

4TH INTERNATIONAL MARTES SYMPOSIUM

MARTES IN CARNIVORE COMMUNITIES

Programme and Abstracts



20-24th July 2004

University of Lisbon - Portugal



THE FACULTY OF SCIENCES OF THE UNIVERSITY OF LISBON

AND THE *MARTES* WORKING GROUP

WELCOME YOU TO THE

4TH INTERNATIONAL *MARTES* SYMPOSIUM

Dear Colleagues



On behalf of the Martes Working Group we are pleased to welcome you to the Martes Symposium held in Lisbon, Portugal on July 20-24, 2004.

Colleagues from all parts of the world are joining us! The main theme concerns the *Martes* species, biology, management and conservation, but papers on interactions with other carnivore species, in a community context (e.g. habitat and prey requirements) will also be presented. We are keen to include both original contributions and comprehensive reviews.

Papers referring to accepted abstracts will be submitted for publication and awards for the best papers will be given.

Attending this meeting should serve as an occasion to deepen friendships and further international understanding on *Martes* issues. The social events and congress tours will provide an opportunity to network with colleagues from around the world in a pleasant environment. We also hope you will enjoy the many sights in and around Lisbon. It is a beautiful city at a delightful time of year.

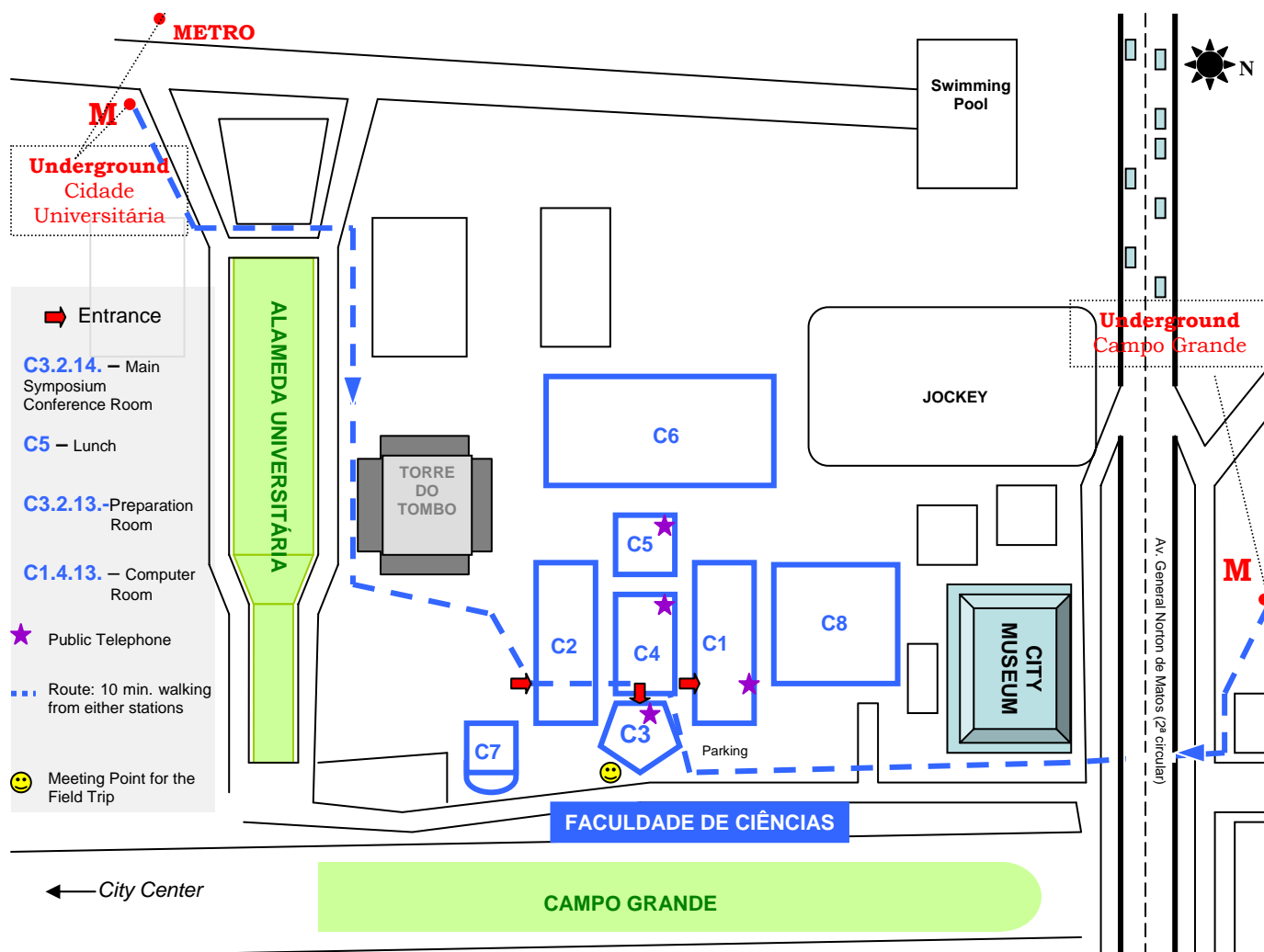
We encourage our colleagues from all over the world to contribute for a successful meeting. Please feel welcome to be involved whether you work in *Martes* research and management or with other species that do interact with them.

