INTERNATIONAL WORKSHOP

CONSERVATION BIOLOGY

BOOK OF ABSTRACTS

University of Primorska

Faculty of Mathematics, Natural Sciences
and Information Technologies

Department of Biodiversity

Koper, 17 - 19 June 2015

SCIENTIFIC COMMITTEE

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International workshop on Conservation Biology

Koper, 17-19 June 2015
Book of abstracts

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PROGRAMME

Wedensday, 17 June 2015

8.00-9.00

REGISTRATION

9.00-9.30

OPENING SESSION: Conservation Biology towards resolving the split between "small population paradigm", and the "declining population paradigm"

Elena Buzan

SESSION 1: CONSERVATION GENETICS & EVOLUTION

9.30-10.30

PLENARY TALK 1: Taxonomic inflation – species concepts and their bearing on conservation biology

Frank E. Zachos

10.30-10.45

Genetic introgression insights in Adriatic grayling (Thymallus thymallus aeliani) obtained from museum specimens

Jernej Bravničar

10.45-11.00

Possible links between molecular data and morphological ecotypes in False ringlet, Coenonympha oedippus (Nymphalidae: Satyrinae) at the southern distribution limit

Sara Zupan

11.00-11.30

COFFEE BREAK

11.30-11.45

Genetic diversity and population structure of Daphne blagayana

Živa Fišer Pečnikar

11.45-12.00

Molecular markers confirm presence of Danube crested newt (Triturus dobrogicus, Salamandridae) in North-Eastern Slovenia

Martina Lužnik

12.00-12.15

Genetic differentiation of chamois (Rupicapra rupicapra) from Alps to the central Balkans

Elena Buzan

12.15-14.00

POSTER SESSION

SESSION 2: PROTECTED AREAS & CONSERVATION POLICY

14.00-15.00

PLENARY TALK 2: Parks, People, Planet: protected areas in the next decade

Andrej Sovinc

15.00-15.15

Marine biodiversity conservation in Slovenia - meeting the requirements of international conventions and European Union policy

Tina Centrih

15.15-15.30

Establishment of Natura 2000 for marine birds in Slovenia

Urška Koce

15.30.-15.45

Alternative approach to nature conservation with social entrepreneurship

Iztok Erjavec

15.45-16.15

COFFEE BREAK

16.15-16.30

Moehringia tommasinii, an endangered endemic plant from the Karst edge

Peter Glasnović

16.30-16.45

Nature Conservation Policy - from legislation to real effect in nature in Gorenjska

Andreja Škvarč

16.45-17.00

The structural and functional role of river bed sediments and gravel bars: implications for conservation ecology

Nataša Mori

17.00-17.15

Evaluating the condition, habitat availability and distribution of Tremarctos ornatus in the National Natural Park Tama and its buffer zone

Carlos Cáceres

17.15-17.30

CLOSING SESSION

Thursday, 18 June 2015

8.30-9.00

REGISTRATION

SESSION 3: ECOSYSTEM HEALTH

9.00-10.00

PLENARY TALK 3: Drugs, Disease, and the Diabolical Diversity of Extraintestinal Pathogenic Escherichia coli

Matthew A. Mulvey

10.00-11.00

PLENARY TALK 4: Worms and germs: the role of microbiodiversity in conservation

Heidi Christine Hauffe

11.00-11.30

COFFEE BREAK

11.30-11.45

Exploring Actinobacteria assemblages in coastal marine sediments under contrasted Human influences in the northern Adriatic Sea, Croatia

Bojan Hamer

11.45-12.00

Waste dumping sites as potential foci of human toxoplasmosis

Vladimir Ivović

12.00-12.15

Between science and politics: indices and trends of Slovene common farmland birds

Primož Kmecl

12.45-13.45

POSTER SESSION

13.45-16.00

LUNCH BREAK

16.00-20.00

FIELD EXCURSION to medieval town of Piran with the boat Solinarka, visit to the Shells and snails museum.

Friday, 19 June 2015

8.30-9.00

REGISTRATION

SESSION 4: LANDSCAPE & POPULATION ECOLOGY

9.00-10.00

PLENARY TALK 5: Forage alternatives, climate change, and predator persistence in the Eastern Bering Sea

Scott Heppell

10.00-10.30

POSTER SESSION

10.30-10.45

Model-based Simulations over 500 Years Provide Insights on Demographic Structure of Turtle Populations

Marco Zuffi

10.45-11.00

Spatio-temporal distribution and movements of small juvenile loggerhead sea turtles (Caretta caretta) from the northern Adriatic Sea

Bojan Lazar

11.00-11.15

Amphibian selection of breeding habitats in the Karst plateau

Jure Jugovic

11.15-11.30

Is population of Moor frog (Rana arvalis) under severe decline in Mura river basin in Slovenia?

Katja Poboljšaj

11.30-11.45

Dolphins have individually distinct faces: photo-identification based on facial features as a tool to enhance studies of Delphinids

11.45-12.15

CLOSING SESSION

CONTENTS

Conservation Biology towards resolving the split between “small population paradigm”, and the “declining population paradigm”

Elena Buzan[1,2]

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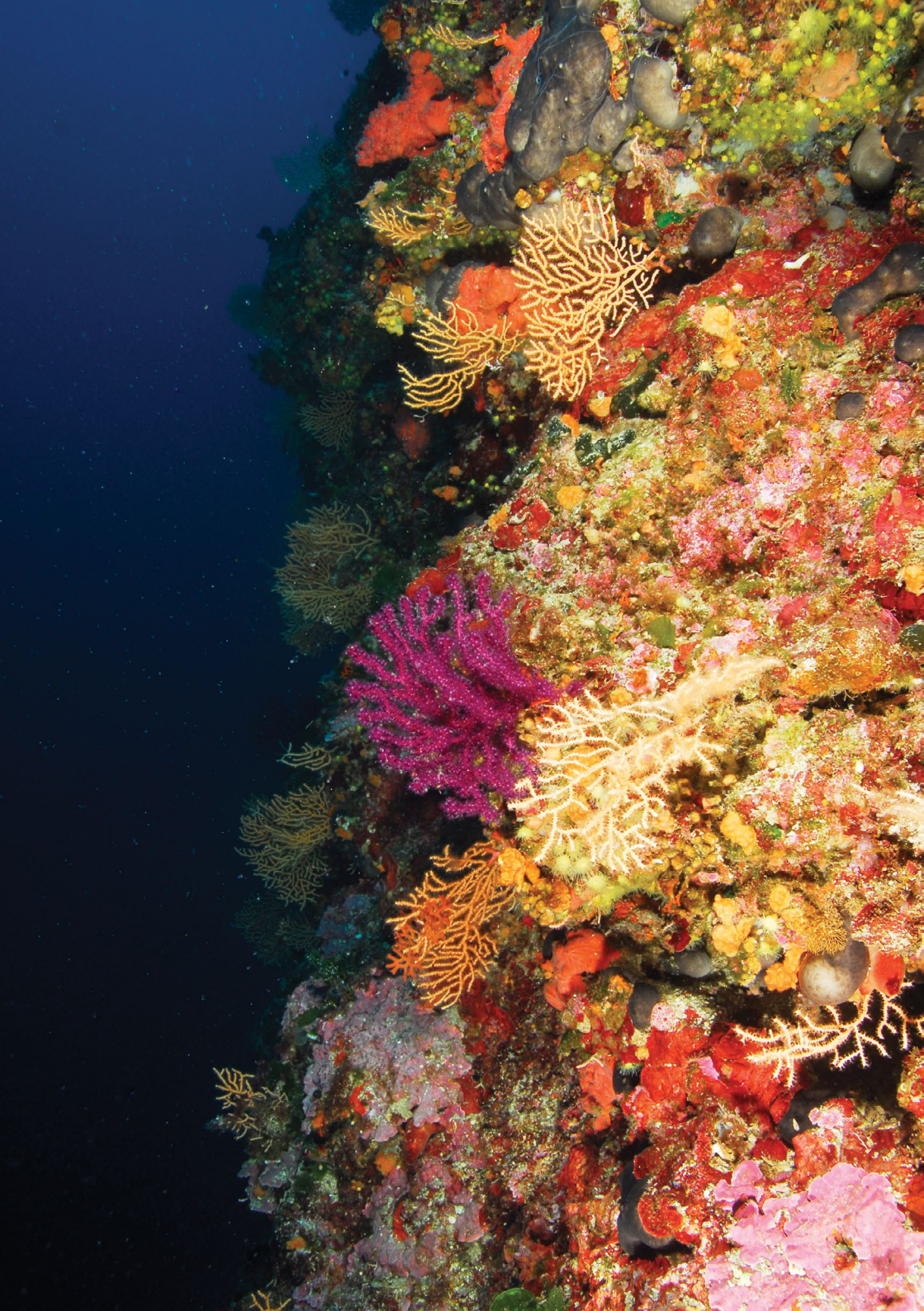
The discussion about division between the “small population paradigm,” which needs more empirical evidence, and the “declining population paradigm,” which needs more theoretical development, has been continuously debated among conservation biologists. To develop compromises between conservation priorities and human needs the theoretical constructs and the field investigations should be considered. In the second Conservation Biology workshop we bring together the international community of conservation professionals to address conservation challenges and present new findings, initiatives, methods, tools and opportunities in conservation science and practice. With four different sessions: (I) Conservation genetics and evolution, (II) Protected areas and conservation policy, (III) Ecosystem health, and (IV) Landscape and population ecology we try to enhance the knowledge about complex biological events, providing decision makers with evidence based research to maximize both biodiversity and socioeconomic outcomes. A special focus at this workshop is given to the topic of ecosystem health. We consider ecosystem health a comprehensive, multiscale, dynamic, hierarchical measure of ecosystem resilience, organization, and vigour to quantify the effects of natural or anthropogenic stress on a particular ecosystem over time. The global venue for presenting and discussing new research and developments in conservation science and practice is given at University of Primorska.



