“Highways and wildlife: How do they coexist?”

Proceedings of

IENE 2011

SCIENTIFIC WORKSHOP

September 21-24, 2011

NYMFEO & KASTORIA

REGION OF WEST MACEDONIA, GREECE

Contents

Welcome

Welcome to the 2011 annual meeting of IENE, 21–24 September 2011 in Nymfeo and Kastoria, Greece, hosted by ARCTUROS and the University of Western Macedonia with the Scientific Workshop with the title: **"Highways and wildlife – how do they co-exist?"**

The site of the meeting, the region of Western Macedonia in Greece, is a place of extreme natural beauty and rich biodiversity. The forests in the area are teeming with wildlife, and are home to rare and endangered species such as wolfs, bears, otters. Unfortunately, ongoing human development and the construction of large infrastructure projects, primarily the development of the national road network have taken a heavy toll on the wildlife in region. One of the main highways of the country, the vertical axis of the "Egnatia" highway (Section "Siatista – Kastoria – Krystallopygi) that connects Greece with its northern neighbor, Albania has been in the past years the showcase of a number of wildlife – vehicle collisions. More than 25 bears and wolves have died in the past years in these accidents. Attendants to the meeting will have the opportunity to visit the sites where the scientific team of ARCTUROS has trapped bears in order to study their behavior and movements relative to the highway alignment and the crossings in place.

The organization committee

1. Lazaros Georgiadis, ARCTUROS' General Director, Meeting Coordinator
2. Andreas Seiler, Grimsö research station at the Swedish University of Agricultural Sciences
3. Vasso Petridou, ARCTUROS' Communication Manager
4. Alexandros Karamanlidis, ARCTUROS' Scientific Manager
5. Miklós Puky, Hungarian Danube Research Station of the Institute of Ecology and Botany of the Hungarian Academy of Sciences, Hungary
6. Anders Sjölund, National Transport Administration, Sweden.
7. Robert Myslajek , Association for Nature "Wolf", Poland
8. Maria Styliadou, Volunteers coordinator and ARCTUROS secretariat support for the Annual Meeting
9. Marie Jakobi, Swedish Biodiversity Centre (CBM), IENE secretariat
10. Ioulia Zlatanou, ARCTUROS' membership support and website support

Introduction

While economic growth at all costs appears to be the preferred way to go in the modern world, threats to wildlife and their natural ecosystems are increasing. The expansion of road networks may cause serious fragmentation and disrupt connectivity between important natural habitats and consequently create impermeable barriers in the gene flow of large animals. Greece cannot be an exception for such a situation. While the main national motorway was between Athens, the capital and Thessaloniki, the co-capital in north there were no considerable impacts on natural habitat fragmentation since two decade before.

Habitat fragmentation, as serious conservation threat to wildlife emerged during the design and construction of the "EGNATIA" highway in the middle of the 1990ies. The highway alignment was set through important natural areas of the Pindos Mountains, the main habitat of large and endangered carnivores of Greece. ARCTUROS, as environmental NGO established in 1992, took actions to promote a more environmentally-friendly alignment of the highway and initiated the first public discussion concerning the impacts of large infrastructure works on natural habitats, with a special focus on the functionality of natural corridors in the gene flow of large carnivores. The importance of this new conservation threat to wildlife has increased significantly, as evidenced by the fact that brown bear mortality due to vehicle collisions has increased dramatically over the last 10 years in Greece. The Action Plan for the Brown Bear in Greece which was drafted in 1996 does not even include vehicle-related mortality as a conservation threat – it is important that an updated version of the Action Plan has to include this threat. Furthermore, as the road network in all the country continues to expand rapidly and wildlife – vehicle collisions increase, effective solutions are urgently required.

ARCTUROS, trying to "import" the international experience and to increase the available relevant knowledge in Greece, jointed the IENE as member before several years and started to cooperate with other members and experts in European level. As a very important result of the development of this cooperation, ARCTUROS and the University of West Macedonia took the honor and the responsibility to organize the 2011 IENE annual meeting which traditionally includes a Scientific Workshop and the General Assembly of the year.

Considering all the above there is a hopeful and positive expectation that this IENE activity will establish and enforce the national and international discussion about the appropriate designing, construction and monitoring of the large scale infrastructures. This discussion has to be a basic tool for the achievement of the effective mitigation of the negative influence on natural continuity and finding finally the way of coexisting of wildlife and highways in both in national and international level.

About IENE

Infra Eco Network Europe (IENE) is a European network of authorities, institutes and experts involved in the phenomena of habitat fragmentation caused by the construction and use of linear transport infrastructure, especially roads, railways and canals (waterways). It addresses decision makers, planners and researchers as well as the public, by providing an international and interdisciplinary arena to encourage and enable cross-boundary cooperation in research, mitigation and planning.

The organization stimulates mutual cooperation among its members and supports the exchange of knowledge between the sectors of environment and transport infrastructure, both on a national and on an international level. IENE combines and disseminates international research results, practical knowledge and experiences in order to advance beneficiary environmental effects and reduce detrimental impacts caused by the construction, use and maintenance of linear transportation infrastructure.

IENE shall address transport and environmental policy at EU level and actively interact with other organizations such as PIARC, UIC, IUCN, ECNC and more deliberately involve civil engineers and technicians. Also the broader public should be addressed and involved. Educational and information material should be provided in order to raise awareness and support the implementation of EU conventions on landscape and public participation. In addition, IENE activities must also relate to climate change and the necessary adaptation of infrastructure. More about IENE in http://www.cbm.slu.se/iene/index.php

About habitat fragmentation

Over the past decades, the pressure of transportation on nature has increased substantially. Vehicular traffic is steadily and quickly growing, requiring an expansion and upgrade of transport infrastructure which in turn allows for further growth in traffic.

Inevitably, transport networks disrupt natural processes, cut through natural – and human – habitat, and isolate and degrade the remaining patches. This loss and fragmentation of natural and human living spaces with subsequent adverse effects on wildlife and social life, has finally been recognised as one of the major unresolved threats to the biological diversity worldwide.

There is urgent need to integrate transport planning and ecological concern in Europe and to re-establish and secure connectivity across fragmented landscapes. Counteracting fragmentation is possible, necessary means and knowledge are available. What lacks behind is often only the political will to build a safer and an ecologically sustainable infrastructure.

About ARCTUROS

ARCTUROS was founded in September 1992 and is a non-profit, non-governmental Organisation (NGO) based in Thessaloniki, Greece. The aim of the society is to promote the study, management and conservation of the natural environment and wildlife. The society's activities initially focused on the brown bear (*Ursus arctos*), since conservation of this species allowed for the global management of the mountainous ecosystems of Greece, especially in the northern part of the country. Since 1997 however, the activities of ARCTUROS have been expanded to include the conservation of large carnivores and large mammals in general, as well as the conservation of mountain and forest ecosystems in Greece and the Balkans. After 19 years of continuous operation ARCTUROS can boast of important achievements in the conservation of the natural environment in Greece and the Balkans. Since 1992 ARCTUROS has:

1. Coordinated the design of the National Action Plan for the brown bear in Greece and continues the preparatory actions for its implementation.
2. Contributed to the enforcement of Habitat Directive (93/43/EU). The President of ARCTUROS, Mr Yiannis Boutaris was the first President of the Natura 2000 Commission in Greece.
3. Created the ARCTUROS' Environmental Centre that gave a permanent solution to the problem of captive large carnivores in the country.
4. ARCTUROS has been carrying out a unique, environmental awareness campaign for the protection of the endangered wildlife and their ecosystems in Greece.
5. Since its establishment ARCTUROS has been exerting political pressure to solve serious environmental issues, such as:
   - the case of the construction of the Egnatia highway – a highway that dissects the core range of brown bears in Greece
   - the improvement of the compensation system of the Hellenic Agriculture Insurance Organisation
   - the promotion and adoption of special solutions for the more effective management of bear and wolf symbiosis with the local society in the country
6. Established an emergency team to deal with serious conflict cases of bears and wolfs with humans.
7. Implemented special research activities and projects to monitor wildlife in Greece and the Balkans.
8. Been participating in international and trans-boundary networks and associations for the conservation of large carnivores and their habitats as:
   - The BALKAN NET as a found coordination member,
   - The Council of IBA (International Bear Association)
   - A member of the Steering Committee of IENE (International Eco Network Europe)
   - A founding member of ENDCAP (European Network for Ending Wild Animals in Captivity)
   - A founding member of EARS (European Alliance for Rescue Centres and Sanctuaries)
   - A member of LCIE (Large Carnivores Initiative for Europe)

More about ARCTUROS in www.arcturos.gr.

