molecular antioxidants – GSH, Asc, H_2O_2, as well as MDA were determined spectrophotometrically.
Results: The root and shoot dry mass of *Lycium chinense* were reduced more than that of *Lycium barbarum* during NaCl treatment.
Conclusions: Our results suggest that *Lycium barbarum* was more tolerant to salt stress than *Lycium chinense* at the salinity conditions tested. It responded to high salinity level with increasing SOD activity, MDA and H_2O_2 levels and improved dry mass accumulation.

Keywords: *Lycium,* salinity, growth, protective enzymes, antioxidants

P04_14

INFLUENCE OF A HERBIVORE INSECT, *ORCHESTES FAGI* L., ON THE ANTIOXIDATIVE STATUS OF COMMON BEECH LEAVES

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Abstract: The invasion of leaf-mining insect (*Orchestes fagi* L.) causes different morphological and physiological changes in the leaves of common beech. The insect feeding has a strong influence on the photosynthesis, pigment content and water regime of the trees.
Aim: The present work is focused on exploring the beech leaves response towards the attack of *O. fagi*. For this purpose, the antioxidant capacity was estimated by the level of total phenols and flavonoids, and the related total antioxidative activity.
Materials and Methods: Experiments were provided at two beech plantations located at 680 m asl and 1400 m asl, Western Balkan Mountain. Total phenolic content was estimated according to Singleton et al., (1999); flavonoid content - according to Chang et al., (2002) and total antioxidant activity was measured after Prieto et al. (1999).
Results: Phenolic compounds, being the most abundant secondary metabolites in plants, possess clearly manifested antioxidative properties. It was shown that beech leaves at the lower altitude, where the infestation was widespread, have an increased phenolic content – 11% - 15%, as compared to the trees at higher altitude. There was also found an enhancement of the level of phenols and flavonoids during the vegetation season, and that effect was especially pronounced in terms of flavonoids. Respectively, total antioxidant activity showed a clear correlation with the changes of phenolic content.
Conclusion: The results, and previously measured changes in some stress markers, could be considered as an evidence for development of oxidative stress in the beech leaves following the herbivore infestation.

Acknowledgement: This work was sponsored by grant No 53/2015 "Changes in the assimilation activity, water regime and antioxidative defense system induced by beech weevil *Orchestes fagi* L. in the common beech located at the Petrohan Training and Experimental Forest Range", University of Forestry, Sofia

Keywords: phenols, flavonoids, total antioxidant activity, *Orchestes fagi,* beech

P04_15

THE CHOLINESTERASES AS BIOMONITORING MARKERS IN CASE OF POISONING OF ORGANISMS IN ECOTOXICOLOGICAL ENVIRONMENT

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Objective: This study is part of the extended project biomonitoring study of the levels of toxicity of various animals under the influence of different pesticides, neuro toxicants, overdoses of drugs, ecotoxic compound etc.

Biomarkers for this type of poisoning are changes in the activity of acetylcholinesterase (AChE) and butyrylcholinesterase (BChE) compared to normal reference values in various brain fractions in mammals and other groups animal species.

Materials and Methods: The activity of AChE and BChE were determined according to the classical method of Ellman et al. (1961). The protein content was determined by the method of Lowry et al, (1951). L-Arginine and Na-Nitroprusside were used as sources of nitrogen oxide (NO) and as a means of stimulating of AChE and BChE and as antidotes for poisoning.

Main results: It was conducted enzyme mapping of the distribution, activity and some kinetic parameters of AChE and BChE in the target animal species and tissues.

Presented are important data for activating efficiency of L-Arginine and Na-Nitroprusside. Stimulating efficiency of L-Arginine at high concentrations is much higher on BChE compared with that on AChE.

Conclusion: AChE and BChE are very good as marker enzymes to measure the degree of intoxication of organisms from different poison, pesticides and drugs. Our data suggest that some donors NO can successfully used as protection in ecotoxicological situations.

Keywords: acetylcholinesterase; butyrylcholinesterase; biomonitoring; L-Arginine; neurotoxicology.

Acknowledgment: This work has been supported financially by funds from Sofia University "St. Kliment Ohridski" for funding of research project supporting PhD.

P04_16

Cu(II) AND Co(II) COMPLEXES WITH THE SAME LIGANDS EXPRESS DIFFERENT CYTOTOXIC/CYTOSTATIC ACTIVITIES

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Introduction: Copper and cobalt are essential elements with broad spectrum of biological activities. These metals are used in various fields of industry, they are widespread in the environment and can enter human body through various pathways.