SESSION 1:

CONSERVATION GENETICS & EVOLUTION

Taxonomic inflation – species concepts and their bearing on conservation biology

Frank E. ZACHOS[1]

[1]*Natural History Museum Vienna, Austria*

The question what a species is and which (if any) of the available species concepts is applicable to all of biodiversity (the "species problem") is arguably one of the most contentious issues in biology. This problem, however, is far from being of purely academic interest. While the theoretical ramifications of the species problem are immense and crucial to many biological disciplines, the taxonomic status of threatened taxa and the designation or rejection of species status are of paramount importance in conservation biology and management as well. This has become increasingly clear over the last years which have seen a paradigmatic shift from the biological to versions of the phylogenetic species concept. In my keynote I will give a (necessarily very brief) overview of the species problem and recent developments in taxonomy, discussing also their potentially very worrying impact on conservation.

Genetic introgression insights in Adriatic grayling (*Thymallus thymallus aeliani*) obtained from museum specimens

Jernej BRAVNIČAR[1], Anja PALANDAČIĆ[2], Simona SUŠNIK-BAJEC[1], Aleš SNOJ[1],

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[2]*Natural history museum Vienna, Zoological Department, Vienna, Austria*

The Adriatic grayling (*Thymallus thymallus aeliani*) with species range in the Northern Adriatic basin is the most diverged among phylogenetic lineages of European grayling (*Thymallus thymallus*) and according to molecular studies has been evolving separately from other European linages for more than 4 million years. Unaware of evolutionary distinctiveness, Soča river was continuously stocked from neighboring basin that inhabits graylings belonging to Danubian southern Alps lineage from 1980s till recently. Practice resulted in mixing of evolutionary lineages and observed but not tested drop of population fitness. Today no pure Adriatic grayling populations can be found in Soča river, with all having a considerable percentage of alleles originating from upper Sava drainage.

Our aim was to identify mitochondrial haplotypes present in river Soča in time which predates known human induced translocations. Fortunately Nature History Museum of Vienna (NHMW) holds specimen originating from Adriatic basin obtained in 1800s.

DNA from white-eyed specimen stored in ethanol was isolated in NHMW clean room. Novel primer sets were designed to multiple overlapping 230-330bp long regions of mtDNA control region.

We were able to obtain isolates from 20 specimen sampled from 1866-1899; Soča (Adriatic lienage), Sava Bohinjka (Danubian southern Alp lineage) and Fischia bei Lichtworth (Danubian northern Alp lineage). Sequenced mtDNA CR fragment haplotypes of 582bp length were aligned with known sequences of European grayling. Phylogenetic analysis was run in order to classify obtained haplotype lineage identity.

Analysis has shown presence of Danubian northern Alps lineage in addition to native Adriatic lineage in Soča river samples from 1861 and 1888. Interestingly in extant specimens from Soča river only Adriatic lineage and Danubian southern Alp drainage (a result of recent translocations) are present. We believe the possibility of human induced translocations of grayling in 1800s is highly unlikely due to technological restraints, although fertilized eggs could have been transferred on damp moss in barrels. Alternatively it could be a product of past natural introgression via Pleistocene glacial damming in alpine valleys. However to clarify this, further genomic analysis is needed.

Possible links between molecular and morphological data in two ecotypes of False Ringlet, *Coenonympha oedippus* (Nymphalidae: Satyrinae) at the southern distribution limit

Sara ZUPAN[1,2], Jure JUGOVIC[1,2], Tatjana ČELIK[3], Elena BUZAN[1,2]

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[3]*Jovan Hadži Institute of Biology, Research Centre of the Slovenian Academy of Sciences and Arts, Ljubljana, Slovenia*

False Ringlet, *Coenonympha oedippus* (Fabricius, 1787) (Nymphalidae: Satyrinae) is one of most endangered species in European butterfly fauna and continue to decline severely. It is restricted to successional habitats mainly characterized by pronounced litter layer, relatively nutrient-poor conditions, no considerable growth of shrubs and direct sun exposition. In Slovenia, False Ringlet has disjunct distribution and its populations are ecologically linked to two very distinctive habitats, to the overgrowing dry grasslands in SW Slovenia (more geographically dispersed and with lower population densities) and to wet grasslands and fens in Central Slovenia. Appearance in two radically different habitat types and a geographic isolation led us to inspect for possible genetic and morphological differentiation among and within these populations in order to prepare a solid ground for more detailed studies of ecotypes in the future. We compared 26 morphometric characters of fore- and hind wings for over 200 specimens from entire distribution area in Slovenia originated mainly from collection in the Natural History Museum of Slovenia and the Research Centre of the Slovenian Academy of Sciences and Arts. Multivariate statistical analysis showed significant differences in wing size and surface of spots (“eyes”) on wings. They could be possibly linked to different ecotypes from wet and dry habitats as a phenotypic manifestation of adaptation to local environmental conditions. Furthermore, genetic analysis of three genetic markers (COI, 12S rRNA, EF-1α) showed interesting haplotype structure. Although the genetic differentiation among studied populations is not completely congruent with morphological differences, populations from Goriška Brda and Karst exhibit highest rate of unique haplotypes, showing that some local differences in morphology could be at least partly assigned to the unique genetic makeup and became clear as a result of the adaptations to local habitats. This preliminary data are valuable and indispensable for conservation and management of the species.

Genetic diversity and population structure of *Daphne blagayana*

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[2] *University of Primorska, Science and Research centre Koper, Institute for Biodiversity Studies, Koper, Slovenia*

Daphne blagayana is a small decumbent bush from the family Thymelaeaceae. Due to its rarity it is protected by national legislation in almost all countries within its range. The present distribution of the species is fragmented and comprises the Balkan Peninsula and the southern Romanian Carpathians. However, the mechanism leading to such fragmented distribution range is not well understood. Sampling of *D. blagayana* was conducted at 21 locations across the entire distribution range. Chloroplast DNA and AFLP markers were used as a tool for assessing its conservation status. The phylogeographic analysis included 95 plants from 21 populations. The study was based on the analysis of five spacer regions of chloroplast DNA: *rpl20-rps12*, *atpB-rbcL*, *trnL-F, psbA-trnH* and *trnK–matK* with the gene *matK*. The results suggest the existence of three clusters: the northern cluster (SLO), including Slovenian and Italian populations, the southern cluster (J), including populations from Macedonia, Montenegro and Stolac (BiH), and the central cluster (SR), including the remaining populations. Both haplotype and nucleotide diversity were highest in the central cluster and lowest in the northern cluster. In the second part of the study we assessed genetic structure and gene flow between 13 selected populations using dominant AFLP markers. The results showed a relatively strong structuring (FST = 0.4) and absence of gene flow among distant populations. Using programs STRUCTURE and BAPS populations were subdivided into 2 and 7 groups, respectively. The groupings proposed by STRUCTURE and BAPS are not fully congruent with cpDNA clusters. This incongruence might be attributed to different reproduction strategies within populations, and to different modes of inheritance of chloroplast and nuclear DNA.