The program

Wednesday – September 21

IENE MEMBERS WELCOME AND

OPEN STEERING COMMITTEE MEETING (First Part)

Nikeios School, Nymfeo (Conference Center of University of West Macedonia and Bear Information Center of ARCTUROS)

15.00: Reception at the Bear Information Center

16.00: Visit at the ARCTUROS' Bear Sanctuary

18.00: Open Steering Committee meeting and discussion of the results of the online General Assembly (first part)

20.30: Welcome dinner

Thursday–September 22

IENE SCIENTIFIC WORKSHOP

Limnaion hotel, Kastoria

MAIN THEME: "Highways and wildlife: How do they coexist?"

08.30: Registration

1st session: Opening presentations – setting the framework

Chairperson: Hans Bekker

09.00: Opening session

09.30: Georgiadis L. et al.: Highways and wildlife in Greece: How do they coexist? ARCTUROS, Greece.

09.50: Sjolund A.: Introduction of IENE. The aim, the achievements, the new goals. IENE, Sweden.

10.10: Helldin J-O and A. Seiler: Challenges for road ecology - some things we need to do different. IENE and Swedish Biodiversity Centre, Sweden.

10.30: Oginski P.: Transport infrastructure and wildlife: how can EU nature legislation contribute to their coexistence? Invited Speaker. European Commission, DG Environment, Unit "Natura 2000".

10.50: Coffee break

2nd session: Planning and preventive designing of large infrastructure

Chairperson: Anders Soljud

11.20: Voumvoulaki N. and G. Krinas: Egnatia Motorway: providing sustainable engineering solutions. Egnatia Odos S.A., Greece.

11.40: Zlatanova D. et al.: Facing challenges in a rapid road infrastructure development – The Bulgarian experience with highways, speed roads and Large Carnivores. Invited Speaker, Balkani Wildlife Society, Bulgaria.

11.50: Bottcher M. et al.: Natural corridors and infrastructure in Germany. Bundesamt für Naturschutz, Germany.

12.10: Mot R. and C.R. Papp: New threats for large carnivore population connectivity in Romania. Presentation of the case of the separate bear population in Western Carpathians in Romania. Greenlight Services Ltd, Romania.

12. 30: Lunch break

3rd Session: Mitigation measures for effectively maintaining connectivity of wildlife populations

Chairperson: Alexandros Karamanlidis

13.30: Huber, D. and J. Kusak: Green Bridges and other structures for permeability of highways in Croatia: Case of Large Carnivores. Invited Speaker, University of Zagreb, Veterinary Faculty, Croatia.

13.50: Iliopoulos Y. et al: Mitigating wolf habitat fragmentation caused by a multiple large infrastructure system (closed high speed railway and E65 highway) in Central Greece. Expectations, realities and lessons learned. Kallisto, Greece.

14.10: Ioannidis Y.: Effectiveness of road barriers and underpasses for reptiles. The case of Milos viper (*Macrovipera schweizeri*). Biosphere, Greece.

14.30: Puky M.: Amphibian and reptile mitigation measures over roads. Danube Research Institute of the Hungarian Academy of Sciences, Hungary.

14.50: Coffee break

4th session: Monitoring and management of large infrastructure

Chairperson: Miklos Puky

15.20: Karamanlidis, A.A. et al.: Bear – vehicle collisions: monitoring the effects of a new source of mortality in an endangered population of brown bears in Greece. ARCTUROS, Greece.

15.40: Hlaváč V. and P. Anděl. Traffic Roads and Wildlife Corridors - Identification of Conflict Points. Agency for Nature Conservation and Landscape protection of the Czech Republic, Czech Republic.

15.50: Mertzanis Y. et al. Monitoring highways impact upon bear habitat and population status in NW Greece – the Egnatia highway case study– Results, lessons learned and management implications. Kallisto, Greece.

16.10: Jagerbrand A. Understanding human behavior in traffic and accident reduction. Swedish National Road and Transport Research Institute, Sweden.

16. 30: Discussion

17.00: Field trip in Egnatia Hihgway (Kastoria, Grevena)

20.00: Dinner

Friday – September 23

Nikeios School, Nymfeo

Open IENE Steering Committee Meeting (and discussion of the results of the online General Assembly **(Second Part)**

09.00-11.00: Steering Committee (2nd part)

11.00-20.00: Excursion - departures

20.00: Dinner

Saturday– September 24

Departures

Abstracts of presentations

Highways and wildlife in Greece: How do they coexist? Georgiadis Lazaros[1,] (e-mail: lgeorgiadis@arcturos.gr), A.A. Karamanlidis[1], D. Bousbouras[1]

[1] ARCTUROS, Roggoti Str. 3, 54625 Thessaloniki, GREECE

While economic growth at all costs appears to be the preferred way to go in the modern world, threats to wildlife and their natural ecosystems are increasing. The expansion of road networks may cause serious fragmentation and disrupt connectivity between important natural habitats and consequently create impermeable barriers in the gene flow of large animals.

In Greece, this conservation threat to wildlife emerged during the design and construction of the "EGNATIA" highway in the middle of the 1990ies. The highway alignment was set through important natural areas of the Pindos Mountains, the main habitat of large and endangered carnivores of Greece. ARCTUROS, an NGO established in 1992, took actions to promote a more environmentally-friendly alignment of the highway and initiated the first public discussion concerning the impacts of large infrastructure works on natural habitats, with a special focus on the functionality of natural corridors in the gene flow of large carnivores. The importance of this new conservation threat to wildlife has increased significantly, as evidenced by the fact that brown bear mortality due to vehicle collisions has increased dramatically over the last 10 years in Greece. The Action Plan for the Brown Bear in Greece which was drafted in 1996 does not even include vehicle-related mortality as a conservation threat – it is important that an updated version of the Action Plan includes this threat. Furthermore, as the road network in the country continues to expand rapidly and wildlife – vehicle collisions increase, effective solutions are urgently required.

Currently, ARCTUROS, with the help of national and European experts is carrying out efforts to mitigate this threat. Efforts, such as trying to enrich "infrastructure terminology" of policy makers with basic terms such as green-bridges, linkages zones and barrier effects, aim to show that wildlife and highways can coexist in Greece.

Introduction of IENE: The Aim, the achievements, the new goals. Anders Sjölund[1] (e-mail: anders.sjolund@trafikverket.se)

1 The Swedish Transport Administration.Röda Vägen 1. 789 81 Borlänge. Sweden. Phone: +4624375228.

What´s the problem?

"Biodiversity (as expressed in**:** *Our life insurance, our natural capital: an EU biodiversity strategy to 2020*) — the extraordinary variety of ecosystems, species and genes that surround us — is our life insurance, giving us food, fresh water and clean air, shelter and medicine, mitigating natural disasters, pests and diseases and

contributes to regulating the climate. Biodiversity is also our natural capital, delivering ecosystem services that underpin our economy".

The EU and the global biodiversity 2010 targets have not been met and that Europe's biodiversity remains under severe threat from changes in land use, pollution, invasive alien species, unsustainable use of natural resources and climate change, as is also shown in the trends of the 2010 assessment on implementation of the 2006 EU Biodiversity Action Plan. The loss of biodiversity is one of the paramount environmental problems of our time. The fast growing transport sector has an increasing impact on natural habitat and cultural heritage through habitat fragmentation, noise, mortality, etc. It is hence a significant challenge for the transport sector to achieve an environmentally sustainable transport system including its associated infrastructure and facilities.