The aim of our study was to evaluate the putative cytotoxic/cytostatic effects of eight newly synthesized complexes of Cu(II) and Co(II) with Schiff bases obtained by a condensation reaction of *o*-Vanillin with amino acids (Tyrosine, Threonine, Tryptophan and Serine).

Materials and Methods: Permanent cell line established from a healthy bovine kidney (MDBK) was used as a model system in our investigations. The experiments were performed by MTT test, neutral red uptake cytotoxicity assay and crystal violet staining.

Results: The results obtained revealed that the examined compounds decrease in a time- and concentration-dependent manner viability and proliferation of the treated cells. Cu(II) complexes were found to exhibit higher cytotoxic/cytostatic activity as compared to Co(II) complexes with the same ligands.

Acknowledgement: Supported by Grant № DFNI Б 02/30 from 12.12.2014, National Fund "Scientific Research", Bulgarian Ministry of Education and Science.

Key words: copper and cobalt complexes; cytotoxic/cytostatic activity; bovine kidney cells, cell cultures

P04_17

Zn(II) COMPLEXES WITH SCHIFF BASES DECREASE VIABILITY AND PROLIFERATION OF BOVINE KIDNEY CELLS

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Introduction: Zinc is a trace element that plays a key role in numerous life supporting physiological processes. The adequate intake and balance of this metal is crucial for proper functioning of all living organisms. Zinc deficiency is associated with various pathological conditions, including disturbed growth and development in children and increase susceptibility to infections and cancer.
The aim of our study was to evaluate the influence of four newly synthesized Zn(II) complexes with Schiff bases obtained by a condensation reaction between 2,6 diformyl-p-cresol with Alanine, Valine, Leucine or Phenylalanine, on viability and proliferation of cultured MDBK bovine kidney cells.
Materials and Methods: The investigations were carried out using methods with different molecular/cellular targets and mechanisms of action such as MTT test, neutral red uptake cytotoxicity assay and crystal violet staining.
Results: The results obtained revealed that applied at a concentration range of 10 – 200 μg/ml for 24-144 h these compounds reduce to varying degrees cell growth and survival.

Acknowledgement: Supported by Grant № DFNI Б 02/30 from 12.12.2014, National Fund "Scientific Research", Bulgarian Ministry of Education and Science.

Key words: zinc complexes with Schiff bases, cell culture, bovine kidney cells, cytotocic/cytostatic effect

P04_18

FRAGARIA VESCA L. – A NEW FOODPLANT TO THE IMAGO OF *ORCHESTES FAGI* L.

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Aim of the paper: The beech weevil *Orchestes fagi* L. is the most important leafminer on the species from genus *Fagus*. Its larvae feeds on young beech leaves in early spring. The fragile leaves are suitable as consistency and sufficient in quantity to larva`s developing and cocoon`s formation. The feeding of a new generation in June and supplementarry feeding of pre-wintered imago in early spring is important to the pubescence of the insects. In Europe it is observed foodplants and feeding preferences of the beech leafmining weevil *Orchestes fagi* L. There are no such observations in Bulgaria. Objective of the study was to gather information about the preferences of beech weevil to the other forest plants.
Materials and Methods: New-born beech weevils (20 number of individuals) were fed with leaves of other forest plants (except of common beech), such as *Aesculus hippocastanum* L., *Prunus cerasifera* Ehrh., *Carpinus betulus* L., *Crataegus monogyna* Jacq., *Fragaria vesca* L., as well as young and old beech leaves. The experiment was conducted in May-June. Leaf material was gathered from the Botanical garden of the University of Forestry. Leaves were replaced with fresh ones in every 24 hours.

The experiments were performed in the Laboratory of Entomology of the University of Forestry.
Results: The observations showed a clear preference of the adults of *Orchestes fagi* L. to the leaves of wild strawberry and to the young beech leaves.
Conclusion: *Fragaria vesca* L. is registered as a new foodplant to the imago of *Orchestes fagi* L.

Acknowledgments: This work was supported by grant 53/2015 of the University of Forestry-Sofia.