Molecular markers confirm presence of Danube crested newt (*Triturus dobrogicus*, Salamandridae) in North-Eastern Slovenia

Martina LUŽNIK[1,2], Maja CIPOT[3], Marijan GOVEDIČ[3], Aleksandra LEŠNIK[3], Damijana RAŠL[1], Elena BUZAN[1,2]

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Crested newts are a group of closely related salamandrids within the *Triturus cristatus* superspecies. Their differential ecological demands result in different morphotypes: ranging from stocky, mostly terrestrial animals, to slender and predominantly aquatic. Species can thus be identified *in situ* based on limb size relative to the body length ("Wolterstorff index" or WI). More reliable identification characters comprise counts of rib-bearing vertebrae and analysis of molecular markers (mitochondrial and nuclear DNA). Crested newt species ranges are mostly parapatric, with narrow hybrid zones whenever there is contact, which complicates species determination. In Slovenia two crested newt species are present: the widely distributed Italian crested newt (*Triturus carnifex*), and the Danube crested newt (*T. dobrogicus*), which was discovered in 2012 in NE Slovenia and was determined using WI index. Both species have a different conservation status in national and international legislation. Because of different ecological requirements, management of habitats should be distinct. It is therefore crucial to know the distribution range of both species in order to apply suitable conservation measures for each species. Here we present the first results of joint morphological and molecular analyses for crested newt populations from eastern Slovenia. WI was analysed in 108 specimens from 9 populations along Mura River floodplains, whereas mitochondrial gene cytochrome *b* was screened in 60 specimens. Morphological results revealed 5 pure *T. dobrogicus* populations and 4 hybrid *T. dobrogicus* x *carnifex* populations. However, molecular analysis revealed populations to have mtDNA associated to *T. carnifex* only, to *T. dobrogicus* only, or both (mixed populations). Due to the inability of mtDNA to reveal hybrids, we can't impose directly which specimens are hybrids, however with the combined morphological and molecular data we are able to suggest that the Mura floodplain is most likely inhabited by hybrid populations. To elucidate the distribution of the investigated species, further research of eastern Slovenian floodplains, where typical Pannonian species are found, is needed.

Genetic differentiation of chamois (*Rupicapra rupicapra*) from Alps to the central Balkans

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[2]*University of Primorska, Science and Research Centre, Institute for Biodiversity Studies, Koper, Slovenia*

In this review study we address the genetic makeup of the chamois from Alps to the central Balkans. Chamois habitat is extensive in the Alps, but scarce and highly fragmented in the Dinaric Mts., which are of lower elevation and largely forested. The chamois populations are well suited to address questions regarding the effects of past management on genetic diversity and population differentiation, since chamois was reduced to very low numbers in the Alps in the 19th century and was almost extinct from north-western part of Dinaric Mts. This region represents the presumable border between the distribution ranges of northern *R. r. rupicapra* and southern *R. r. balcanica*. By utilising mtDNA variation in chamois from Slovenia, Croatia and Bosnia and Herzegovina, we found existence of rupicapra haplotypes in the Alps and north-western Balkans, and balcanica haplotypes in the central parts of Dinaric Mts. The results confirm the impact of recent human management (documented translocations) in Velebit Mts. and have established a new contact (hybridization) zone between the *R. r. rupicapra* and *R. r. balcanica* subspecies. Spatial genetic analyses revealed by microsatellite markers divided Alpine populations, from Pohorje Mts. and north-western Dinaric Mts. Dinaric Mts. populations are highly fragmented and exhibit a significant isolation-by-distance pattern, indicating limited gene flow and existence of severe bottlenecks in the past due to their small size and low dispersal ability in the forested landscape. The clustering of chamois populations from central Dinaric Mts. supports their differentiation into five geographically associated clusters and reveals a strong substructure within mountain ranges with suboptimal chamois habitat. Evidently, small groups of chamois may stay isolated in restricted habitat patches that are separated by extensive forests. Occasional, but very restricted gene flow can be observed between them. The clusters, re-evaluated with a spatial analysis of genetic variation, have undergone independent demographic histories and should be regarded as independent units for conservation and management purposes.

The idea of Cannibalism Gene Transfer to *Mnemiopsis leidyi*

Majid HONARI LECCE GOURABI[1], Motahareh MOHSENPOUR[2]

[1]*Azad University Of Lahijan, Iran*

[2]*Institute of Agricultural Biotechnology, Tehran, Iran*

After the *Mnemiopsis leidyi* was introduced to Caspian Sea it caused substantial decrease in number of Caspian Sea Sprat due to its predation of fish eggs and larvae and competition for same food source (zooplankton).

Until now, huge efforts are given to the problem of increasing *Mnemiopsis leidyi*. At the end the best solution was to introduce another ctenophora called *Beroe ovata* as a predator to the Caspian Sea. The introduction should be taken with a huge caution due to the possible future treats.

As a begging of research of possible treat we used comparation of transcriptomes of non-cannibal type of this ctenophora and its close cannibal species. After analysing genes sequence we will target the genes involved in cannibalism, cannibalism trait is identified and after supplemental studies. Next step will include microinjection of CMV virus E1 gene promoter and Terminator SV40 poly (A) into fertile eggs of ctenophora. It is expected that by achieving transgenic *M. leidyi* carrying cannibalism gene and transferring them into the sea in large numbers, the number of *M. leidyi* and feeding competition with Caspian Sea Sprat is reduced and the number of this fish increases again. Since *M. leidyi* has caused more than 120 billion tomans of damage to country, it is hoped that the idea presented in this project will be able to solve this problem in the future.

SESSION 2:

PROTECTED AREAS & CONSERVATION POLICY

Parks, People, Planet: protected areas in the next decade

Andrej SOVINC[1]

[1]*IUCN World Commission on Protected Areas*

The IUCN World Parks Congress (WPC) is a major form for advancing global protected area policy and practice. The 6th Congress was held in November 2014 in Sydney, Australia. With its theme ‚Parks, People, Planet: Inspiring Solutions', the Congress discussed ways to find better and fairer ways to conserve natural and cultural diversity, involving governments, businesses and citizens in establishing and managing protected areas, inspire people around the world and across generations to reconnect with nature and demonstrate natural solutions to our planet's challenges, such as climate change, health, food and water security.

The presentation will highlight major WPC outcomes, present orientations on how to reach conservation goals and effectively protect biodiversity, address the role of protected areas in mitigation and adaptation to climate change, role of protected areas in securing people's health, importance of ecosystem services provided by protected areas, challenging development goals, demonstrating different governance types, including engagement of indigenous people in protected area establishment and management issues and strengthening the role of youth in conservation. Four Cross-cutting Themes will also be presenting, including marine protected areas, capacity building, World Heritage and a new social compact for just conservation.

The IUCN World Parks Congress is the decade's most important forum to identify and communicate inspiring solutions involving protected areas for some of the world's most pressing global challenges. Innovative and transformative approaches that address new challenges for protected areas are embraced in The Promise of Sydney, not an action plan for protected areas but rather a platform for commitments offering a broad constituency to make their own promises towards achieving effective conservation and sustainable development goals.

Marine biodiversity conservation in Slovenia - meeting the requirements of international conventions and European Union policy

Tina CENTRIH[1]

[1]*Institute of the Republic of Slovenia for Nature Conservation, Ljubljana, Slovenia*

There are several international conventions, directives and agreements that help protect and conserve marine biodiversity. We analysed the current state of marine biodiversity in Slovenian marine protected areas (MPAs) and the implementation status of international conventions and European policy, with the emphasis on the Convention on Biological Diversity (CBD), the Barcelona Convention, the EU Habitats Directive together with the Birds Directive, and the Marine Strategy Framework Directive. On an overall objective they all obligate Slovenia as a state to maintain a good status of its coastal and marine biodiversity. Our research on available data shows that the implementation of the different policies is not always consistent with their legal requirements. Some protected species and habitat types still do not have designated protected areas in Slovenian waters. This is especially true for open water species and habitats, such as the loggerhead sea turtle (*Caretta caretta*), bottlenose dolphin (*Tursiops truncatus*), reefs, sandbanks and Posidonia meadows. Furthermore, the management of existing MPAs is poor or even non-existent in some. A network of comprehensive, representative and effectively managed national marine protected areas in Slovenian waters is thus still wishful thinking. In order to achieve this goal, a number of activities would need to be implemented, both in terms of identification and establishment of new MPAs, as well as in terms of a more efficient management plan for existing ones. To conclude, we provide recommendations that could prove beneficial in order to reach one of the CBD Aichi Biodiversity Target objectives, that at least 10% of the sea and the sea shore, especially the areas of utmost importance in terms of biodiversity and ecosystem services will be protected by the year 2020.