The council of EU emphasizing the importance of ensuring an appropriate balance between the objectives of all EU sectoral policies and the EU Biodiversity Strategy to 2020 in particular with respect to major global challenges e.g. in the fields of biodiversity loss, food security and climate change. *An effective and crucial step forward is to enhance, extend and sustain collaboration among European countries*.

What is IENE?

Infra Eco Network Europe (IENE) is a European network of authorities, institutes and experts involved in the phenomena of habitat fragmentation caused by the construction and use of linear transport infrastructure, especially roads, railways and canals (waterways). It addresses decision makers, planners and researchers as well as the public, by providing an international and interdisciplinary arena to encourage and enable cross-boundary cooperation in research, mitigation and planning.

The organisation stimulates mutual cooperation among its members and supports the exchange of knowledge between the sectors of environment and transport infrastructure, both on a national and on an international level. IENE combines and disseminates international research results, practical knowledge and experiences in order to advance beneficiary environmental effects and reduce detrimental impacts caused by the construction, use and maintenance of linear transportation infrastructure.

IENE addresses transport and environmental policy at EU level and actively interact with other organisations such as PIARC, CEDR, ICOET and more deliberately involve civil engineers and technicians. IENE also try to address schools, children and a broader public.

IENE history

The establishment of IENE in 1996 was originally an initiative of the Road and Hydraulic Engineering Division of the Dutch Ministry of Transport, Public Works and Water Management. It was based on the conclusions of the International Symposium on Habitat Fragmentation and Infrastructure that was organized by the Road and Hydraulic Engineering Division, Directorate General of Public Works and Water Management of the Ministry of Transport, Public Works and Water Management in the Netherlands in 1995. During the symposium met and discussed.

The symposium with 135 participants from more than 25 countries proposed the formation of an international network, IENE, in order to jointly address the effects of habitat fragmentation caused by infrastructure, share resources and find harmonizing solutions to the common problems.

Until June 1998, IENE had been financially supported and coordinated by the Road and Hydraulic Engineering Division in the Netherlands. After that, the coordination was taken over by the Swedish National Road Administration and after additional two years by the Institute of Nature Conservation in Brussels, Belgium, who maintained coordination upon the completion of the COST-341 Action at the IENE conference in 2003. Over 21 countries had been officially affiliated with IENE at this time. In the following years, however, the network remained dormant. In April 2008 eighteen European countries met in the Hungarian city Nyíregyhàza to discuss the needs, with respect to the ongoing expansion of transport infrastructure especially in Eastern-European countries to re-activate the IENE. An interim steering committee was formed to establish a new IENE secretariat, update statutes and website and ensure future funding.

The new IENE organisation was officially reactivated at the IENE general assembly in Portugal, April 2009. A new steering committee was established and the general assembly agreed upon a Memorandum of Understanding (MoU), setting the basis for the new IENE.

IENE activities

Annual General Assembly and Open Day

IENE arrange annual general assemblies (GAs) of members to openly discuss statutes, administration, funding, projects and strategic issues and elect the SC. This meeting is combined with an international IENE conference, or with a national Open Day as for example in the workshop in Greece 2011. These meetings is hosted by different organisations and countries from year to year. During the Open Day, experts and public from the hosting country can meet IENE members and discuss local or national issues.

The Open Day and General Assembly 2009 took place in Évora, Portugal, between 22 and 25th of April.

IENE conferences

IENE international conferences on ecology and transportation provide a recurring interdisciplinary forum for the exchange of current research, knowledge and practical experience between the sectors of environment and transport, between scientists and practitioners, in Europe and worldwide.

The conferences aim at presenting cutting-edge research, identifying urgent questions and problems, discussing effective solutions, and outlining the paths for upcoming activities in transport and infrastructure ecology. The aim is to hold the conferences at a two to four year interval. Each IENE international conference develops its specific thematic focus.

The last IENE conference and General Assembly 2010 took place in Velence, Hungary September 27 - October 1. The theme of the conference was "Improving Connections in a Changing Environment".

IENE Projects

The most prominent "product" of IENE so far is the COST 341 Action (Habitat Fragmentation due to Transportation Infrastructure). The COST 341 Action started in 1998 producing an European Handbook on how to avoid Habitat Fragmentation due to Linear Transportation Infrastructure, a European State of the Art Report on Habitat Fragmentation due to Linear Transportation Infrastructure in Europe (European Review) and National State of Art Reports from 13 countries. Experts from over 21 European countries were actively involved. The handbook (Wildlife and Traffic) was completed with an international conference in Brussels in November 2003. The COST-341 products have been translated into many languages and are known worldwide.

New IENE initiatives have been proposed and an ongoing project includes a handbook on monitoring the effectiveness of fauna passages and other fauna provisions.

IENE Awards

IENE recognises and awards outstanding efforts made to reduce the detrimental effect and enhance the positive influence on nature caused by the construction, use and maintenance of transport infrastructure.

IENE awards, established in 2010, are: a) the IENE Personal Award for outstanding engagement and special achievements made by individuals and b) the IENE Project Award for extraordinary work accomplished by initiatives, activities or plans.

Exchanging knowledge and news

The core of IENE is the network of members, and the communication between people. Hence, one of the main activities within IENE will be to promote communication and exchange of knowledge, ideas and news. The IENE web site (www.iene.info) will play a central role in this, as well as electronic newsletters and e-mail lists. The new IENE website provide tools like RSS feed, a data base of reports and publications within the field of ecology and infrastructure, e-mail subscription, etc. Registered IENE members can access internal pages on the website, publish documents, join a discussion forum, etc.

Challenges for road ecology – some things we need to do different. Helldin Jan Olof [1,2] and Andreas Seiler[2].

[1]IENE.

[2]Swedish Biodiversity Centre, SLU Dept. of Conservation Biology

In the last two decades, the study and management of ecological effects of roads and railroads has grown into a field of its own – road ecology. Research in this field has provided broad evidence of negative impacts on biodiversity (such as habitat loss, mortality, disturbance, movement disruption, spread of invasive species), but has also revealed a positive potential in roadside habitats for some species of conservation concern. A number of recent overviews of road ecology provide a firm starting point for the transport sector to recognize its responsibility and manage its impact on biodiversity. But the transport sector lags behind in action in this field. We seek to outline – from a conservation biologist´s perspective – some remedies, on which planning practitioners and researchers must cooperate in order to improve the situation:

Set standards! Minimum achievement standards for biodiversity management and impact mitigation of transport infrastructure networks must be derived from national legislation as well as international (EU) directives. A judicial practice needs to be developed in support of this standard setting.

Preserve unfragmented landscapes! We must realize that most negative impacts on biodiversity cannot be fully mitigated (fauna passages are no quick fixes). Every new road or railroad corridor adds to the human footprint in the landscape. Landscapes not traversed by large infrastructure must stay that way.

An environmentally acceptable transport corridor network should be established. Any new road or railroad should align with this network; this will minimize cumulative effects at landscape level, while making mitigation of the increased local impacts more cost-efficient.

Pay back! The transport sector must gradually restore valuable ecosystem components eroded by decades of unsustainable infrastructure development. Fair project targets for biodiversity should therefore be more ambitious than purely no-net-loss.

Cross-disciplinary approach! Similarities in effects on biodiversity, outdoor recreation, traditional land use, and cultural history should be acknowledged to a larger extent. Any multi-purpose mitigation is more likely to be effectuated. Options for win-win situations need deeper analysis.

Increase research relevance and efficiency! Impact assessment and mitigation must be scientifically founded. There are several options to provide more relevant answers to pressing questions, and thereby add scientific value-for-money: (i) Learn from all actions – monitor every mitigation measure following sound scientific standards. (ii) An international protocol for monitoring should be developed, that guarantees scientific rigour, and allows meta-analyses and other comparisons between projects. (iii) Effects must be assessed in relation to the population level – or it will not be relevant to biodiversity conservation. (iv) Look further into biological mechanisms behind the effects. This will help in selecting the right mitigation measures, and make it possible to apply results in new situations. (v) Setup cross-border research to share costs of expensive projects.