Keywords: *Orchestes fagi*, foodplants, *Fragaria vesca*

P04_19

MULTIPLICATION AND POLYPHENOLICS PRODUCTION OF *SIDERITIS SCARDICA* THROUGH DIFFERENT TISSUE CULTURE TECHNIQUES

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The *Sideritis* genus (Lamiaceae) comprises of over 150 species, distributed mainly in the Mediterranean region, the Balkans, the Iberian Peninsula, Central Europe and West Asia. The Balkan endemic *Sideritis scardica* is traditionally utilized as a pulmonary treatment, as well as anti-flu and wound healing remedy. The low germination rate and collection pressure imposes significant risk on its natural populations. Therefore *ex situ* conservation approaches for its conservation have been utilized in Bulgaria, including field cultivation for the needs of the market.
The aim of the present work was to study the effect of different approaches of tissue culture development on the multiplication, as well as polyphenolic production capacity of the species *in vitro.*
Materials and Methods: Organic (plant growth regulators, benzyl adenine and naphtalene acetic acid), as well as inorganic (activated charcoal) treatments were applied to shoot cultures of the species.
Results: Higher multiplication rates, as well as higher polyphenolics levels were obtained by means of plant growth regulators treatments. However, plants tended to have a shorter sub-culture period and form lower and more compact shoot clumps, as compared with the charcoal-treated *S. scardica* plantlets.
Conclusion: As a cost-effective and inorganic agent, activated charcoal seems to be a prospective tool in development of *in vitro* culture system for both prolonging sub-culture period and improvment of explant quality in biotechnological development of the plant.
Keywords: Sideritis scardica in vitro culture, plant growth regulators, activated charcoal, multiplication, phenolics.

Acknowledgements: Swiss National Science Foundation in the Framework in the Bulgarian-Swiss Research Program (BSRP, grant No. IZEBZO_142989; DO2-1153); World Federation of Sciences – Bulgarian National Scholarship Programme for young researchers

THEMATIC SESSION V

ECOLOGY AND EDUCATION

PL05_01

ENVIRONMENTAL EDUCATION IN PARADIGM OF LIFELONG LEARNING

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Abstract

Lifelong learning paradigm is an expression of current educational aims. It is not only conditions for unlimited personal opportunities for flexibility to social trends and unexpected social and economic changes, but also synergetic approach to institutional and individual aspects of education.

Environmental education is one of the best examples of importance of synergetic efforts and decisions despite of levels of management and working of social system.

In the report is presented synergetic model of environmental education. The model is specified by following interactions:

- Formal – non-formal – informal environmental education;
- Normative documents – resources – key competencies.

Processes of formation of positive attitudes to environment require unidirectional, adequate to conditions efforts by everyone involved.

Key words: environmental education, synergetic approach, lifelong learning

L05_01

PROJECT-BASED LEARNING ON "ECOVILLAGES"

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Abstract

The objective is to increase the ecological knowledge of the students working on projects based on ecovillages. One of the main goals of this form of biological education is to activate the ecological self-consciousness in the process of learning. The study aims to show an innovative model for teaching. The theme is "Ecovillages" , in which settings the students work on preliminary given algorithm and present their own developed projects after completion. Project-based learning gives the opportunity for individual expression for every student based on their knowledge and skills in the ecological area, and with this, a complete ecological self-consciousness.

Key words: Ecovillage, Ecological self-consciousness, project-based learning

L05_02

EDUCATION FOR SUSTAINABLE DEVELOPMENT – THE MODERN FACE OF THE ENVIRONMENTAL EDUCATION. THE TRANSITION IN HISTORICAL PLAN

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Environmental education plays a worldwide role since 1970. Many international conferences were organized since then, mostly from UNESCO and the International Union for Conservation of Nature in the context of ecology and environmental protection. In Europe, the European community pays attention to the environmental education issues from 1980. After the United Nations Conference on Environment and Development held in Rio de Janeiro in 1992, grows the need to reorient the education for biodiversity, the so called environmental education, to human rights, justice and democracy, that are basical for the sustainable development.

The article observes the transition process from environmental education to education for sustainable development and suggests the main content and aproaches needed for elaboration of modern educational programs.

Theoretical analysis and synthesis are used for the research.

Education for sustainable development is the next generation of environmental education, related to new ways of thinking and learning. It integrates environmental, health, global, civic and other educational fields as a whole. It is necessary to develop environmentally friendly, economically feasible and socially equitable behavior in the personal and professional life style. This can be achieved by conducting both formal and non-formal education for sustinable development.

Key words: education for sustainable development, environmental education

L05_03

MODEL ON PROJECT-BASED TEACHING ON THE TOPIC OF: "GREEN BUILDINGS-THE NATURE IN OUR LIVES"

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The following report presents an idea for organizing a project-based teaching on the topic of: "Green buildings-the nature in our lives". The educational project is focused on the following questions:

What do we imagine, when we talk about the future image of our planet? Where is nature's place in our lives? Can we just ignore it in the name of the technological progress? Numerous researches prove the irreplaceable role of plants in people's health. Do we have to be deprived from one for the sake of the other? With the help of green building we can reach a balance without choosing. How do we achieve it?