Establishment of Natura 2000 for marine birds in Slovenia

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Seven species of marine birds have been protected in Slovenia within Natura 2000 network. In the beginning (2004) mostly coastal terrestrial habitats of breeding colonies and roosting areas of seabirds were included and only a small part of coastal sea representing seabirds' foraging habitat. Representativeness of marine environment in Natura 2000 network has been significantly improved in 2013 when another two coastal sites were added. Despite this recent expansion, open sea foraging habitats have been neglected until recently, due to lack of data from unexamined off-shore areas. Project SIMARINE-NATURA (LIFE10NAT/SI/141) was initiated in 2011 to complement the missing piece. Among several seabird species occurring at the Slovenian sea, the Mediterranean Shag (*Phalacrocorax aristotelis desmarestii*) was chosen as a priority species for the identification of new Important Bird Areas (IBAs) which represent an internationally agreed base for the designation of Natura 2000 sites. The (sub)species qualified as priority because it is included in the Annex I of the Birds Directive, the Bern and the Barcelona Conventions, and it is regularly occurring in significant numbers at the Slovenian sea. Moreover, it can be used as an umbrella species for the protection of wider marine environment in Slovenia, because it is a top predator in widely distributed muddy and sandy bottom habitats which hold abundant populations of its most important prey, the black gobie (*Gobius niger*). Standardised methods and modern techniques (ESAS monitoring and GPS telemetry) were used for data collection on the distribution and movements of the Mediterranean Shags. Identification of foraging areas was carried out through comprehensive spatial analytical approach. One off-shore site was identified as a new IBA and a belt of shallow coastal waters was recognized as an important extension of an existing site. Besides the spatial analysis, diet analysis was made, altogether giving an important insight into foraging ecology of the Mediterranean Shags in the Slovenian sea which was previously poorly understood. Potential threats were described and management guidelines proposed but evaluation of these threats and preparation of an effective conservation plan remains a challenge for the near future.

Alternative approach to nature conservation with social entrepreneurship

Iztok ERJAVEC[1], Klemen BIZJAK[1], Martina GOPURN[1]

[1]*Institute for Sustainable Development and Holistic Solutions – InTeRCeR, Slovenia*

Is it possible to achieve restoration of traditional landscapes and the associated biodiversity through enabling new opportunities for employment for local communities and sustainably developing these areas?

We are working on the project Land sharing to achieve this goal. The aim of the project is the reintroduction of old farming practices which build traditional cultural landscapes. We will establish framework conditions for sustainable development in rural areas with intergenerational cooperation between elderly owners of small multipurpose farm in the countryside and unemployed people in towns for improvement of their economic and social situation.

Cooperation will restore multipurpose organic farming which took place in the past and transfer this knowledge from older generations who actively participated in these farming practices to younger generations with work on the land. This is a new nature protection concept based on reintroduction of traditional multipurpose organic agriculture through cooperation between land users, people who are working on the land and nature conservation.

Reintroduction of traditional multipurpose organic agriculture will restore and preserve traditional landscapes, their ecological and economic functions with ecosystem services and enable endangered flora and fauna species existence in these landscapes.

This is new approach for solving more problems combined (economic, social, demographical, educational, environmental and nature conservational) with solutions that are not expensive. The aim is not to lead people but connect them together to cooperate and help them by their work.

This will restore sustainability which was present in the past, but is getting lost, because we have a generational gap between people. We want to close this gap and provide opportunities for generations to work together for a common goal. In the time of crisis new opportunities arise, we just have to take different approach and change the thinking which brought us in this situation.

In this process we will establish social cooperative for production and marketing of regional organic food products, promote sustainable development of landscapes with introduction of eco-innovations and old farming practices. With our model we will strengthen the local economy and rural development with community supported agriculture.

Moehringia tommasinii, an endangered endemic plant from the Karst edge

Peter GLASNOVIĆ[1,2], Nataša FUJS[2], Živa FIŠER PEČNIKAR[1,2], Elena BUZAN[1,2], Boštjan SURINA[2,3]

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Endemic species play an important role in understanding biogeographical patterns and are often used in planning nature conservation strategies. *Moehringia tommasinii* is a stenoendemic plant from the Karst edge in northern Istria (Croatia, Italy and Slovenia) where it inhabits overhanging rocks of calcareous cliffs where water occasionally oozes and provides nutrients. Due to its rarity and vulnerability, it is considered in all main national and international conservation acts. According to IUCN, recreational activities such as rock climbing represent the main threat to *M. tommasinii*. The problematics of climbing in the Karst edge was already emphasized by other studies and negative effects of rock climbing on chasmophytes have been documented by several other studies from different parts of the world. The population size of *M. tommasinii* was estimated in all three Slovenian localities by observing the habitat from distance using binoculars and a telescope. The largest population was observed in Osp with estimated population size between approx. 570 and 650 individuals. The cliffs of Osp are one of the most visited climbing sites in the region with 201 climbing routes of a length of 7040 m. The highest climbing intensity is on the western side of the wall where the smallest number of plants was observed. Plant remnants, observed on several occasions on the foothills of the wall, suggest the potential negative effects of climbing on the plant. In the eastern, less visited part of the cliff we observed the largest number of plants. The climbing site of Črni Kal consist of 54 climbing routes of a length of 1454 m. Here we recorded between 320 and 340 individuals. The majority of individuals occured in very small cushions, while larger plants were observed only in the most inaccessible sites. The only Slovenian site with *M. tommasinii*, where climbing is not allowed, is the cliff in Podpeč, where we recorded between 250 and 260 individuals. This study represents the basis for future monitoring of the population status of this endangered species.

Nature Conservation Policy - from legislation to real effect in nature in Gorenjska

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"Everyone is obliged in accordance with the law to protect natural heritage" is stated in Slovene constitution. Therefore, an important way of achieving nature conservation is establishing appropriate and effective spatial planning, which includes nature conservation policy at several stages.

In this presentation, we have focused on the final administrative stage before project or spatial activity is implemented in the field. For implementing projects and spatial activities in areas with nature conservation status, investors need to acquire different types of consents and permits, depending on the type of activity, in order to assure nature conservation.

The Institute of the Republic of Slovenia for Nature Conservation participates in this process with giving expert opinions and assessments included in the relevant consents. In this presentation the analysis of all given opinions for spatial activities in Gorenjska region in years 2013 and 2014 was made. The spatial activities were grouped by types of activities and their frequency was counted. Spatial pattern of different groups of activities was observed with GIS. For each group the compliance with nature conservation policy was checked.

There are many real cases which show gaps in implementation of the law at practical level. The majority of bending the rules is in the field of building different types of objects connected with the agriculture, water engineering and forest roads. Extremely short deadlines for preparing nature conservancy consent which includes expert opinion, predominantly legal interpretation of nature conservation policy and weak field control leads to non-achievement of the main goal of nature conservation stated in the law and constitution.

The solution is in raising public awareness of nature conservation, strengthening the role of expert opinion and interpretation of law in the view of its main goal in final decisions, and strengthening the field inspection.

Evaluating the condition, habitat availability and distribution of the spectacled bear, *Tremarctos ornatus*, in the National Natural Park Tama and its buffer zone

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In order to elaborate regional conservation strategy for the spectacled bear (*Tremarctos ornatus*), we evaluated the occupation, habitat availability and threats to *T. ornatus* in the NNP Tama located in northeast Colombia. We assessed habitat availability and occupation in 24 quadrants of 9 km^2 and along 3 linear transects of 1.8 km, distributed from 300 to 3,500 msnm. We assessed the availability and quality of habitat by using the habitat sustainability index (HIS), and characterised the structure of the vegetation to generate a list of available resources. For identification of individual bears we used camera traps RM45 y Reconyx HC500, Bushnell Trophy Cam, and Primos Truth Cam, which were set up in 64 stations. Sampling effort was 1,392 man-hours and 89,712 trap nights, from June 2012 to April 2015. We recorded 3.060 indirect traces of the presence of *T. ornatus* (feeders, droppings, tracks, footprints, claws, brand-remarks, climb-brand, hair and nests), We collected feces for the analysis of diet and habitat use. Also we produce a map of potential distribution of species through the ArcMap in ArcGis 9.2, DIVA-GIS, and Maximum Entropy Model MaxEnt. 3 3.3 k, layers of climatic variables from WordClim and BIOCLIM, evaluating the importance of those factors to the model according to the Jackknife test calculated on MaxEnt, the model of digital elevation (DEM) in the region, layers digital issues of the study area, and records obtained from T. ornatus. In addition, we identified current and potential threats, among which is hunting, deforestation, pollution, protected area invasion and presence of feral species. We also report the intake of synthetic polymers by *T. ornatus* and other mammalian species, Selective game hunting and subsistance are recognized as the major threats to the spectacled bear and other species of local mastofauna, which emphasize the need for generating strategies for wildlife conservation at local and regional level.