Your colleagues look forward to seeing you here!

Margarida Santos-Reis, Lisbon University, Portugal
Main Organiser

Johnny Birks & John Messenger, UK
Co-Organiser

FACULTY OF SCIENCES MAP




Faculdade de Ciências is the Portuguese name for the Faculty of Sciences. It is located in the area of Campo Grande.

The Faculty of Sciences is organized in buildings with designation as C1, C2, etc. Ground level floor is designated as floor #1, and room numbers include the number of the building, floor and room (ex. 3.2.14 means building C3, 2nd floor and room 14).

You can access the buildings by bus (*autocarro* in Portuguese), underground (*Metro* in Portuguese) and taxi. Locations of the underground stations are represented in the map. Please contact the Registration desk for information on other public transportation.

ORGANIZING COMMITTEE



-  **MARGARIDA SANTOS-REIS**, UNIVERSITY OF LISBON
-  **JOHNNY BIRKS**, MARTES WORKING GROUP (EUROPE)
-  **JOHN MESSENGER**, MARTES WORKING GROUP (EUROPE)
-  **FRANCISCO PETTRUCCI FONSECA**, UNIVERSITY OF LISBON
-  **HUGO MATOS**, UNIVERSITY OF LISBON
-  **MARIA JOÃO SANTOS**, UNIVERSITY OF LISBON

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-  **ANDRZEJ ZALEWSKI**, POLISH ACADEMY OF SCIENCES, zalewski@bison.zbs.bialowieza.pl
-  **STEVEN BUSKIRK**, UNIVERSITY OF WYOMING, marten@uwyo.edu

SYMPOSIUM VENUE

The Faculty of Sciences of the University of Lisbon hosts the 4th International *Martes* Symposium

WWW INFORMATION

<http://dba.fc.ul.pt/martes2004/>

SPONSORS



CENTRO DE BIOLOGIA AMBIENTAL (<http://cba.fc.ul.pt/>)



MARTES WORKING GROUP (<http://www.martes.laurentian.ca/>)

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INSTITUTO DO AMBIENTE (<http://www.dga.min-amb.pt/pls/ia>)



INSTITUTO DOS VINHOS DO DOURO E DO PORTO (<http://www.ivp.pt/>)



CÂMARA MUNICIPAL DE GRÂNDOLA (<http://www.cm-grandola.pt/>)



CÂMARA MUNICIPAL DE LISBOA (<http://www.cm-lisboa.pt/>)



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UNIVERSIDADE DE LISBOA (<http://dba.fc.ul.pt/>)



DELTA CAFÉS (<http://www.delta-cafes.pt/>)



BANCO PORTUGUÊS DE INVESTIMENTO (<http://www.bpi.pt/>)

TRAVEL AWARDS

-  **CLÉMENT FORTIN**, CANADA
-  **ISABEL BARJA NÚÑEZ**, SPAIN
-  **LAIMA BALTRUNAITE**, LITHUANIA
-  **LON GRASSMAN**, USA
-  **MARIA TÓTH-APÁTHY**, HUNGARY
-  **MARK STATHAM**, IRELAND
-  **MARYANA RANYUK**, RUSSIA
-  **VADIM SIDOROVICH**, BELARUS
-  **VLADIMIR MONAKHOV**, RUSSIA



IMPORTANT SYMPOSIUM INFORMATION



The **Registration desk** will be open from 2:00pm to 5:30pm in the main lobby of building **C3** on **Tuesday July 20th**. The following days, except during the field trip, it will be open from 8:00am to 5:00pm.



Symposium conference room is located in **building C3**, 2nd floor, room **3.2.14**.



There will be available a preview room for **viewing your presentation** and confirm compatibility with our projection equipment. This will be located in **building C3**, room **3.2.13**. Authors are invited to bring their presentations to be tested in the previous day of their scheduled time.



Participants that will be presenting **posters** are asked to set them at the main lobby of building **C3** as early as possible. **Fixation materials** will be available at the Registration desk. During their specific sessions authors are requested to stand by their posters.



A **message board** will be displayed at the lobby of **building C3**. Symposium updates and information will be posted in this area. Participants are welcome to include information on this board.