Keywords: Project-based teaching, Green buildings, Biology teaching, Motivation

P05_01

ENVIRONMENTAL EDUCATION MODEL TITLED "ECOLOGICAL CORRIDORS - ROADS FOR ANIMALS"

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Abstract:

This article presents one educational model, based on project-based learning, to teach the students from the secondary school the necessity of ecological corridors in secondary school. The main purpos of the ecological corridors is to preserve the wild life and minimize the anthropogenic impact of built highways, crossing their natural habitats. Project-based learning is a dynamic approach to spread this idea through the Bulgarian schools, in order to draw attention of the young generation to this ecological problem and become a common practice to save the wild nature.

Key words: Environmental Education, Ecological corridors, Project-based learning

P05_02

ENVIRONMENT POLLUTION FROM A FOOD CONTACT MATERIALS

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Aim: Food contact materials are all materials and articles intended to come into contact with food, such as packaging, containers, kitchen equipment, cutlery and dishes, bottles.
Waste falling in water bodies and in particular plastics pose a threat not only to the health of marine ecosystems, but also for the population. The majority of the waste in the aquatic systems are generated by the activities on land, namely as a result of human involvement. The aim of this study is to make a summary literature research on major sources of pollution and to pathway opportunities to attend to the problems associated with waste into the environment.
Materials and Methods: For the implementation of the task has been used scientific information available in different European organizations such as the European Environment Agency, European Food Safety Authority, World Health Organization, Ministry of Environment and Waters in Bulgaria, RASFF etc.
Results: Following the study it was been found that about 10 million tonnes of waste fall into the world seas and oceans each year. Plastics and especially plastic bags, bottles and bags for single use are the most common type of contaminants found in the marine environment. Base on the RASFF research the following conclusions can be drawn: over the years a significant number of notifications in respect of the overall migration; a significant number of notifications for metals (chromium, manganese, nickel, etc.); melamine formaldehyde.
Conclusions: Based on this study, it can be concluded that different countries search for sufficient options to address the problems related to environmental pollution from used packaging. These are: the production of biodegradable packaging; make a periodic collection of waste in the seas, oceans, rivers; cleaning of a beaches and seaboard around them; protection of rivers and etc.

Key words: environment pollution, food contact materials, plastic bags, bottles.

P05_03

BIO-FIT PROJECT - PROMOTING ORGANIC FARMING BY TRAINING IN BIO-FERTILIZERS

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Eco-innovation is a core action of EU 2020 strategy, which promotes the development of products and processes that contribute to sustainable development, using the corporate application of knowledge to elicit ecological improvements. This concept is on the ground of Bio-FIT project, which main objective is focused on development of innovative VET educational programme in the frame of biotechnology of bio-fertilizers designed through EQF/NQF strategic system within BG, CY, GR and HU. This type of training can contribute in bridge building between technology and farming, and can introduce bio-innovations in sustainable development of the agricultural sector at National/EU level.

The Bio-FIT project offers the following key products:

- National case studies, assessing the current state of the art in each partner country in respect to project subject area
- Bio-FIT Qualification Passports describing the key competences for specialists, working in the project subject area
- Bio-FIT eTraining environment, a functional tool for delivery of free-access information resources and training opportunities
- Bio-FIT Training Programme, offering multilingual model for international transfer of acquired qualification in the field of bio-fertilizers
- Bio-FIT Handbook for Trainers/Trainees, designed to assist in delivering/acquiring the Bio-FIT training content, and
- Bio-FIT ECVET Framework, identifying the ways how ECVET principles and instruments can be integrated into the Bio-FIT project.

Besides these Intellectual outputs, Bio-FIT project organizes different initiatives for implementation and popularization of the products and thus influences the application of the training approach in the related sectors of the economy. The Bio-FIT project impacted the provision of new opportunities for making education more relevant to the needs of the labor market. Project develops a competency based training which will empower the end users with green skills and competences. The Bio-FIT b-learning programme is based on learning outcomes model and thus will contribute to the implementation of the "new skills for new jobs" strategy at national and EU scale. In long term through offering high quality VET pathways, Bio-FIT project can give better prospects for professional carrier and professional competence development.

THEMATIC SESSION VI

OTHER RELATED TOPICS

L06_01

USE OF BIOMASS FROM ANTARCTIC YEAST STRAIN FOR THE REMOVAL OF METALS FROM AQUEOUS SOLUTIONS

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Background: Environmental pollution with heavy metals is a major threat to the ecological balance. Among the basic requirements in the development of purification systems are non-toxicity, renewable sources and biodegradability. The systems can act as biosorbents of target metals for effective treatment of contaminated areas.