Another brick in the wall: artificial walls as a possible tool for reptile conservation

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Reptile conservation is gaining more and more attention in the last decade among conservation biologists, but actions aimed to habitat management for these vertebrates are still scanty. This is probably due to a scarce appeal of reptiles for common people that often consider them as dangerous or disgusting. Some species, indeed, do not show particular ecological needs and often live near humans and they could be used as a didactic model to explain their behaviour and importance in ecological networks. A good number of refuges, basking sites and preys are usually a sufficient condition to obtain and support a population of some species, such as common wall lizards. In this context, we present a new approach to reptile conservation based on the building of an artificial wall in a natural protected area in northern Italy. We chose a didactic center in the Parco Pineta di Appiano Gentile e Tradate, an open area surrounded by mixed woods near an astronomic observatory. An artificial wall (8.2×5.4×1.8 m) will be built at the wood border using hollow concrete bricks. It will be southward oriented and bricks will be filled with soil and posed in a ladder-like way to create many basking places. The back side will be made with a soil embankment to reduce visual impact from the wood. For the same purpose, we will use brown and green bricks. A 10 cm gap between two adjacent bricks will be left to create multiple refuges for reptiles. We think that this structure may be useful for reptile conservation in at least three ways: i) it could be a suitable site for many reptile species (in particular for *Podarcis muralis*, but also for *Lacerta bilineata*, *Anguis veronensis*, *Hierophis viridiflavus*, *Zamenis longissimus*, *Natrix natrix* and *Vipera aspis*) that live in this area; ii) it could be used for didactic purposes and indirectly contribute to reptile conservation via education; iii) it could be useful for experimental studies, aimed at deepening the knowledge of reptiles biology and giving more instruments to conservation biologists.

Monitorings in Škocjan Caves Regional Park, Slovenia

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Škocjan Caves ranks among the most important karst phenomena not only in Slovenia's Karst region, but worldwide. Škocjan Caves is on the UNESCO list of natural and cultural world heritage sites. The protected area forms part of two Natura2000 areas, (SPA) and (SCI) Kras. According to the Birds Directive, some nesting species significant for the protected area include the eagle owl, European nightjar, peregrine falcon, Eurasian scops-owl and nightingale. Among all the species present according to the Habitats Directive, the area is particularly important for bats. Among them are most significant species that occur in extensive populations (long-fingered bat). So far, twenty-seven stygobiotic and troglobiotic organisms have been described in Škocjan Caves. The Park's absolutely main priority is nature conservation wich is a key task for the managing such a vulnerable area as Caves are. Main conservation goals are determined in parks management plan which is coordinated with EU and State nature protection legislation. Nature supervision service is responsible for performing supervision of most valuable and sensitive areas in the park. We are executing several monitorings of species, habitats and environment. We set up the observations of percolation water (epikarst fauna). Furthermore, we observe the state of the underground troglobiont fauna in the tourist-accessible part of Škocjan Caves. Monitoring of bat species and their habitats is one of the major importance. We replaced all halogen lights to decrease »noise«, energy input and "lampenflora" in the cave. We also monitor several chemical parameters of the underground river and the microbiological quality of the cave air. The most important parameter to determine is the "carrying capacity" of the cave, meaning the number of visitors allowed, especially in the parts of the cave where protected species are present.

Biometric reader as a tool for traceability of invasive alien animal species

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Invasive alien species represent a major threat to global biodiversity. The European Parliament and the Council are preparing regulation documents on the prevention and management of the introduction and spreading of invasive alien species. Different approaches for the monitoring of invasive species exist currently, however none address the use of iris recognition system. We believe that this technology compared with other is less invasive, faster and more specific/ sensitive. The major aim of our study is to apply iris recognition system for invasive alien animal species identification and traceability. This would enable us to follow the eventual introduction and spreading of the invasive alien species. The specific goals of the study are to a) capturing visible light digital images of the iris pattern of an animal eye b) description of iris morphological characteristics c) evaluate the applicability of iris morphological characteristics for animal identification and d) development of software for the biometric reader. This innovative use of an already existing method will be tested on 2 pilot groups of species from Slovenian coast region 200 gold fish (*Carassius auratus*) and 50 terrapins (*Trachemys sp*). The morphology of their iris pattern will be studied between February and July of 2015: This study was performed within the project »Biometric reader as a tool for traceability of invasive alien animals« financed by Ad Futura foundation of Slovenia

SESSION 3:

ECOSYSTEM HEALTH

Drugs, Disease, and the Diabolical Diversity of Extraintestinal Pathogenic *Escherichia coli*

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Escherichia coli strains are remarkably diverse bacteria with respect to their genetic makeup and their ability to colonize and persist in numerous niches both in the environment and within animal hosts. Oftentimes, within the intestinal tracts of humans and other vertebrates, E. coli strains establish beneficial symbiotic relationships in which they provide the host with nutrients, key signals for developmental and immune regulation, and protection against foreign pathogens. However, some strains of E. coli can diverge from their commensal counterparts, acquiring the ability to cause serious disease both within the intestinal tract and elsewhere within the host. Especially problematic are strains known as Extraintestinal Pathogenic E. coli (ExPEC). These bacteria can colonize the gut, usually without eliciting overt pathology, but have the added capacity to disseminate and cause disease within other host niches, including the blood, central nervous system, and the urinary tract. An ExPEC isolate typically possesses about 5,000 genes, but specific gene content between individual ExPEC strains can differ by as much as 30%. Most of the genes encoded by ExPEC strains are functionally undefined, and factors that dictate the host and niche specificities of distinct ExPEC isolates remain for the most part enigmatic. Much of the variability in gene content among ExPEC isolates is associated with mobile genetic elements that can be transferred horizontally between E. coli and other bacteria. Of particular concern is the growing spread of drug resistant genes and multi-drug resistant ExPEC strains that threaten to render most front-line antibiotics useless. This talk will examine the selective forces that drive ExPEC diversity and niche adaptability, taking into consideration both rare and common genetic loci that impact the stress resistance, persistence, and virulence potential of these important pathogens within varying host environments.

Exploring Actinobacteria assemblages in coastal marine sediments under contrasted human influences in the northern Adriatic Sea, Croatia

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The exploration of marine Actinobacteria has as major challenge to answer basic questions of microbial ecology that, in turn, will provide useful information for the exploitation of Actinobacteria metabolisms in biotechnological processes. The ecological functions performed by Actinobacteria in marine sediments are still unclear and belongs to the most burning basic questions. The comparison of Actinobacteria communities inhabiting marine sediments that are under the influence of different contaminations will provide information in the adaptation capacities of Actinobacteria to colonize specific ecological niche. In the present study, the characterization of different Actinobacteria assemblages according to contamination type revealed the ecological importance of Actinobacteria for maintaining both general biogeochemical functions through a core Actinobacteria community and specific roles associated with the presence of contaminants. The results allowed to distinguish Actinobacteria genera and species operational taxonomic units (OTUs) able to cope with the presence of either (i) As, (ii) metals Ni, Fe, V, Cr, and Mn, or (iii) polycyclic aromatic hydrocarbons (PAHs) and toxic metals (Hg, Cd, Cu, Pb, and Zn). Such observations highlighted the metabolic capacities of Actinobacteria and their potential and advantage that should be taken into consideration during the implementation of bioremediation processes in marine ecosystems.

Waste dumping sites as potential foci of human toxoplasmosis

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Legal and illegal dumpsites pollute nature and natural resources, and directly or indirectly affect the health of humans and animals. Both commensal and wild rodents are also attracted by organic waste. Increased density of different rodent species leads to direct contact and transmission of pathogens between them.

Toxoplasmosis is the most widespread infection among warm-blooded animals, including man, at the global level. One of the indicators of the prevalence of toxoplasmosis in a given area is the infection rate of rodents as the intermediate host. Using collected samples from the DIVA project, we aimed to determine infection rate of wild and synanthropic rodent species in the study area of Istria (both Slovenian and Croatian part).