Participants that wish to access **computers** or need to use the **internet** may use the computers located in **building C1**, room **1.4.13**.



Fax and **copies** will be available at the **Registration desk**.










ATM and **public-phones** are available in the Faculty of Sciences main buildings (check the FCUL map for their location). Most public-phones require a phone card.



Lunches on July 21st and 22nd will be located at the main cafeteria near building **C5**.



-  No food or drink is allowed in the Symposium conference room (except water bottles).
-  **Coffee** will be offered to the symposium participants during coffee breaks.
-  Participants attending the **Symposium banquet** are asked to wear informal clothing.
-  Participants attending the **Field trip** are asked to **not forget** to bring light cloths, hiking shoes, hat, sun screen and water.
-  **Smoking** is prohibited inside the buildings.
-  **Parking** will be available at the Faculty of Sciences parking lots. If you need parking space please contact the registration desk.
-  In case of **emergencies** please contact the **Registration desk**.

SYMPOSIUM SCHEDULE



| | TUESDAY, JULY 20 TH | WEDNESDAY, JULY 21 ST | THURSDAY, JULY 22 ND | FRIDAY, JULY 23 RD | SATURDAY, JULY 24 TH |
|-----------|--|--|--|---|--|
| MORNING | | 8:30-9:00am: Opening remarks 9:00-10:00am: Keynote lecture 10:00-11:00am: MARTES VARIABILITY, DISTRIBUTION AND STATUS 11:00-11:20am: Coffee break 11:20-12:40pm: MARTES VARIABILITY, DISTRIBUTION AND STATUS | 8:30-9:00am: Opening remarks 9:00-10:00am: Keynote lecture 10:00-11:00am: MARTES CONSERVATION AND MANAGEMENT 11:00-11:20am: Coffee break 11:20-12:20pm: MARTES CONSERVATION AND MANAGEMENT | FIELD TRIP – GRÂNDOLA MOUNTAIN, Alentejo, SW Portugal | 8:30-9:00am: Opening remarks 9:00-10:00am: Keynote lecture 10:00-11:20am: MARTES RESEARCH TECHNIQUES 11:20-11:40am: Coffee break 11:40-12:30pm: Closing session |
| LUNCH | | 12:40-2:00pm | 12:20-2:00pm | | |
| AFTERNOON | 2:00-5:30pm: Registration and refreshments 5:30-6:30pm: Welcome session | 2:00-3:00pm: MARTES ECOLOGY 3:00-3:20pm: Coffee break 3:20-4:20pm: MARTES ECOLOGY 4:20-6:00pm: POSTER MARTES DISTRIBUTION AND STATUS and MARTES RESEARCH TECHNIQUES | 2:00-3:20pm: MARTES INTERACTIONS 3:20-3:40pm: Coffee break 3:40-5:00pm: MARTES INTERACTIONS 5:00-6:30pm: POSTER MARTES ECOLOGY and MARTES MANAGEMENT AND CONSERVATION | | |
| EVENING | 7:00pm: Opening reception DOURO AND PORT WINE INSTITUTE | 6:00-7:00pm: Wine tasting FCUL 7:00-8:00pm: MWG Meeting | 6:30-12:00pm: Symposium banquet LEZIRIA GRANDE RIDING CENTRE | | |



PORT AND DOURO WINES INSTITUTE

Porto: a wine with a history

For almost two millennia, a unique viticulture landscape rose on the schistose hillsides along the Douro River valley and that has produced an exceptional wine. More than a gift of Nature, Port Wine is at heart the expression of this history, a collective cultural heritage of work and experience, know-how and art, that has built up from generation to generation. Port Wine was, and is, a key product for the national economy and even more, a symbolic asset that represents Portugal throughout the world.

The history of vineyards in the Upper Douro is a long and ancient one. There is no lack of archaeological discoveries and documented references to witness the cultural persistence of viticulture from past eras.

Remains of stone treading tanks and casks dating back at least to the 3rd and 4th centuries can be found throughout the region. The designation Port Wine, however, only appears during the second half of the 17th century at a time of the expansion of Douro viticulture and rapid growth in wine exports.

Port and Douro Wines Institute

The Port and Douro Wines Institute (IVDP), is an interprofessional public institute in which the boundary between its public and private roles is assured by the way that the respective responsibilities of the Administration and the Interprofessional Council have been allocated.