Transport infrastructure and wildlife: how can EU nature legislation contribute to their coexistence? Przemyslaw Oginski[1]

[1]European Commission, DG Environment, Unit "Natura 2000", Avenue de Beaulieu 5, 1160 Bruxelles, Belgium

EU nature legislation consists of two major legislative acts: Birds Directive and Habitats Directive. These two pieces of legislation are the key elements of the EU biodiversity policy which aims at halting the loss of biodiversity and the degradation of ecosystem services in the EU, and at restoring them in so far as feasible. One of the main actions envisaged to achieve this target is to finalize establishment of the Natura 2000 network and to properly manage protected areas. Transport infrastructure can create a wide range of impacts on nature and environment both inside and outside protected areas. These impacts can include direct effects such as habitat loss, habitat fragmentation, disruption of migration corridors, road kills, noise, pollution, spread of invasive alien species etc. and indirect effects such as encouraging further development. Transport infrastructure can, therefore, have a major impact on achieving the targets of the EU biodiversity policy and more specifically on the objectives of the Natura 2000 network.

EU nature legislation provides a number of mechanisms to ensure that infrastructure development and nature protection can go hand-in-hand. Article 6 of the Habitats Directive introduced a system of checks and balances which guarantees that every transport project which might have significant effect on Natura 2000 areas has to undergo an appropriate assessment and it may be implemented only if it can be proven that it will not negatively affect protected habitats or species; otherwise strict conditions regarding alternative solutions and public interest assessment as well as compensatory measures have to be met. EU nature legislation provides also for a system of strict species protection outside Natura 2000 areas, which has to be respected when implementing transport projects.

Egnatia Highway : providing sustainable engineering solutions. Voumvoulaki Niki[1] (email: nvoum@egnatia.gr) and Georgios Krinas (email: gkrinas@egnatia.gr)

[1] EGNATIA ODOS S.A., 6th km Charilaou - Thermi, 57001 Thessaloniki, GREECE

In a global environment with a fragile social, economic and environmental balance, all human activities of a small or a bigger range - as far as they are concerned -should involve those parameters that will ensure better living conditions, economic development and environmental protection, at a local, but also at a broader level. When the human activity concerned is the conception, design and implementation of a large road infrastructure project, which aims at improving living conditions and economic development of a site, the stakeholders should no longer respond to the

challenge, but to the imperative need of environmental protection, apart from the legal and administrative obligations. Egnatia Odos SA, with a 15-year-experience of operating in a certain frame of public works management, has developed tools and practices for environmental protection, original in some cases, improving the way public works were treated so far. These tools refer to design and implementation of projects and form the basis for their development to further levels of intervention.

Tools for environmental protection at the design level:

- Construction of large structures for the passage of Egnatia highway from a wide variety of protected areas (RAMSAR, Natura 2000, archaeological sites, etc.)
- Rehabilitation Design Guidelines

Tools for environmental protection at the implementation level:

- Construction of fauna crossings
- Special fencing
- Rehabilitation of areas with local vegetation and private seed bank
- Installation of Pollution Control Units
- Confronting impacts during project construction
- Monitoring impacts during project operation
- Creation of the Observatory for Spatial Impacts

The experience gained from managing the Egnatia highway and its vertical axes is a great opportunity to improve and implement the tools of environmental protection in new projects undertaken by the company in Greece and abroad and distribute them to other areas of infrastructure.

Facing Challenges in a rapid road infrastructure development – The Bulgarian experience with highways, speed roads and large carnivores. Zlatanova Diana[1] (email: **zlite2@mail.bg**), Al. Dutsov[1] (email: adutsov@balkani.org) and K. Valchev[1] **(**email**: valchev@balkani.org**).

[1]Balkani Wildlife Society, Bulgaria

After the accession of Bulgaria in the European Union, there is a strong pressure of improvement of the TransEuropean transport corridors No 10 (Serbia to Turkey) and No4 (Romania to Turkey and Greece). This means the prolongation of the existent and the building of new highways. Highways, although currently few in Bulgaria are found to be significant barriers for the dispersal of the animals because of the lack of suitable mitigation measures.

Current studies show the severe fragmentation effect of the oldest highway Trakia on the free movement of medium and large animals, highly affecting the most vulnerable

– the large carnivores, which are also the ones in need of large areas to exist. This highway plays the major role in the bear population discontinuity. Further on, the building of the new Struma highway (within transport corridor 4) and the speedroad through Central Balkan Mountain (within transport corridor 9) will have further impact on the large carnivore population connectivity.

In attempt to understand all these issues of connectivity we used a habitat modelling to analyse the potential of the carnivore habitat towards the existent and new road infrastructure development This theoretical approach was combined with a detailed analysis of field data for the presence of suitable crossing structures in attempt to propose solutions for dealing with the barrier effect of the highways and speed roads.

Habitat corridors and infrastructure in Germany. Böttcher Marita (email: Marita.Boettcher@bfn.de)[1], H. Reck[2], and B. Schulz[3]

[1] Bundesamt für Naturschutz, Karl-Liebknecht Str. 143, 04277 Leipzig, Germany

[2] Christian-Albrechts-Universität zu Kiel, Institut für Natur- und Ressourcenschutz, Ohlshausenstr. 75, 24118 Kiel, Germany

[3] Stiftung Naturschutz Schleswig-Holstein ,Eschenbrook 4, 24113 Molfsee, Germany

Species-rich and natural habitats in Germany decreased extremely within the last century whereas intensively used land, settlement and high-speed traffic infrastructure increased. Result is a patchwork of isolated and/or dissected habitats that can no longer safeguard the biodiversity of Germany. (nature data 2008, p. 44, 55, 83, 90). Therefore still existing or restorable ecological networks that are necessary for spatial ecosystem functions have to be identified and re-activated to secure metapopulations, migrating species and dispersal that is essential to cope with minimum areas, patch dynamics and climate change.

Frame Concept in the scale of 1:1.000.000

Against the background of European connectivity concepts,

1. Potentially functional habitat systems (for species of different biotope types) as well as a corridor system for larger mammals have been identified by processing millions of habitat data using the Algorithm “Habitat-Net” (all in all showing still existing functional areas or areas that could be re-established if linear barriers would be overcome or if stepping stone biotopes would be restored at fitting places);
2. Conflict areas have been determined (left possible habitat networks are intersected at 30,000 locations by federal roads) and
3. The urgency of mitigation measures has been assessed. The prioritisation of connectivity measures is essentially based on how intense the bisection is (traffic density, presence of crossing opportunities) and how effective the measure would

be regarding biodiversity conservation (size of the bisected habitat systems and location with respect to connectivity axes of large-scale or national importance).

(nature data 2008, p. 191, 222; www.bfn.de/fileadmin/MDB/documents/themen/-landschaftsplanung/wiedervernetzung_oekosysteme-en.pdf)

Application in the scale of 1:5.000

The presentation shows how the concept is used in practice. On the one hand by the example of restoring donor habitats and migration corridors as a multispecies measure for enhancing the ecosystem functions of overpasses (Hinterlandintegration) (www.lebensraumkorridore.de), on the other hand by a integrative and coherent mitigation plan for safeguarding spatial ecological functions along a new motorway of 100 km length. Thereby some first monitoring results of good and bad practice of the construction and maintenance of fauna passages and results on the interaction between large mammals and small species (biodiversity approach instead of single species approaches) will be presented.

New threats for large carnivore connectivity in Romania. Presentation of the case of the separate bear population in Western Carpathians in Romania. Mot Radu[1] (email: greenlightserv@gmail.com) and C. R. Papp[2]

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At present, in Romania, main debates are targeting the size of the bear population and management practices, the need of conservation status assessment for separate subpopulations and impact of isolation being currently overlooked.A more detailed assessment of the separate bear population in Western Carpathians identified factors that impact its conservation status. As safeguarding connectivity with the main population in Southern Carpathians is essential, extensive field work combined with GIS analysis identified possible dispersal routes inside a 150 kilometers-long last structural ecological corridor. Bears occurrence outside „traditional" ranges was used to evaluate corridor functionality.

The study highlighted the need and urgency for efficient conservation actions and substantiated the proposal of new Natura 2000 sites which, together with existing ones, should form a functional regional ecological network between Western and Southern Carpathians.However, new research paired with conservation and management measures are crucial in order to assure that connectivity will have genetic and demographic effect for the separate bear population in Western Carpathians.