We analyzed brain tissue from five rodent species, *Rattus rattus*, *Mus musculus*, *Apodemus sylvaticus*, *A. flavicolis* and *A. agrarius*, a total of 136 animals. Using real time PCR *T. gondii* DNA was detected in 4 homogenized brain tissue samples (2.94%), from all of the analyzed species except black rats. Out of these, two samples had sufficient DNA for genotyping of *T. gondii* isolates in which we demonstrated the presence of clonal type II using RFLP PCR with four markers (SAG1, SAG2, GRA6 and GRA7.

This study is particularly relevant since more prey is available at waste sites that attract cats which are consequently more likely to become infected with Toxoplasma parasites. This could especially affect human health, particularly outdoor cat owners, professional and occasional farmers as well as seronegative pregnant women, who could come into contact with water and/or soil contaminated with cysts from cat feces.

Poor management of illegal waste sites also contributes to the higher infection rates in some rodent species which, due to the increased mortality caused by Toxoplasma infection, could end up in the endangered category.

Between science and politics: indices and trends of Slovene common farmland birds

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The monitoring of common farmland birds in Slovenia has been going on in the period from year 2008 and every year since (7 years). Altogether 109 sqares were censused by counting pairs of indicator bird species on 2 kilometer transects. The transects have two belts which enables the calculation of breeding density. The monitoring scheme produces the „Slovene index of farmland birds - SIPKK“ which is one of the indicators of national Rural development programme. For each species counted, a species index and trend are calculated by means of Poisson regression (TRIM); separate indices are then combined into composite index. The results show a clear decline of some specialist species, especially meadow birds and a much smaller decline of generalist species. The overall index of 29 farmland indicator species is for the period 2008-2014 78.1 (index 100 would mean no change) and the index of meadow birds is 62.8 for the same period. The index of generalist species is 90.1. The most dramatic decline is observed for Linnet (*Carduelis cannabina*) with the index 26.4 +/- 7.9 and with the trend classified as steep decline ($P<0.01$). Altogether 14 out of 29 indicator species are in moderate or steep decline, three have stable trend and three are in increase. The period for trend calculation is still very short and the strength of biologically relevant trend description will increase with each year added. Birds can serve as good umbrella species for the measurement of biodiversity change. Moreover, they are well liked in public and such montoring schemes (and indices produced) can be used as link between science and politics. It is also an example of citizen science; this work and its large extent would not be possible without skilled volunteers. The Slovene farmland bird monitoring scheme is part of PECBMS (Pan-European Common Bird Monitoring Scheme).

The structural and functional role of river bed sediments and gravel bars: implications for conservation ecology

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The riverscape in its natural state is composed of a variety of habitats due to geomorphological features, ranging from wetted river bed sediments, to occasionally flooded gravel bars and islands. Especially in floodplain areas, the riverscape heterogeneity substantially increases. This contribution reviews the importance of river bed sediments, gravel bars and islands for river ecosystem functionality and emphasise the major issues that should be addresses within future scientific research, and also within river management and conservation planning in Slovenia. The wetted river bed sediments are important habitats for diverse surface and groundwater invertebrate species. In the river reaches, connected with alluvial aquifers, the presence of groundwater species is expected to be high. The sampling of the rivers within Sava catchment confirmed those expectations. There is a strong need for classification of such habitats on the basis of biodiversity indices and a need for prioritisation of the most important areas. Secondly, the important part of decomposition and mineralization is taking place in the river sediments by biofilm and invertebrates during water flow through the interstitial spaces. In the Soča River, the floodplain islands were the areas with the highest sediment respiration activity demonstrating the importance of those habitats for nutrient cycling in the rivers. Similarly, biofilm from the river bed sediments was more active in deeper layers in comparison to the surface indicating that majority of nutrient processing is taking place within the river sediments. In conclusion, the river channel in near pristine conditions, with well developed sediment layer, and a mosaic of gravel bars and islands support high biodiversity and maintain nutrient cycling processes. However, the management of river corridors usually prioritize flood protection by introducing river channelization and do not consider the ecological importance of river bed sediments and gravel bars.

Seabed mapping using remote sensing techniques

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In the last decade, the advancement in technology enabled significant progress in the mapping of land using optical methods as well as automatic classification. These methods are much more challenging in the water environment, where optics is limited by the light penetration, especially in the turbid waters. Acoustic methods, on the other hand, enable mapping of the seabed habitats. Single-beam acoustic ground discrimination systems, sidescan sonar systems, and recently also multi-beam echo sounders, represent excellent tools for studying large areas of the sea-bottom. The purpose of this study was to develop an automatic methodology for the seabed mapping of large areas. The seabed was scanned by multibeam sonar, which enables measurements of up to 10 square kilometers of seabed a day, gathering data with resolution of less than 20 centimeters. The data were treated by the specially developed automatic processing of the acoustic data, which enables generation of seabed types maps in a matter of hours. Our method doesn't give as detailed maps of seabed types as we can acquire by the video sledges or diving, but has many benefits, like continuous coverage (no need for interpolation), speed and applicability to a large scale mapping. In the case of seagrass meadows, indicators of distribution like presence/absence, area distribution and distribution limits can be easily monitored. These indicators can reflect eutrophication, changes in coastal infrastructure, as well as impacts of dredging, anchoring, traffic, etc. Geo-referenced data from remote sensing can be easily utilized for providing an easily accessible and interoperable maps of seabed habitats, and represent a good basis for a more detailed inspection directly on the field.

SESSION 4:

LANDSCAPE & POPULATION ECOLOGY

Forage alternatives, climate change, and predator persistence in the Eastern Bering Sea

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The changing climate scenario for the eastern Bering Sea predicts less ice cover, earlier ice retreat, and a 3 °C increase in sea surface temperature in the next 100 years. One of the primary concerns under this scenario is the predicted substantial decrease in primary productivity on the Bering Sea shelf, which would affect the entire food web. The Bering Sea is an extremely productive ecosystem and is currently home to 29 species of marine mammals, 420 species of fish, 102 species of birds, the planet's largest fishery, and it provides a needed subsistence food source for indigenous peoples. Central-place foragers, those species such as colony-breeding seabirds and pinnipeds that are tied to a specific location, can only forage a limited distance from their colony before needing to return to care for their offspring. With decreasing productivity on the Bering shelf, central-place foragers can either foraging elsewhere or experience population declines. St. Paul, St. George, and Bogoslof Islands are islands located on the eastern Bering Sea shelf but at different distances from the shelf edge, which provides us with an opportunity to evaluate if foraging over deep slope waters can compensate for the loss of shelf prey. In order for foraging on slope prey to be successful, prey have to be abundant, reliable, and high energy, because commute distances will be farther (i.e. cost more energy) and because slope prey are diel vertical migrators, which means they are only available to surface-feeding predators during a limited nocturnal period. Our results indicate that being close to the slope ecosystem has an influence on population persistence because slope prey are both energy rich and available. Access to multiple foraging arenas may therefore be one means by which species in the Bering Sea can temper the effects of climate change.

Model-based simulations over 500 years provide suitable information for long time managementof the European Pond turtle populations

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Theoretical and practical proposals for the conservation of habitat and species have long been of interest in conservation biology. A number of results are currently available in the biology, ecology and life-history traits of many vertebrates, however very little has been done to provide a robust and long-lasting tool in the management of long living organisms, especially for reptiles. In this study, life-history traits of a well-known population of European Pond Turtle (*Emys orbicularis*) from central Italy were used in a computational model, built in on our own at Department of Computer Science. We used model-based simulations to predict the demographic structure of turtle populations, taking stochastic variations into account, for a period of 500 years (that is about 38 turtle generations). These simulations showed that, after a period of 55-60 years, the population structure reaches stability, irrespectively of both the initial number of adults and the methodology for population reinforcement. After the initial period, when stability is reached, the observed variations of each age class and of the whole population suggest that the population can remain stable for at least for five centuries. The model-based simulations presented offer a quite simple methodological approach for management of long-living animals, as freshwater turtles as well terrestrial tortoises. The specific case of the European Pond Turtle underlined that actual procedures of population reinforcement, reintroduction and introduction should be carefully reconsidered. Due to the very short times to run most analyses, absence of any direct costs, our theoretical model should be considered a suitable best practice for the management of long-lived reptiles.