The duties of the IVDP are as follows:

- a) Recommend the strategic guidelines and execute the viticultural and winemaking policies for the Demarcated Region of the Douro (DDR);
- b) Promote the convergence of interests of production and trade in defence of the general interests of the Region;
- c) Control, promote and defend the DDR's appellations of origin and geographical indications, as well as control the remaining wines and wine products that are produced, made-up or transit through the Region, without prejudice to the prerogatives and duties of the Institute of the Vine and Wine (IVV);
- d) Discipline, control and supervise the production and trade of wines produced in the DDR, promote and guarantee their quality, and sanction all infractions of the rules and regulations governing wines and wine products from that Region, without prejudice to the prerogatives and duties of the Institute of the Vine and Wine (IVV);

- e) Promote and administer all aids for guiding, regulating and organising the Douro and Port wine markets, as well as those for Terras Durienses wine when, under law, expressly authorised to do so by the Ministries of Finance and of Agriculture, Rural Development and Fisheries;
- f) Encourage the adoption of the best viticultural, winemaking and technological development practices;
- g) Assume all other duties and responsibilities for the DDR viticultural and winemaking sector that the Government may attribute it.

For more information visit: <http://www.ivp.pt/uk/>





CENTRO EQUESTRE DA LEZÍRIA GRANDE

LEZÍRIA GRANDE RIDING CENTER

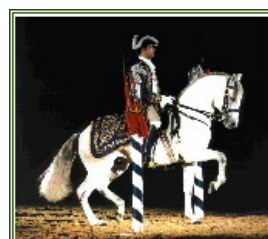
The Centre Equestre at Vila Franca was created and dedicated to the horse, the riding school based on the work of the Marquis of Marialva and related activities.

The location was built and planned combining the riding school with the natural beauty of the area. The area is referred to as the "Lezíria", meaning a fertile plain through which the Tagus runs. It is a natural reserve with abundant flowers and wildlife. The riding centre took its name from the floodplain, and the Centre Equestre de Lezíria Grande offers tourists not only the natural beauty of the setting, the horses and typical cuisine and the delicious local wines, but also cultural events such as folk dancers, brass bands with typical Portuguese instruments. The highlight of every entertainment is the Equestrian Gala, based on the presentations which were made to the kings of Portugal in the eighteenth century and showing the versatility of the horse in a number of disciplines; the gala has to be seen to be believed; there is nothing quite like it elsewhere in the world.

The Centre Equestre de Lezíria Grande is open to everyone; age is simply not an issue; our specialism is the High School work, training these horses to the level of the airs above the ground.

At the Centre Equestre a number of different breeds of horses can be seen; however the Lusitano horse features most predominantly. The original characteristics of the Lusitano horse, which includes its great courage and obedience to the rider combined with agility and a unique ability to go down on the haunches and remain in balance, all of which makes it invaluable in bull-fighting, have been preserved here.

The traditions and costumes of the 18c are to be seen here, and this includes the harness and above all the horsemanship practised at that time; the golden age of the art of riding. Through the efforts of a few individuals this horsemanship and tradition has survived, and influenced the way of riding in Portugal. This represents a very special and unusual equestrian heritage in terms of the teaching of the art of riding, which has such a brilliant reputation in Portugal.



For more information visit: <http://www.celg.pt/>

Herdade da Ribeira Abaixo is the Field Station of the Centre of Environmental Biology (CBA). It is located in the Serra de Grândola (Alentejo, SW Portugal), 100km south of Lisbon. The field station comprehends an area of 221ha. Climate is Mediterranean with some Atlantic influence, and precipitation levels assume mean annual values of 800mm. The altitude ranges from 159 to 238m, with few permanent and temporary streams.

The *montado* is a multiple use system with major economical income from cork and livestock production. Land cover is dominated by cork and holm oak woodlands (*Quercus suber* and *Q. ilex*). The understorey is dominated by several shrub species such as *Cistus* spp. The area has been classified as a CORINE Biotope (C-108).

Water resources are scarce. The area has one main stream - *Ribeira de Castelhanos* - with intermittent character. Temporary flooding occurs during winter rains and during the summer the stream dries. Throughout the area you can also find several creeks. Riparian vegetation assumes an important role in Mediterranean cork oak woodlands. They provide important refuge, food and water, key resources in the high summer temperatures of the Mediterranean climate.

The local carnivore community includes several species: least weasel (*Mustela nivalis*); polecat (*Mustela putorius*); stone marten (*Martes foina*); Eurasian badger (*Meles meles*); Eurasian otter (*Lutra lutra*); common genet (*Genetta genetta*); Egyptian mongoose (*Herpestes ichneumon*) and red fox (*Vulpes vulpes*).