We will present factors that negatively impact connectivity in this priority area within the Carpathians range, especially new planned transportation infrastructure for which

expertise and practice in designing efficient mitigation solutions are lacking at present in Romania.

Green bridges and other structures for permeability of highways in Croatia : Case pf large carnivores. Huber Djuro[1] (email: huber@vef.hr) and Josip Kusak[1] (email: kusak@vef.hr).

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The construction of wildlife crossings over highways is already well-established in the Croatian road planning processes and relevant legislation. Only in the mountainous part of Croatia a total of 367 km of new highways was constructed in the period 1999 – 2008. One green bridge was constructed on the Zagreb – Rijeka highway (Dedin, 100 m) and 10 other green bridges on the Zagreb – Dubrovnik highway (120-200 m each). In addition, one big tunnel (Plasina) and 5 viaducts were constructed to mitigate the highway permeability. In total, 25.2% of the Zagreb – Rijeka highway, 13.1% Zagreb – Dubrovnik highway do have structures that allow animal crossings (tunnels, viaducts, bridges and green bridges).

We studied the impact of the Rijeka – Zagreb highway through Gorski kotar on large and medium sized mammal movements, and estimated the highway permeability for those animals. The conclusions were that large mammals of Gorski kotar preferred to use wide overpasses (100 m and wider) instead of narrow (10 to 50 m) underpasses.

We documented that all large mammals used green bridges on regular basis, but the frequency and patterns of crossings vary during day, as well as between large mammal species and groups. There was strong negative correlation between human passage and passage of large carnivores as well as between passage of large carnivores and ungulate passage, and positive correlation between human and ungulates passage.

Therefore, in order to increase usage of green bridges by large carnivores, human influence at green bridges should be eliminated or at least minimized by the enforcement of existing legislation.

Mitigating wolf habitat fragmentation caused by a multiple large infrastructure system (closed high speed railway and E65 highway) in Central Greece. Expectations, realities and lessons learned. Iliopoulos Yorgos[1], A.

Giannakopoulos[1, 2], M. Petridou [1], I. Aravidis [1], T. Kallimanis [3], Y. Lazarou [1], S. Galinos [1], K. Selinides [1], Y. Mertzanis [1]

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Wolves are capable of crossing highways, but when several infrastructures are combined together may have synergetic effects accounting for delayed re-colonization and dispersal, increasing the influence of stochastic events on species' populations and threaten its long term viability. E65 highway and high speed railway alignments, run parallel for more than 30 km bisecting the strictly protected wolf population south of the 39^{o} parallel (EC 92/43).

To alleviate fragmentation effects constructors of both infrastructures were obligated to implement monitoring programs to specify best locations for wildlife passages according to relevant EIA terms. Contrary to what would be expected monitoring of wolf population was divided in four smaller independent projects with implementation time period and duration based solely on each constructor timetable and available budget thus not confronting multi barrier issue in a more holistic manner.

Our mitigation proposals were evidence based on extensive field data (satellite telemetry on wolves, snow tracking, infrared camera traps, transects) and habitat modeling (ENFA, logistic regression). Main problems arisen while in the process of proposing mitigation measures were: a) Lack of coordination in wildlife passage and mitigation design between constructors b) Unsynchronized mitigation proposals with construction timetables in some alignment parts, due to late initiation and short duration of monitoring c) Incompatible updates of mitigation measures with construction time tables due to frequent modifications of the E65 alignment.

Close collaboration of our working team with engineers compensated relatively well for problems mentioned above thus succeeded the additional approval and/or construction of 2 river bridges, 4 wildlife overpasses, 7 large underpasses, other smaller passages, proper fencing and special lighting modifications.

Timely initiation, proper duration of pre-construction monitoring projects and a more flexible construction timetable to permit changes in passage location and characteristics when necessary, would result in a more cost-effective and efficient designing of defragmentation measures.

Effectiveness of road barriers and underpasses for reptiles. The case of Milos viper (*Macrovipera schweizeri*). Ioannidis Yannis[1] (email: ioan@biosfaira.org),

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Road barriers and underpasses have been extensively used to decrease road mortality of frogs and toads. However the effectiveness of this method wasn't well documented for reptiles and especially snakes. The main question was "Do snakes avoid underpasses?" as this could create cut-off problems to the population in case of an extensive application of these constructions. Milos Viper (*Macrovipera schweizeri*) is one of the most threatened reptile species in Europe.Between 1993 and 2006, it has been estimated that 183-537 vipers were killed annually on the road network of Milos, a mean of around 10% of the total viper population per year. This was the main source of human caused mortality during this period and represented a serious threat for the main population of this species on Milos island.

As an experiment for a viable long-term solution to this problem, concrete barriers with total length of 800 m were constructed during December 2005, in three parts of the road network with high mortality rates. Six underpasses were built in between the barriers. Four different designs of underpasses were used in order to test their effectiveness. To evaluate the efficiency of the barriers and underpasses, monitoring of their usage from the vipers was carried out during 2006-2008 active seasons. It included daily inspection of tracks on a sand layer and the use of an IR-camera.

No vipers were found dead or alive on the road surface in the areas where barriers were constructed. The underpasses permitted the vipers to pass safely under the road with no significant signs of avoidance. In the active seasons of 2006-2008, a mean daily rate of 0,77 viper passages per day was recorded with a maximum of 1.16 in 2006 and a minimum of 0.57 in 2007. A mean of 77% of the vipers that met an underpass, used it to cross the road with an increasing rate from 2006-2008.In conclusion barriers and underpasses could be a long-term solution to road mortality of snakes as long as they are annually inspected and cleared from developing bush branches and fallen rocks.

Amphibian and reptile mitigation measures over roads. Miklós Puky[1,2]

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Instead of halting the loss of biodiversity, its wide-scale degradation was recorded by 2010 as the ecological footprint of humanity exceeds the biological capacity of the Earth by a wider margin than at the time the 2010 target was agreed. The abundance of vertebrate species, based on assessed populations, fell by nearly a third on average between 1970 and 2006, and continues to fall globally, while amphibians face the greatest risk among the animal groups evaluated. Under such global circumstances the

necessity of lowering the effect of roads on the herpetofauna is steadily increasing. Roads may basically determine amphibian distribution, cause avoidance, extremely unequal sex ratio, low density in the vicinity of sections with high traffic, genetical isolation and local extinction. Much less is known about its effect on reptiles but it seems to be more frequent nearer to the Equator, cause extremely unequal sex ratio and lower density in the vicinity of roads than further away and may cause local decline.

Mitigation measures to help herpetofauna elements under or over roads have got a more than forty years history in Europe. By today, there is a great diversity in the actual technical solutions. Planning is influenced by several factors such as the spatial pattern of the migration, species composition and local topography. The most favourable tunnels have large diameter (1 m x 1 m, if the road is very wide 2 m x 2 m), moist microclimate (sometimes with a permanent or temporary stream), rectangular shape, amphibian-friendly material or natural soil in them and a smooth tunnel - barrier wall connection. Non-herp specific mitigation measures or viaducts also have a great conservation potential for the herpetofauna. Besides amphibians, all reptile groups present in Europe, snakes, terrapins and lizards also cross roads using tunnels and fauna bridges.

Bear – vehicle collisions: monitoring the effects of a new source of mortality in an endangered population of brown bears in Greece. Karamanlidis Alexandros A[1] (email: akaramanlidis@gmail.com), J. Beecham[2], D. Bousbouras[1], M. de Gabriel Hernando[1], K. Grivas[1], L. Krambokoukis[1], N. Panagiotopoulos[1], G. Papakostas[1] and L. Georgiadis[1]

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Implementing effective conservation measures for endangered species requires the thorough understanding of conservation threats. Roads can have substantial impacts on bear populations either through direct mortality or through the modification of behavior and genetic isolation.

In Greece, brown bears are considered endangered and human pressures on the species currently include direct mortality from collisions with vehicles and habitat destruction and fragmentation through the expansion of the road network. Using three different methodological approaches the environmental NGO ARCTUROS initiated in 2002 efforts to monitor the effects of this new conservation threat to the species in the country.