Spatio-temporal distribution and movements of small juvenile loggerhead sea turtles (*Caretta caretta*) from the northern Adriatic Sea

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The northern Adriatic Sea is one of the most important neritic foraging habitat for the loggerhead sea turtle (*Caretta caretta*) in the Mediterranean basin, inhabited by juveniles and adults primarily belonging to the Ionian-Adriatic management unit. Loggerheads recruit the northern Adriatic at small size, but habitat utilization and movements of juveniles, which constitute the bulk of population, is unknown. In this study, we equipped 10 juvenile loggerhead turtles (mean curved carapace length: 35.5 ± 3.9 cm) with pop-up archival satellite *tags (PAT* Mk-10, Wildlife Computers). Turtles were released from Piran (Slovenia) and Savudrija (Croatia) between August and November 2014. Results obtained so far indicate that small juvenile loggerhead turtles: (i) remain in the Adriatic Sea throughout the year; (ii) perform seasonal movements between exclusive summer foraging habitats in the northernmost part of the Adriatic Sea (wider area of the Gulf of Trieste) and overwintering areas; (iii) exhibit behavioural plasticity and different patterns of habitat use during the winter, including migrations to the southern Adriatic; (iv) show site fidelity for northern Adriatic foraging grounds; and (v) utilize national waters of all Adriatic countries, which emphasize the importance of international cooperation in the Adriatic for conservation of regional stocks of this endangered species.

This study was performed within the project NETCET - Network for the Conservation of Cetaceans and Sea Turtles in the Adriatic, co-financed by the IPA Adriatic Programme of the European Union.

Amphibian selection of breeding habitats in the Karst plateau

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Artificial water reservoirs, such as ponds, are typical for the dry limestone plateau of SW Slovenia. These waterbodies are largely situated near villages and differ in size, structure, location and purpose. Over generations ponds developed into semi-natural wetlands that form a network of stepping stone habitats for many species and represent the only aquatic habitat suitable for amphibian breeding. They are recognised as important conservation sites for freshwater biodiversity. The aim of this study was to establish biotic and abiotic determinants of amphibian breeding habitat selection in the Karst plateau.

We surveyed 12 ponds in the Škocjan Caves Park and 21 ponds in the Karst edge area. Hydro-morphological parameters, habitat types and land use in a 100 m surrounding area, and physical and chemical parameters were assessed for each pond. Presence and abundance of different stages of amphibians were evaluated and presence of fish was also recorded. We then tested data for the possible correlation between parameters with multivariate statistical analyses (Non-metric Multidimensional Scaling, Minimum Spanning tree and Canonical correspondence analysis). Altogether, nine amphibian taxa were recorded. Multivariate analyses showed *Lissotriton vulgaris*, *Triturus carnifex* and *Rana dalmatina* to be the least selective species in this region, as were present and abundant at most sites. *Mesotriton alpestris*, *Salamandra salamandra* and green frogs (*Pelophylax* spp.) were more selective. Highest amphibian diversity was found in a large pond situated in the village of Socerb (eight species). On the other hand, two ponds were devoid of amphibians, and seven held only one species. These sites were either concrete ponds or were populated by gold fish, and thus less adequate for most amphibians. In the Karst area the establishment of invasive species such as fish poses the greatest threat to amphibians. These globally declining animals are thus strongly dependent on responsible pond management within modern farming practices, various projects and civil initiatives.

Is population of Moor frog (*Rana arvalis*) under severe decline in Mura river basin in Slovenia?

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Distribution of *Rana arvalis* in Slovenia is well known, but only in few occasions data are result of systematic research. As a result, population conservation status and population size and trends are most unknown. The only systematic survey targeted for *Rana arvalis* so far was made in Ljubljansko Barje area in 2011. Here we present our study covering a large part of the Mura River Basin, carried out in the "Mura" Natura 2000 site between Gornja Radgona and Vučja vas, in spring 2013 and 2014. We obtained an insight into the population size and density in the study area by egg mass counting, and by counting of blue-coloured adult males. We added existing data for some other major spawning sites of the species in the Mura River basin from past decade to our data, and compare the results.

Numbers of counted spawns and blue-coloured males gathered during our study were surprisingly low. During our census we expected far more new spawning sites to be found and higher numbers of egg-masses to be counted at least on few known localities. There were only few previously known localities with high number (more than 100) of breeding animals in the Mura river basin: oxbows Zaton (Petanjci), Bunčani, Muriša (Lendava), Csiko Legelo (Lendava) and Nagy Parlag (Lendava), forest Polanski log (Velika Polana) and forest Črni log (Lendava). We noticed a severe decline of populations in the area in the last decade. The results of egg mass counts in Polanski log in 2014 showed a 90 % decline since 2011. A similar trend of decline is observed from 2008 to 2013 from Zaton oxbow.

Exact causes for the decline are not known, but several natural and anthropogenic factors such as pollution, habitat disappearance and degradation are in place. Potential causes for the decline are the drainage of the oxbows due to lowering of the ground water level, afforestation of oxbow banks and shading of breeding sites and large forest clear cuts. Whether decline in the number of moor frogs gathered in last few years are a sign of population decline, which is possibly heading toward local extinctionis currently not know, but the results emphasize the need for further population monitoring and better identification of threats.

Dolphins have individually distinct faces: photo-identification based on facial features as a tool to enhance studies of delphinids

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Application of photo-identification techniques to cetaceans and other animals has dramatically increased our understanding of their biology and ecology. In cetaceans, a range of long-term natural markings are used to identify individuals, and digital technology has further facilitated the use of photographs in cetacean research. In this study we investigated the viability of facial recognition as a tool to enhance the study of bottlenose dolphins and potentially other delphinids. From a long-term time series containing >56,000 digital photographs, we extracted 2,318 photographs containing dolphin heads and matched them to known individuals using dorsal fins. We looked at whether we could accurately and reliably identify individuals based only on faces. We then also looked whether we could successfully match individuals across left and right sides. Next, for those individuals for which we had sufficiently long time series of photographs, we evaluated whether the facial features were temporally stable and could be identified over long term. Finally, for mother-dependent calves for which we had photographs over a longer period of time we attempted to establish whether facial features changed drastically during the calf's development. We ran simple matching trials to determine whether other people could also distinguish dolphins this way. The results suggest that a) bottlenose dolphins can reliably be distinguished and identified by facial features; b) these features are consistent across the left and right sides; c) such features are temporally stable and could be used over long-term; and d) calves could be re-identified after weaning using this method. We present a number of implications for the study of bottlenose dolphins, but also broader applicability to other delphinids. We do not suggest that face recognition could or should replace standard dorsal fin identification, but argue that it may complement it and provide additional benefits and useful information.

Interannual variation of the asexual reproduction of *Aurelia aurita* followed in situ (Bay of Koper, Adriatic Sea)

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Over the last decade we have witnessed increasingly frequent occurrences of gelatinous zooplankton masses, where the benthic polyp phase plays a key role in ensuring the long-term viability and success of jellyfish populations. Ecological tolerance of polyps and adaptation to environmental changes and anthropogenic factors are affecting the distribution of moon jellyfish (*Aurelia aurita* s.l.). Monitoring of polyps and their asexual reproduction under natural conditions is essential for understanding the problem of mass phenomena, i.e., jellyfish blooms. We studied the seasonal fluctuation of polyp abundance and their asexual reproduction dynamics from March 2010 to March 2013. The performed study was carried out in the Bay of Koper (northern Adriatic) where we monitored monthly the population of polyps attached to oysters at various depths and positions on one of the pillars located in Port of Koper. We recorded environmental parameters of temperature, irradiance PAR, salinity and pH. Maximum abundance was recorded in August (31 polyp/cm) and minimum abundance in December (8 polyp/cm). The abundance of polyps has a significant upward trend in correlation with increase in water temperature and a decreasing trend with increase in salinity. A high density of polyps has the effect of reducing asexual reproduction. Asexual reproduction in the form of budding and creation of stolons was present throughout the year with an increase in warmer periods. The strobilation process began in October (19.7 °C) and reached its peak in December (11.7 °C). The pattern of seasonal polyp dynamics abundance did not differ significantly between years, but it did change their density which could be caused by favourable environmental conditions.

Spatiotemporal occurrence of European pilchard (*Sardina pilchardus*) eggs in Slovenian sea (northern Adriatic)

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European pilchard (*Sardina pilchardus*, Walb., 1972) is a typical small pelagic fish and together with European anchovy (*Engraulis encrasicolus*, L., 1758) represents an essential link between trophic levels in marine pelagic environment. It is one of the most important commercial species of the Mediterranean and the Adriatic Sea.

Only recently have stock assessments become available for a small proportion of commercially exploited Mediterranean fish stocks. One of the newest stock assessment methods is ichthyoplankton based, which needs relatively little effort to gather the required data and has never before been performed in Slovenia.