For more information please visit: http://cba.fc.ul.pt/index_en.html

SCIENTIFIC PROGRAMME



JULY 20TH (TUESDAY)

2:00 – 5:30pm Registration and light refreshments

5:30 – 6:30pm Welcome session

Welcome address, *Nuno Guimarães* (President of the Directive Board of the Sciences Faculty)

Opening remarks, *Johnny Birks* (Organizing Committee)

Welcome address, *Gilbert Proulx* (Martes Working Group)

7:00pm Opening Reception

Porto and Douro Wines Institute

JULY 21ST (WEDNESDAY)

8:30 – 9:00am Opening Remarks

9:00 – 10:00am Key-note Lecture

MARTES ISSUES IN THE 21ST CENTURY: LESSONS TO LEARN FROM EUROPE

Sim Broekhuizen (THE NETHERLANDS).....22

10:00 – 12:40pm SESSION I: **MARTES VARIABILITY, DISTRIBUTION AND STATUS**

Moderator: Johnny Birks (UK)

10:00 – 10:20am PHYLOGENY OF MUSTELIDAE AS INFERRED FROM NUCLEAR GENE SEQUENCES, WITH SPECIAL REFERENCE TO THE PHYLOGENETIC STATUS OF THE GENUS *MARTES*

Jun Sato, T. Hosoda, M. Wolsan, Y. Yamaguchi & H. Suzuki (JAPAN).....23

10:20 – 10:40am PHYLOGENIC HISTORY OF *MARTES* BASED ON UNIQUE INDELS IN THE MC1R GENE

Tetsuji Hosoda, J. Sato, T. Shimada, K.L. Campbell & H. Suzuki (JAPAN).....23

10:40 – 11:00am GENETIC STRUCTURE AND DIVERSITY OF THE FISHER: IMPLICATIONS FOR CONSERVATION AND MANAGEMENT

Samantha M. Wisely, S. Buskirk, G.A. Russell, K. Aubry & W.J. Zielinski (USA)...24

11:00 – 11:20am COFFEE BREAK



| | |
|--|----|
| 11:20 – 11:40am GENETIC STRUCTURE OF A RECOLONIZING FISHER POPULATION IN ONTARIO | |
| Denis J. Carr, J. Bowman & P.J. Wilson (CANADA) | 24 |
| 11:40 – 12:00am POPULATION VARIABILITY IN PHENOTYPIC CHARACTERS OF SABLE | |
| Mariana Ranyuk & V. Monakhov (RUSSIA) | 25 |
| 12:00 – 12:20pm THE STONE MARTEN AND THE CITY | |
| Mária Tóth-Apáthy & P. Szenczi (HUNGARY) | 25 |
| 12:20 – 12:40pm DISTRIBUTION OF PINE MARTEN <i>MARTES MARTES</i> IN PORTUGAL | |
| Hugo Matos & M. Santos-Reis (PORTUGAL) | 26 |
| <i>12:40 – 2:00pm LUNCH</i> | |
| 2:00 – 4:20pm SESSION II: MARTES ECOLOGY | |
| Moderator: William J. Zielinski (USA) | |
| 2:00 – 2:20pm ECOLOGY AND CONSERVATION OF THE YELLOW-THROATED MARTEN (<i>MARTES FLAVIGULA</i>) IN NORTH-CENTRAL THAILAND. | |
| Lon I. Grassman & M.E. Tewes (USA) | 27 |
| 2:20 – 2:40pm ECOLOGY OF THE AMERICAN MARTEN IN THE OREGON CASCADE RANGE | |
| Martin G. Raphael (USA) | 27 |
| 2:40 – 3:00pm REST SITE SELECTION OF THE PACIFIC FISHER IN THE SOUTHERN SIERRA NEVADA | |
| Amie K. Mazzoni, K. Purcell, B.B. Boroski & D.D. Grubbs (USA) | 28 |
| <i>3:00 – 3:20pm COFFEE BREAK</i> | |
| 3:20 – 3:40pm EFFECTIVE POPULATION SIZE OF FOREST INDICATOR <i>MARTES AMERICANA</i> IS ENHANCED BY COMPENSATORY DISPERSAL | |
| Thomas Broquet, C. Johnson, J. Fryxell, F. Burel & E. Petit (FRANCE) | 28 |



3:40 – 4:00pm AMERICAN MARTEN ECOLOGY ON AN ALPINE SKI AREA

Thomas E. Kucera (USA).....29

4:00 – 4:20pm SPATIAL ORGANISATION AND HOME RANGE USE OF PINE MARTEN *MARTES*
MARTES IN A PRISTINE DECIDUOUS FOREST

Andrzej Zalewski, W. Jedrzejewski & B. Jedrzejewska (POLAND).....29

4:20 – 6:00pm Poster Session

Moderator: John Messenger (UK)

Topic Areas: *MARTES* VARIABILITY, DISTRIBUTION AND STATUS and *MARTES*
RESEARCH TECHNIQUES

6:00 – 7:00pm Portuguese Wines' Tasting

7:00 – 8:00pm Martes Working Group Meeting

JULY 22ND (THURSDAY)

8:30 – 9:00am Opening Remarks

9:00 – 10:00am Key-note Lecture

MARTES ISSUES IN THE 21ST CENTURY: LESSONS TO LEARN FROM AMERICA

William J. Zielinski (USA).....30

10:00 – 12:20pm SESSION III: *MARTES* CONSERVATION AND MANAGEMENT

Moderator: John A. Bissonette (USA)