Materials and Methods: For obtaining the biomass, a new Antarctic yeast strain *Cryptococcus laurentii* AL_{65} and 5-litre Sartorius Aplus bioreactor cultivation system were used. The resulting biomass was pretreated and used as biosorbent for ions in multielement standard solution (Multi IV, Merck) with a concentration of 10 and 20 ppm. For determining the metal ions in the solution ICP-OES system was used.
Results: The cultivation of the producer in a bioreactor allowed the accumulation of 6.30 g/L biomass. The biosorption abilities were determined for 16 elements: 0.07 g/g dry biomass was the adsorbed amount of ions for 10 ppm, and it was 0.12 g/g for 20 ppm respectively. The best adsorption capacity was observed for solution with 20 ppm for Al, Cr, In, Ga, Fe and Bi in the range of 12 to 16 mg/g dry biomass at an optimal pH of about 5.
Conclusion: The results about biosorption ability of Antarctic producer *Cryptococcus laurentii* AL_{65} can be used in the optimization of technological processes for the removal of heavy metals from solutions.

Keywords: biosorption, metals, Antarctic yeasts, solution

L06_02

DATA INTEGRITY: A NEW LOOK AT AN OLD TOPIC

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Aim: to ensure that all the records generated by laboratories are accurate, complete, intact and maintained within their original context, including their relationship to other data records.
Introduction: Data integrity is fundamental in a quality system which ensures that products are of the required quality. Data may be generated by a paper-based record of a manual observation, or in terms of equipment, a spectrum of simple machines (eg pH meters and balances) through to complex highly-

configurable computerised systems (eg HPLC and ERP systems). The inherent risks to data integrity will differ depending upon the degree to which data generated by these systems can be configured, and therefore potentially manipulated. Data integrity requirements apply equally to manual (paper) and electronic data. Manufacturers and analytical laboratories should be aware that reverting from automated / computerised to manual / paper-based systems will not in itself remove the need for data integrity controls. In addition to an overarching data governance system, which should include relevant policies and staff training in the importance of data integrity, consideration should be given to the organisational and technical controls applied to different areas of the quality system.
Conclusions: Laboratories should document an overall data integrity approach by outlining informatics based on workflow. This approach can be set forth in a laboratory data integrity strategy.
Keywords: data integrity, MHRA, data governance

P06_01

HEALTH AND ENVIRONMENTAL ASPECTS OF SEWAGE SLUDGE UTILIZATION

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Aim: Application of sewage sludge from urban wastewater treatment plants in agriculture is the preferred treatment method according to EU requirements. This procedure is defined for Bulgaria in "Ordinance on the order and the way of recovery of sludge from waste water treatment through its use in the agriculture (adopted with CM Decree 339/14.12.2004, SG112/23.12.2004)". Under the Ordinance, an essential requirement to fulfill before sludge utilization, is to ensure protection to human health.
Materials and Methods: This study presents the results from microbiological analyses of 298 sludge samples from 43 wastewater treatment plants in Bulgaria, investigated in NCPHA within the period 2006-2015. The details of the investigation for microbial contamination, were discussed followed by statistical generalization and interpretation of the environmental health risk.
Results: While in most cases the sewage sludge samples appeared to be clean from harmful chemicals, the microbes presented in some of the samples indicate the potential health risk of pathogenic contamination. The indicative quantifications of *E. coli* and *Cl. Perfingens* prove their persistence in different proportions in some of the samples.
Conclusion: The results of this study prove the need for further introduction of new and more efficient methods for final sewage sludge treatment and microbial decontamination.

Keywords: sewage sludge, wastewater treatment, environmental health

P06_02

LIQUID CRYSTALS, BIODIVERSITY AND ADAPTATION MECHANISMS OF LIVING MATTER

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The aim of the paper is, on the basis of the unique properties of liquid crystals (LC), to discuss their role in accommodation mechanisms of living matter, as building blocks of biodiversity and in the origin of life on earth.

Materials and Methods: Liotropic, smectic and cholesteric LC are mainly in use. The methods of investigation include experiments with liotropic membranes, flexoelectric analysis, polarization microscope observations and others.
Results and discussion: The results reveal that LC show properties of sensitivity and ability to interplay between mechanical, electrical and optical external influences. LC incorporated in living organisms act as proto-organs thus cause and facilitate the adaptive abilities of biological specimen.
Conclusion: LC are widely found as effectively functioning building blocks of the living organisms, facilitating their adaptation mechanisms and can be considered as predecessors of life on earth.

Key words: Adaptation mechanisms, liquid crystals, origin of life.

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