The so called Daily egg production method (DEPM) plays a key role in our understanding of the fish ecology, population dynamic and biomass estimation for the target species. Method improves our understanding of the interrelationships between fish species during their early life stages, as well as an understanding of adult spawning patterns. Since pilchard and anchovy stocks are economically important for Italy, Croatia and Slovenia it is crucial that all countries strive towards a joint stock assessment and management.

The main aim of this study is to determine the peak spawning season and area of the target species (European pilchard) in the Slovenian sea following the DEPM sampling protocol. The data will be compared with the results of the previously used method for peak spawning determination, the gonad maturity method. Our goal is also to explain the peak of egg abundance in relation to the selected biotic (zooplankton biomass, chlorophyll *a*, etc.) and abiotic (depth, salinity, temperature and oxygen) parameters.

Domestic cats are still predators

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Domestic cat (*Felis silvestris catus*) numbers are rising and the range of the species has expanded as a result of human activities. This does not only mean more "cute and furry" animals, but also more free-ranging and feral cats around. Equipped with all that predator needs, they are very efficient hunters of native wildlife (birds, bats, amphibians, reptiles, small mammals, invertebrates). The effect of such predation on local prey populations can be severe as cat numbers are kept high by supplemental feeding and show no responses to changes in prey density. Cats also keep capturing prey despite being fed by people. In order to evaluate the extent of free-ranging cats and their predation rates in Slovenia, we performed a survey among Slovenians. With data collected we were able to assess the percentage of free-ranging cats and gather information about killing rates and prefered prey. Furthermore we gathered geographical data about free-ranging cat occurrence in Slovenia.

Caught in the net: prolonged partial entanglement of a bottlenose dolphin calf in fishing gear

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Interactions between cetaceans and fisheries are a widespread occurrence worldwide, with bycatch in fishing gear one of the main threats to these animals globally. We report on a prolonged partial entanglement of a bottlenose dolphin (*Tursiops truncatus*) calf in a fishing net, documented during a long-term study on bottlenose dolphin population ecology in the northern Adriatic Sea. The calf was first observed entangled in March 2014. A part of a fishing net (likely trammel net) was embedded in the anterior part of the dorsal fin, cutting into the tissue, and hanging off the sides of the dolphin. The calf, first seen in 2013 and presumed about a year old in 2014, was accompanied by its mother, with about 40 other dolphins in the group. The mobility of the animal and the depth of water in the study area precluded any potential attempts of intervention. Furthermore, it was considered that any intervention would likely be more detrimental. The calf, its mother and the rest of the group were continuously encountered in 19 sightings over the summer. The calf could apparently swim normally and its behaviour did not deviate from behaviour observed in other calves or other dolphins generally. The calf was last seen in October 2014. By this point the net was on the animal for a minimum of 203 days. At the time of last sighting, the calf was apparently still viable. However, the net has cut deeper into the dorsal fin, with the likely result of future loss of the dorsal fin. Previous data showed that bycatch is a source of calf mortality in this population. This case shows that incidental entanglement in fishing gear is not only a conservation concern, but also an animal welfare issue.

The breeding density and habitat selection of Eurasian Scops Owl (*Otus scops*) along the Adriatic coast

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We have studied the breeding density and habitat selection of the Eurasian Scops Owl (*Otus scops*) along the Adriatic coast at two study sites, in Slovenian Istria and Konavle, Croatia. In the breeding season 2012 we searched for the Eurasian Scops Owl singing males in Konavle (Croatia) and in the breeding season 2013 in Slovenian Istria. We applied the playback method in both areas, to estimate the density with count points spaced between 500 and 1500 m, depending on the openness and forest cover. In Slovenian Istra we surveyed 308 points and registered 239 males, while we recorded 103 males at 88 survey points in Konavle. Breeding density in Slovenian Istria (0,99 males/km^2) was lower than breeding density in Konavle (1,50 males/km^2). Three parameters showed to have significant impact on the habitat selection by the Eurasian Scops Owl along the Adriatic coast: orientation, slope and distance from the highways. Other parameters (vertical distribution and the distance from the coast and villages) did not showed statistically significant results. The spatial distribution of the Eurasian Scops Owl in the Slovenian Istria and Konavle is not uniform, but clustered and linked to individual areas, mostly settlements. Analysis showed us that the distance from the settlements, as a central part of the population in both areas is located in residential areas, and from them up to 1.2 kilometers away. Our data was consistent with the indications from the literature, where the Eurasian Scops Owl is described as a resident of settlements. We assume that the most likely reason for the large densities of the Eurasian Scops Owl in settlements is that owl nests in the settlements or they feed with the insects that are attracted by the street lamps.

PLENARY LECTURERS

Heidi Christine HAUFFE, Fondazione Edmund Mach, Department of Biodiversity and Molecular Ecology, Research and Innovation Centre, Italy

Heidi is trained in Evolutionary Biology and established a genetics laboratory at the Centro di Ecologia Alpina, Trento, Italy, in 1997. Now at the Fondazione Edmund Mach, her research interests range from the causes and effects of biodiversity loss (emerging pathogens) and gain (speciation), rodent-borne viruses (especially the Ljungan virus), and conservation genetics of alpine species. All her research is multi-disciplinary and she has strong collaborations across Europe and beyond. She is currently involved in three EU projects: EDENext, EuroWestNile and CONgress.

Scott HEPPELL, Oregon State University, USA

Scott Heppell has obtained his PhD in 1998. He is an Associate Professor at the Department of Fisheries and Wildlife, Oregon State University. His research interests are the physiological ecology of fishes, in particular how physiology, behavior, and life history traits affect the interactions between fish populations and their respective fisheries. He has worked on bluefin tuna on the Atlantic high seas, Mediterranean, and east coast of the United States, on groupers throughout the southeast Atlantic, Caribbean, and Gulf of Mexico, on rockfish in Oregon and Alaska, and on trout, steelhead, and salmon in Japan and the high deserts of eastern Oregon and Northern Nevada. He collaborates with academic scientists, state and federal agencies, foreign agencies and universities, and commercial and recreational fishermen, in order to address issues related to the sustainability of marine and freshwater resources and their ecosystems.

Matt MULVEY, University of Utah, USA

Matt Mulvey is Professor in the Department of Pathology, University of Utah, Salt Lake City. He is focused on understanding the survival and virulence strategies of important bacterial pathogens collectively known as Extraintestinal Pathogenic Escherichia coli, or ExPEC. These bacteria can efficiently colonize the gastrointestinal tract like commensal strains, but have the added capacity to disseminate and cause disease in other host niches, such as central nervous system, the urinary tract and the blood. ExPEC strains are responsible for some of the most common infections on the planet and are gaining resistance to antibiotics at an alarming rate. Prof. Mulvey is investigating to delineate both bacterial and host factors that control the ability of ExPEC to colonize and persist within diverse environments, with a major goal being development of new anti-bacterial therapeutics. His research utilizes genetics, microscopy, biochemistry, global gene expression analysis, and molecular biology techniques coupled with cell culture, mouse, and zebrafish infection model systems.

Prof. Mulvey has authored 8 chapters, is one of three editors of a book entitled Urinary tract infections:Molecular pathogenesis and Clinical Management and has published 55 original and review articles, including in Science (2013 IF=31), Nature Rev Microbiol (IF in 2013 above 22), J Immunol, Curr Opin Microbiol, PLOS Pathogens, Blood and JBC.

Frank Emmanuel ZACHOS, Natural History Museum in Vienna, Austria

Frank E. Zachos is head of the Mammal Collection at the Natural History Museum in Vienna, Austria. He studied biology and philosophy in Kiel and Jena, Germany, and got his PhD from Kiel University in 2005 with a dissertation on genetic diversity and fluctuating asymmetry in roe deer. He then spent some further years in Kiel as a postdoc and assistant professor before taking up the position in Vienna. Frank is an evolutionary zoologist working mainly on ungulates, carnivores and birds of prey, focusing on population genetics, biogeography and conservation. He also has a keen interest in theoretical issues of evolutionary biology and systematics/phylogenetics, most of all species concepts and their bearing on taxonomy and conservation.

Andrej SOVINC, IUCN WCPA Regional Vice-Chair Europe

Andrej has obtained his PhD in Protected area systems in Slovenia. For the last three years he holds the position of the IUCN WCPA Regional Vice-Chair Europe. Andrej is also lecturer in the MSc programme Management of protected areas in Klagenfurt (Austria) and in the BSc programme Biodiversity at the University of Primorska. Andrej has both a theoretical and practical background in the management of protected areas, since he has been leading the Secovlje Salina Nature Park in Slovenia for the last twelve years.

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Famnit
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Varstvo narave

Magistrski študijski program 2. stopnje
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