10:00 – 10:20am USING FOREST INVENTORY DATA TO PREDICT AMERICAN MARTEN
DISTRIBUTION

Gilbert Proulx, R. Kariz & J. Farkvam (CANADA).....31

10:20 – 10:40 am FISHER POPULATIONS IN ONTARIO: A TEMPORAL PROJECTION BASED ON
ECOLOGICAL TRENDS

Jean-François Robitaille, J. Bowman & G.H. Parker (CANADA).....31



10:40 – 11:00am *COFFEE BREAK*

11:00 – 11:20am MONITORING OF FISHER IN QUÉBEC FROM 1984 TO 1999

Clément Fortin, Y. Leblanc & Y. Garant (CANADA).....32

11:20 – 11:40am RESOLVING CONFLICTS GENERATED BY PINE MARTENS DENNING IN BUILDINGS IN SCOTLAND

Hugh Brown (SCOTLAND).....32

11:40 – 12:00pm MULTI-SPECIES PLANNING ACROSS SPATIAL SCALES: MARTES, OWLS, HERPTILES, AND MOLLUSKS IN CALIFORNIA

Carlos Carroll, J.R. Dunk & W.J. Zielinski (USA).....33

12:00 – 2:00pm *LUNCH*

2:00 – 5:00pm SESSION IV: *MARTES* INTERACTIONS

Moderator: Andrzej Zalewski (Poland)

2:00 – 2:20pm THE PINE MARTEN *MARTES MARTES* IN VERTEBRATE COMMUNITY OF THE TRANSITIONAL MIXED FOREST ECOSYSTEMS OF BELARUS: REVIEW OF RESULTS

Vadim E. Sidorovich (BELARUS).....34

2:20 – 2:40pm DIET COMPOSITION AND HABITAT USE OF SYMPATRIC RED FOX AND PINE MARTEN IN OJCOW NATIONAL PARK, SOUTHERN POLAND

Izabela Wierzbowska, B. Bober & G. Malgorzata (POLAND).....35

2:40 – 3:00pm STONE MARTEN'S URBAN HABITAT: DO RED FOX ACTIVITIES EXPLAIN THEIR DISTRIBUTION?

Gwenaëlle Le Lay & T. Lodé (FRANCE).....35

3:00 – 3:20pm ECOLOGICAL NICHE OVERLAP OF SYMPATRIC STONE MARTENS AND PINE MARTENS

C. Pittiglio, F. Antonelli, Piero Genovesi & L. Boitani (ITALY).....36



3:20 – 3:40pm *COFFEE BREAK*

3:40 – 4:00pm SPACE USE AND FORAGING STRATEGY OF PINE AND STONE MARTENS IN POLAND

Maciej Posluszny, M. Pilot, B. Gralak & J. Goszczynski (POLAND).....36

4:00 – 4:20pm PATTERNS OF RESTING SITES USE BY STONE MARTENS AND GENETS INHABITING A CORK OAK WOODLAND

I. Pereira & Margarida Santos-Reis (PORTUGAL).....37

4:20 – 4:40pm SHOULD WE LOOK FOR SEXUALLY SELECTED INFANTICIDE IN MARTENS?

Piero Genovesi (ITALY).....37

4:40 – 5:00pm COMPARATIVE HABITAT USE OF SYMPATRIC *MARTES* POPULATIONS FROM TWO REGIONS IN CALIFORNIA

Keith M. Slauson & W.J. Zielinski (USA).....38

5:00 – 6:30pm Poster Session

Moderator: Erin C. O'Doherty (USA))

Topic Areas: *MARTES* ECOLOGY and *MARTES* MANAGEMENT AND CONSERVATION

6:30pm – 12:00am Banquet

CENTRO EQUESTRE DA LEZÍRIA GRANDE (VILA FRANCA DE XIRA)

JULY 23RD (FRIDAY)

8:00am – 6:00pm FIELD TRIP

GRÂNDOLA MOUNTAIN (ALENTEJO)

JULY 24TH (SATURDAY)

8:30 – 9:00am Opening Remarks

9:00 – 10:00am Key-note Lecture

MARTES ISSUES IN THE 21ST CENTURY: LESSONS TO LEARN FROM ASIA

Midori Saeki (JAPAN)39

10:00 – 12:20pm SESSION III: *MARTES* RESEARCH TECHNIQUES

Moderator: Gilbert Proulx (CANADA)