Based on a nationwide information system all bear – vehicle collisions in the country were registered and accident sites inspected and environmental variables recorded. At the three major highways within the range of the species (i.e., “Egnatia”, “E65” and “Siatista – Krystallopigi” highways) bears were fitted with satellite collars and habitat

use and activity patterns were monitored. Finally, genetic monitoring of the species was carried out throughout the country in order to identify patterns of genetic diversity and population structure.

From 2003 – 2011, 48 bear – vehicle collisions were recorded in the country with a high percentage of them occurring in the area of the three major highways, where special mitigation measures have been taken. In these three areas, 21 bears were fitted with collars and their movements monitored; varying behavioral patterns were distinguished between different age and sex classes and monitoring areas. At the same time, more than 400 bears in two sub-groups were identified in the country; the "Siatista – Krystallopigi" highway appears to create a barrier for genetic dispersal to bears in the region.

We present management suggestions and actions that have been taken in order to mitigate negative interactions and discuss improvements to the current mitigation measures.

Traffic Roads and Wildlife Corridors - Identification of Conflict Points. Václav Hlaváč[1] (email: vaclav.hlavac@nature.cz) and Petr Anděl[1]

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Avoiding the barrier effect of the traffic roads and reduction of fauna traffic mortality has become a priority in the transportation infrastructure planning in last years. Unfortunately, up to now there are still many large fauna passages that were build at inconvenient locations and also vice versa, there are many important sections of new build roads, where no passages have been erected. The usage and functionality of fauna passages are always determinated mainly by their location.

To solve the problem of searching for optimal fauna passage locations, during 2007-2010 the project focused on the identification of migration corridors in the Czech Republic was realized. Five species of large mammals – wolf, lynx, brown bear, red deer and moose were chosen as target species for the project. During the study 10.000 km of migration corridors have been identified. Real permeability of the proposed corridors was checked in field. Simultaneously, the study about fauna traffic mortality was also realized.

The aim of this study was to clarify the mortality level on the different types of roads and to identify the influence of different landscape structures on traffic mortality of different fauna species. During the study, the geographical locations of 2148 killed animals were analyzed. On base of these projects the recommendation for identification of optimal location for building of fauna passages has been prepared. It was also possible to identify the conflict points on existing highway net. The results showed that it is necessary to focus attention not only on the highways, but also on lower-class roads.

Monitoring highways impact upon bear habitat and population status in NW Greece – the Egnatia highway case study– Results, lessons learned and management implications.

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Avoidance of otherwise suitable habitats in close proximity to roads has been shown to occur for brown bears. In Greece, part of the current alignment of the newly constructed Egnatia Motorway (680 km) and part of the TENT, cuts through Pindos mountain range, one of the strongholds of the brown bear population in Greece with a minimum estimated at 80 ind.

After a Council of the State verdict, public authorities revised the EIA study and incorporated additional mitigation measures over a 37km stretch comprising: 13 tunnels, 11 viaducts, 1 green bridge and 7 wildlife underpasses, thus mitigating about 35%. This was followed by the implementation of a monitoring programme on the highway impact upon large mammals as part of the environmental terms prior to, during and after construction. During construction (2006-2009) twenty five (25) adult and sub-adult bears were fitted with GPS/GSM radiocollars yielding 42,465 radiolocations.

The results showed that:

- The noise from the construction camps above 47 dB seemed to act as a negative disturbance factor upon bear's nocturnal activity
- Distance from highway during construction was recognized as one of the statistically significant values affecting the relative abundance and bear presence.

Bears seem to appear more often at distant sites from the highway. Furthermore the surface of the habitat units used by bears significantly increased with the distance from the highway.

- During operation the openness index (medium and high) of the crossing structures seems to play an important role in their use by bears.
- Brown bear marking behaviour seems influenced by the proximity of the highway. Lower marking intensity has been found at a closer distance to the highway.

Overall it seems that the highway functions as a critical landscape barrier. The results of this study will essentially contribute in further adjustment of mitigation structures.

Abstracts of posters

The impact of road construction on birds and their habitats. Appropriate mitigation and compensation measures. Bousbouras Dimitris[1].

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According to the international literature, impacts of road construction on the bird fauna include loss and degradation of habitat, isolation and fragmentation of habitat, direct killing, creation of new habitats, ecotones and communication corridors, emission of chemicals, noise and illumination.

While planning a new road, options that have to be examined are a. avoidance, b. impact mitigation, and/or c. the implementation of rehabilitation and compensation measures on the land zone occupied by the road and in the wider area.

Basic precautionary measures during planning and construction are:

- Precise mapping of important sites for birds, particularly of nesting sites, in the framework of EIA.
- Prevention of disturbance of sites which host raptor nests, habitats of rare, endangered and threatened species, of wetlands, rivers and riparian vegetation, and of areas with a high number of mature / old trees.
- Implementation of measures for the conservation of biotopes and populations of amphibians, reptiles, small mammals, insects that are prey to diurnal and nocturnal raptors.
- The avoidance of soil works and explosions during the nesting period.
- The avoidance of the elevation of the road above ground level in the attempt to decrease collision possibilities.
- The width of a bridge over rivers and streams should in all cases exceed that of the main bed.
- Proper vegetation cover planning on the slopes, so as to prevent bird concentration and killing. Fruit-bearing shrubs and other plant species that attract insects must be avoided.
- The construction of barriers for the restriction of outgoing noise and light.
- The use of non-diffusive illumination when necessary the light.

The HABITATS project: Social validation of INSPIRE Annex III Data Structures in EU Habitats. Michela Gori[1], M. Guccione[1], G. Rago[1] (email: gabriella.rago@isprambiente.it).

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Studies and analyses on the impacts of infrastructures on biodiversity are largely supported by GIS, and their outputs rely closely on good quality data. Therefore, when considering transboundary infrastructures and impacts, it is crucial to have easily accessible and interoperable environmental spatial information among EU Countries, and this is the aim of the INSPIRE Directive.

The HABITATS project, funded by the Competitiveness and Innovation framework Programme, focuses on the evolution of INSPIRE standards through a participatory validation process building a trans-European social network to generate usage scenarios and requirements, and assess the impact of project outcomes, to directly feed into interactive data/metadata modelling of the four INSPIRE data themes 16-19 (Sea regions; Bio-geographical regions; Habitats and biotopes; Species distribution).

Widespread user validation is grounded in 7 pilot services covering these data themes across Europe, and led by content-providing partners:

- Wild Salmon Monitoring (IE)
- La Palma Protected Marine Area (ES)
- Hiking Trip Planner (IT)
- Soria Natural Reserve (ES)
- Sheep and Goat Herd Management (IT)
- Economical activity at marine coastal benthic habitats (LV)
- Czech National Forest Programme (CZ)

The validation pilots involve multi-stakeholder partnerships in which users actively participate in the co-design of the network services, and develop on-demand integration on the pilot service mash-up platforms. Validation pilot partnerships develop and test organisational/institutional arrangements for service sustainability and business models that underpin the project's sustainability and exploitation strategy. Specific and realistic quantified indicators measure the envisaged improvements in availability, access and use.

The partners involved in HABITATS project are: TRAGSA (Spain); NSI (Italy); MAC (Ireland); HSRS (Czech Republic); TRAGSATEC (Spain); TU Graz (Austria); Madonie Park (Italy); ISPRA (Italy); FMI (Czech Republic); IMCS (Latvia).

Differential response of wolves in large infrastructure construction phase. The important role of secondary barriers and social interaction in-between adjacent wolf packs. Iliopoulos Yorgos[1], M. Petridou[1], Al. Giannakopoulos[1, 2], Y Lazarou[1], Il. Aravidis[1], Ch. Pilides [1], Sp. Galinos[1], K. Selinides [1], Th.[1]Tragos, Y. Mertzanis [1]

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Data on wildlife response during construction phase of large linear infrastructures are relatively scarce but may reflect at some degree future response during operation phase and therefore permit timely adjustments on mitigation measures when necessary.

We studied local wolf pack response in two areas A) Egnatia highway (4.1) construction area (25 km) in northern Greece (2008-2009) and B) E65 highway and high speed railway construction zone (27km) in central Greece (2009-2011), both characterized by serious landscape modification and disturbance due to excessive earthworks. Other secondary but permeable barriers included a non- fenced national road and Venetikos river in Egnatia study area. In E65/railway area the old railway line, a local paved road and a river run parallel and in close distance to construction zone.

Response of wolves was studied with satellite telemetry (2 wolves marked in area A and 3 wolves in area B), snow tracking and infrared cameras. Data on wolf movement and presence prior construction were available as satellite locations (area A), snow tracking routes (area A&B) and infrared camera records (area A&B).

Egnatia construction had little effect on wolf movements with 190 crossings recorded in 10 months. In the contrary, radiocollared wolves in E65/railway zone never crossed it but moved closely and only westwards of it.

Wolves living eastwards crossed construction zone in a very limited rate as compared to 2005-2006 data. Territorial marking was recorded in the construction zone from resident wolves. Works may further weaken an already weak linkage zone due to multiple secondary barriers synergistically acting also as a behavioral rather than a physical barrier in between neighboring wolf pack territories.

To alleviate the problem further mitigation measures were proposed. Alignment design and wildlife monitoring projects should carefully examine the role of secondary barriers in relation to landscape topography and identify weak linkage zones of species in concern.

Impact caused by a road in the coastal zone of Gialova wetland. Dead individuals of the endangered African Chameleon of Pylos and other wildlife species. Summarizing ten years work by Hellenic Ornithological Society". Maneas Giorgos[1] and Dimitris Bousbouras [1]

[1]Hellenic Ornithological Society, Greece

Gialova lagoon is part of the European network of NATURA2000 areas both as SPA and SCI. This area is the most important wetland of the South Balkan Peninsula and so far, more than 265 wild bird species have been observed and identified. Additionally, it is the only habitat in Europe for the endangered African Chameleon

(*Chamaeleo africanus*). This species is referred in the Red Book of Endangered Species of Greece as Critically Endangered with a population of 125-300 individuals.

The nesting area of the chameleon is along a beach called Divari Beach, otherwise known as Golden Coast. It is a narrow strip of land of 3,8km length and 150m width. The area is covered by sand dunes, where cedars, maquis vegetation, tamarisks and eukalyptous trees grow. Along this strip of land, to the north, there is a 3,8km road that separates the coastal zone from the inner area of the wetland. The part of the road (2,7km length), that leads to the only bar on the beach, is covered by asphalt.

Each year, by the traffic on that road, many chameleon individuals die (on average 15 individuals per year). Also, there are counts of dead vertebrates such as snakes (*Malpolon monspessulanus, Eryx jaculus, Elaphe quatrolineata, Natrix natrix*), turtles (T*estudo marginata, Testudo hermanni*), amphibians (*Bufo bufo, Rana balcanica, Hyla arborea*), and small birds. Additionally, incidents like traffic and parking of vehicles on the dunes lead to constant degradation of the ecosystem which in some cases may be permanent.

In order to face the consequences, protect the chameleon and conserve the habitat, along with the support of volunteers the Hellenic Ornithological Society implements conservation and protection actions in the area since 1998. Among them is the protection of sensitive habitats with wooden sticks, signposting, installation of reducing speed obstacles and more.

Dear advisory service for animals: When should I not to go across high-speed road? Poláková S.[1] (email: simona.polakova@daphne.cz), J. Reif [1], P. Marhoul [1], J. Mejsnar [1], J. Vondrušková [1], J. Dušek [1].

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As roads are built and upgraded to accommodate greater traffic densities, the rate of wildlife-vehicle collisions has increased significantly. However, a little is known about spatial and temporal patterns off road-kills for fair rank of animals as it is not easy to study such a random event. Therefore indirect methods as carcass identification are used. We applied this way to evaluate in which part of season (breeding x post-breeding) and day (day x night including dusk and dawn), and combinations of habitats surrounding both sides of the road (field-meadows x field-meadows, forest x forest, field-meadows x forest, pond) leads to the most numerous road-killing in various vertebrates groups (amphibians, reptiles, birds, small mammals, medium-sized mammals, ungulates, domestic animals).

We selected 187 segments surrounded by homogeneous habitats at a high-speed road. It measured 427 m on the average. We made 16 controls during breeding as well as post-breeding season. Firstly, we removed all carcasses from the road segment. Then we monitored all killed animals during two 12 hours periods. Each segment was counted eighteen-times. 171 carcasses were found.

We were not able to perform statistical analyses about reptiles and medium mammals that represent rare victim of killing. Generally, more carcasses were found between the same type of habitats (field-meadows x field-meadows, forest x forest) than between places where one side of road was different (pond, field-meadows x forest). Exceptions were amphibians that were mainly by the field-meadows x field-meadows and by the pond, and small mammals and ungulates that were found only by the field-meadows x field-meadows. More carcasses were found in breeding season. The only exceptions were small mammals and ungulates that show no seasonal trend. Daily differences were found only in birds that were killed more during night period (including dawn) but only in breeding season.

LIFE ARCTOS/KASTORIA: A project aiming to improve conditions of bear-human coexistence, including minimization of bear-vehicle collisions in the area of Kastoria. Objectives, actions, first results. Psaroudas Spyros[1] (email: spyros@callisto.gr), Y. Mertzanis[1], C. Godes[1], Th. Tragos[1], L. Bousiaki[1], F. Anastasiadis[1], Al. Giannakopoulos[1, 2], E. Gelastopoulou[1], F. Arambatzidou[1], Suzanne Riegler[1], Armin Riegler[1], and Ch. Pylides[1,3]

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In the area targeted by the project, brown bear subpopulation and habitat are suffering from severe pressure, degradation and disruption respectively, related to the construction of a 72 km highway branch "Siatista-Krystallopigi", which is connected to the Egnatia highway (TENT) network. This large infrastructure has already severe consequences and is expected to have more in the immediate future upon brown bear habitat and population integrity and connectivity in the area.

Immediate mitigation measures are needed to minimize this negative impact. To this new mortality cause, should be added known bear human caused mortality related to other major causes such as damages caused by bears on livestock, beehives and crops, or bear habituation to human food sources. CALLISTO, the Region of W. Macedonia and Kastoria's Development Company (ANKAS) cooperate in the framework of the LIFE ARCTOS/KASTORIA project aiming at: (A) Minimisation of bear mortality related to traffic accidents in the road network of the area and subsequent increase of road safety for drivers; (B) Confrontation of bear habituation to human food sources and settlement approaching; (C) Promotion of measures preventing damages caused by bears and improvement of conditions for human-bear coexistence in the project area; (D) Improvement of awareness raising level on the issues above.

Main actions of the project include: Establishment of specific mitigation measures related to traffic mortality risks; Bear population systematic monitoring and analysis of genetic status; Establishment and operation of a Bear Emergency Team; Promotion of preventive measures' implementation through networking; Operation of a long term supporting mechanism facilitating awareness raising and consultation with local people; Organisation of seminars, public events, meetings; Dissemination of information; Development-implementation of environmental education programmes; Mobilisation and activation of local people and other citizens/volunteers (eco-volunteering). Progress made and first results so far will be briefly presented and discussed.

What animals do children want to save from road traffic? Miklós Puky[1,2]

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Public relations are key elements of conservation projects, especially, when the applied measures is expensive, which is true for most linear infrastructure-related measures. It is especially timely at the beginning of the second decade after the millennium as current global financial difficulties makes tax-payers, who cover the cost of all de-fragmentation measures, scrutinising how their money is spend.

As a satellite programme of the 2010 Infra Eco Network Europe conference held at Velence a PR campaign called "On dangerous roads" was launched a year before the meeting started. Talks, special programmes and broadcasts were carried out all over Hungary. Parallel with those activities a competition was also organised for children. They could express their opinion about infra-eco issues in the form of drawings, sculptures, etc. More than 180 entries were sent in from 11 counties and the capital of Hungary.