10:00 – 10:20am *MARTES* SP. DISTRIBUTION IN A SYMPATRY AREA USING DNA ANALYSES OF SCATS

Oskar Bérdion-Grados & B. Gómez-Moliner (SPAIN).....40

10:20 – 10:40am USING SNOW-TRACKING DATA TO INVESTIGATE CARNIVORE HABITAT-USE AND BEHAVIOUR

Erin C. O'Doherty & G. Proulx (USA).....40

10:40 – 11:00am A QUALITY-SCORING SYSTEM FOR USING SIGHTINGS DATA TO ASSESS PINE MARTEN DISTRIBUTION

S. Poulton, J. Messenger, Johnny Birks & D. Jefferies (UK).....41

11:00 – 11:20am AN INTERACTIVE WEBSITE FOR ARCHIVING AND EVALUATING RESULTS FROM REGIONAL CARNIVORE SURVEYS

Keith Aubry & L.A. Jagger (USA).....41

11:20 – 11:40am COFFEE BREAK

11:40am – 12:30pm Closing session

Margarida Santos-Reis (Organizing Committee)

Gilbert Proulx (Martes Working Group)

POSTER SESSIONS



TOPIC AREA: *MARTES* VARIABILITY, DISTRIBUTION AND STATUS

P.01

PHENOGEOGRAPHIC PICTURE OF SABLE INTRASPECIFIC VARIABILITY IN RUSSIA (COLORATION, SKULL MORPHOLOGY)

Vladimir G. Monakhov (RUSSIA)

P.02

THE PINE MARTEN IN NORTHWESTERN PORTUGAL: ECOLOGICAL CONSTRAINTS AND POTENTIAL AREAS OF OCCURRENCE

Francisco Álvares & J.C. Brito (PORTUGAL)

P.03

RECORDS OF PINE MARTEN *MARTES MARTES* IN THE ARAGONIAN PREPYRENEES

Sérgio Couto, R. García-González, J. Herrero, C. Prada, A. García-Serrano & O. Fernández-Arberas (SPAIN)

TOPIC AREA: *MARTES* RESEARCH TECHNIQUES

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ASSESSING A RE-ESTABLISHED POPULATION OF PINE MARTEN (*MARTES MARTES*) IN KNP, IRELAND.

Aine B. Lynch & John M. Rochford (IRELAND)

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MORPHOLOGICAL AND RFLP MARKERS FOR DISTINGUISH ITALIAN PINE AND BEECH MARTEN SPECIES

Francesca Vercillo, L. Lucentini, N. Mucci, F. Panara, E. Randi & B. Ragni (ITALY)

P.06

IDENTIFYING INDIVIDUAL FISHERS FROM TRACK PLATE FOOTPRINTS

C.J. Herzog, R.W. Kays, J.C. Ray, M.E. Gompper & **William J. Zielinski** (USA)

TOPIC AREA: *MARTES* ECOLOGY

P.07

PINE MARTEN'S DIET AND HABITAT USE IN SANDY AND CLAY PLAINS, LITHUANIA

Laima Baltrunaite (LITHUANIA)

P.08

PINE MARTEN (*MARTES MARTES*) FEEDING ECOLOGY IN CONTINENTAL AND INSULAR ENVIRONMENTS OF EUROPE

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PLENARY SESSION

MARTES ISSUES IN THE 21ST CENTURY: LESSONS TO LEARN FROM EUROPE

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Martens have always attracted a great deal of interest due to their secretive and mostly nocturnal way of life, their predation on game species and poultry, their importance as furbearers and their damage to human properties, also nowadays in several countries as vandals of motorcars. Therefore, early research on martens was orientated towards developing methods of trapping and breeding. Even now there is still a demand for improving these techniques, certainly also for ecological research. From the middle of the 19th century several populations declined or even disappeared because of over-harvesting and predator control. This promoted the keeping of hunting statistics, which in many countries still provides an important source of information about the trend and dynamics of the population. However, because of their elusive way of life, it is still a problem to determine the real number of martens present, and improvement of methods for monitoring is still desirable.

In several West-European countries habitat fragmentation and isolation also led to small and isolated marten populations with less genetic variation, or even to local extinction. Besides the more classical methods as comparing metric and non-metric characteristics of the skeleton, the availability of molecular genetic techniques now offers tools to study the impact of isolation between populations.

Isolation of populations is countered by dispersal of some of the animals, especially when there is a surplus in the population. To preserve small populations, we have to protect and, if possible, to guide dispersing individuals. However, up to now little is known about the distances covered, the risks and the habitat use during dispersal in relation to the characteristics of the landscape. A better understanding of all aspects of dispersal is needed. This holds especially for the pine marten.