Children certainly want a multi-species focus, one drawing even showed nine species crossing on a green bridge. Altogether twenty-seven animal groups or species were portrayed in connection with roads or railways. Invertebrates, especially snails, were the most popular among kindergarten children. Amphibians and reptiles were the most often shown by 11-14 year old children, while mammals dominated the most in the 7-10 year category. Frogs and toads were the commonest animals to save, which can be the result of toad rescue campaigns, where many children can have "hands on" experience on the protection of these animals.

Not only the species spectrum children dealt with was wide, they also came up with many new inventions from snail ladders and monkey overpasses to deer level crossings and cable cars for snakes and amphibians. The winners of the competition got their prizes at the 2010 IENE conference from, among national scientific or parliamentary leaders, the chair of IENE.

Effect of around Napahai wetland highway on birds behavior reaction in winter, China. Wang Yun[1], Q. Li [1], L. Guan [1], R. Fang [2], R. Jiang [2]
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In order to know the road-effect zone of birds and effect of around Napahai wetland highway on Black-necked Crane(*Grus nigricollis*) behavior, we drove at low speed(40km/h) and by foot to observe on the selected spot to investigate along wetland highway.

The results indicate:

- altogether 36 bird species were recorded, protective species account for 91.7 percent, including 4 species list first-class protection, and 3 species list second-class protection, roadside species richness account for 73.47 percent of Napahai wetland;
- road-effect zone of birds ranged from 10.17m to 189.63m, among which 50m to 100m extent concentrated 60 percent species, this was because traffic noise decreased quickly and water-land intersection area was excellent habitat, there was no correlation between road-effect zone and population amount, as to sensitive species Black-necked Crane its road-effect zone was 135.18m;
- The behavioral reaction of Black-necked Crane was correlate with initial status and vertical distance to highway, that is to say if Black-necked Crane was alert at beginning, then it would react sensitively(such as walk away or fly away), and the closer it distance to highway, the more possible it fly away. We advised to strengthen protection of roadside bird in Napahai wetland, such as strictly limiting speed 20km/h, prohibiting whistle, limiting visitor's activity（ such as away from habitat of Black-necked Crane at least 122.25m） etc; strictly protecting roadside water-land intersection area vertical to highway 50m to 100m; To sensitive species Black-necked Crane, we suggested highway route selecting should avoid habitat 135m away at least.

Train-deer collisions in Sweden. Andreas Seiler[1] (e-mail: eiler@wildlifeandtraffic.se) , M. Olsson[2] (e-mail: mattias.olsson@enviroplanning.se), J-O Helldin[3] (e-mail: j-o.helldin@slu.se)

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Train collisions with larger wildlife, especially moose and roe deer, have hitherto been of little concern to railway agencies. During recent years, however, collision numbers have risen substantially and statistics have become available for analysis. It has become evident that collision costs can be substantial due to damaged engines and train delays and that mitigation measures such as fences and wildlife passages may be cost-effective in the long run.

We present the first official analysis of collision reports from Swedish railways between 2001 and 2011. During this period, collision frequencies averaged 7,9 moose and 10.9 roe deer incidents per 100 km railroad and year, however with clear geographical and temporal accumulations.

We defined hotspots in collisions and used logistic regression analyses to establish a set of environmental criteria that significantly severed hotspots from cold-spots. In concordance with other studies on train-deer collisions, we found that most accidents occurred around sunset and sunrise, during winter and especially under snow-rich conditions. Least accidents occurred around midday and midnight, and during early summer. Accident hotspots were characterized by higher proportion of forest habitat nearby the tracks, more clear cuts, fewer roads and rivers, and more conventional bridges and tunnels than compared to cold-spots.

We discuss the role of large scale factors relative to local factors in determining the frequency of train-deer collisions and propose mitigation actions that address these factors.

Wildlife–train accidents and interactions – results from a locomotive engineers questionnaire. Mattias Olsson[1] (e-mail: mattias.olsson@enviroplanning.se), J-O Helldin[2] (e-mail: j-o.helldin@slu.se), A. Seiler[3] (e-mail: eiler@wildlifeandtraffic.se) , and H. Norin[1] (e-mai-l: helena.norin@enviroplanning.se)

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Accidents involving train and larger wildlife are problematic in many aspects. Valuable wildlife are being killed or wounded in the accidents, the accidents entails economical loss for the train companies due to vehicle repairing and delays, and train drivers may perceive anxiety when involved in those accidents.

The aim of the study was to evaluate the drivers' knowledge about and experiences of the interactions and problems with wild animals (with focus on ungulates) and railroad traffic. The study was designed as a web-based survey. Special attention was given to; 1) the engine driver´s experiences of wildlife-train collisions, 2) behaviour of wild animals along the tracks, 3) how differences in vegetation control along the railroad may affect wildlife-train accident risks, 4) the driver's recommendations for reducing wildlife-train accidents.

In total, 174 respondents reported accidents with 1563 ungulates during 2009 and 2010. Roe deer (Capreolus capreolus) was the most common species involved in those accidents (49.3% of the respondents), followed by moose (Alces alces) (23.5%), reindeer (Rangifer tarandus - domesticated) (19.4%) and wild boar (Sus scrofa) (5.0%). Only a few accidents involving red deer (Cervus elaphus) (0.8%), and fallow deer (Dama dama) (0.4%) were reported. Approximately 65% of the respondents observed large fauna on the tracks more than once a week. The majority of the respondents reported that ungulates most often escaped from the tracks when several warning signals was given, and that a single warning signal often prolonged the time ungulates were at the tracks, since they appeared to investigate the source of the signal. Ungulate behavior appears to be problematic since 40% of the respondents answered that ungulates often tried to escape by running on the tracks away from the train.

The average degree of anxiety for wildlife collisions was 3.5 (SD=3.14) on a 0-10 scale where 10 was maximum anxiety, but 23% of the drivers reported great anxiety (7-10 on the same scale). There was a significant difference in the degree of anxiety between drivers of passenger and freight trains, where the drivers of passenger trains reported a higher degree of anxiety for delays and damages on the trains.

The majority of the respondents reported that the visibility along the track affects the risk of accidents, and that dense vegetation near the railroad is the main factor for an increased risk. The risk was reportedly lower in stretches were trees had recently (1-2 yrs ago) been cleared at a distance of approximately 20 m from the railroad, compared to stretches with bushes or dense forest near the railroad.

Migration corridors for large carnivores in the West Carpathians, Czech Republic – current threats and conservation activities. Miroslav Kutal[1,2] (e-mail: miroslav.kutal@hnutiduha.cz)

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The Beskydy Mountains located on the Czech – Slovak border function as an important gateway for wolves, lynxes and bears. Their populations recovered in last

50 years by recolonisation mainly from the Slovak Carpathians, but they suffer from illegal hunting and migration barriers.

There are three key migration corridors with national or international importance in the West Carpathians: Jablunkov region (1) located on the north part of the Beskydy Mts. is probably the only corridor ensuring direct connectivity among Czech, Slovak and Polish populations of large carnivores. South corridors in Vsetín region (2) connect Beskydy with another mountain range on Czech-Slovakian border (White Carpathians) and with hills continuing to the west. The west corridor located in Moravian gate lowlands (3) is important for migration of large mammals to the Jeseníky Mts. and possible the Bohemian / Bavarian forest and other regions with potential presence of large carnivores.

The functionality of the key migration corridors is endangered by several factors. The most important is increasing traffic and lacking adequate mitigation measures. The tremendous example is Jablunkov region cut by road with increasing traffic between two new car factories - Nošovice (CZ) and Žilina (SK). No mitigation measures have been realised so far. Similar situation takes place in Moravian gate, where mitigation measures on D47 (D1) highway have been invested non-effectively and possibilities for migration of large mammals are very limited.

Second problem comes from planned new industry and build-up areas in relatively cheap agriculture lands, which have worked as passages for animals so far. All key corridors are at least potentially endangered by this factor. FoE CZ conduct monitoring, research and lobby for better protection in decision making process, EIA/SEA procedures and spatial planning. It deals with public awareness and stakeholders' education as well. Concrete examples, achievements and failures are presented.

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