Study of habitat use and social structure became popular from the late 1960s onwards, when transmitters for radio telemetry became small enough to adapt to marten-sized animals. Especially in the 1980s many studies with radio telemetry have been carried out. Research on habitat use was favored by the political recognition of the ecological impact of habitat fragmentation. Although the role of several habitat factors have become better understood, many studies were too short-termed to unravel the variation in population structure in relation to the quality of the habitat and the use of landscape elements in relation to season and age, especially also during dispersal. Unfortunately, now funding of long-termed field studies has become much more difficult than in the 1980s. In general, nowadays there is a dip in field studies and in several European countries there are not any field studies on martens going on at all.

In spite of all the studies that are carried out to determine the local and seasonal variations in the food of martens, there are still many questions about the relationships between the numbers of martens present and that of their prey species as well as of their guild members. There is also a shortage of information about the impact of density dependency and prey availability on the marten's fertility and reproductive success.

The spectacular increase in the stone marten population since the 1960s was unexpected. The cause of this increase has still to be elucidated.



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PHYLOGENY OF MUSTELIDAE AS INFERRED FROM NUCLEAR GENE SEQUENCES, WITH SPECIAL REFERENCE TO THE PHYLOGENETIC STATUS OF THE GENUS *Martes*

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Phylogenetic relationships within the marten genus *Martes* have repeatedly been studied using either morphological or genetic data, but both the monophyly of the genus and the pattern of the relationship among the subgenera *Martes* (true martens), *Charronia* (yellow-throated martens), and *Pekania* (fisher) remain an issue of uncertainty and controversy. Here we present results on phylogenetic relationships among 27 species of Mustelidae (including all extant species of the genus *Martes*) as inferred from nucleotide sequences of two nuclear genes: the recombination-activating gene 1 (RAG1) and the gene encoding interphotoreceptor retinoid-binding protein (IRBP). Neighbor-joining, maximum parsimony, maximum likelihood, and Bayesian phylogenetic analyses on these genes separately and combined were conducted. Although the analyses moderately to strongly supported the monophyly of the subgenus *Martes*, they resulted in a poorly resolved relationship among this subgenus, *Charronia*, *Pekania*, and the genus *Gulo* (wolverine), providing support, albeit weak, for a paraphyletic status of the genus *Martes* (with respect to *Gulo*). The time of the radiation into the three marten subgenera is consistently indicated to be at 5.5 Ma by the two genes.

PHYLOGENIC HISTORY OF MARTES BASED ON UNIQUE INDELS IN THE MC1R GENE

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Melanocortin-1 receptor (*MC1R*) gene variants are associated with pelage colour polymorphisms in mammals by regulating the distribution of two melanin pigments: eumelanin (black/brown) and pheomelanin (red/yellow). The sequence variation within the 5' flanking region (ca. 250 bp) and exon region (ca. 430 bp) of the *MC1R* gene was examined to determine the potential role of this gene in the melanistic coat coloration of 15 mustelid species spanning 5 genera; *Martes* (martens), *Mustela* (weasels), *Gulo* (wolverines), *Lutra* (otters) and *Meles* (badgers). Members of the genera *Mustela*, *Lutra* and *Meles*, together with *Martes fravigula* and *M. pennanti* were shown to have intact gene segments. However, several “in frame” deletions, in a region of the *MC1R* gene implicated in melanism in jaguars and jaguarundis, were detected within members of the genera *Martes* and *Gulo*. For instance, *M. americana*, *M. melampus*, *M. zibellina*, and *M. martes*, shared a common 45-bp (15 amino-acid) deletion within the gene while *Gulo gulo* possessed a separate 15-bp deletion overlapping this region. Interestingly, while *Martes foina* was found to possess an intact gene segment in this region, this species was found to possess an 8-bp insertion followed closely by a 28-bp deletion immediately upstream of the earlier noted deletions. Finally, no gene variation was found between two subspecies of the Japanese marten (*Martes melampus*), which exhibit variation in winter coat coloration, yellow or grey. These unequally distributed indels reflect the unique phylogenetic history of these lineages.

GENETIC STRUCTURE AND DIVERSITY OF THE FISHER: IMPLICATIONS FOR CONSERVATION AND MANAGEMENT

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Evolutionary processes can be strongly affected by landscape features. In vagile carnivores that disperse widely, however, genetic structure has been found to be minimal. Using microsatellite DNA primers developed for other mustelids, we found that populations of a vagile forest carnivore, the fisher (*Martes pennanti*), exhibit high genetic structure ($F_{ST} = 0.45$, $SE = 0.07$) and limited gene flow ($Nm < 1$) within a > 1600 km long distributional peninsula, that genetic diversity decreases from the base to the tip of the peninsula and that fishers exhibit a non-equilibrium isolation-by-distance pattern of differentiation. Genetic structure was greater at the periphery than at the core of their distribution; data fit a model of stepping-stone range expansion. Multiple lines of paleontological and genetic evidence suggest that the fisher recently (< 5000 bp) expanded into the mountain forests of the Pacific Coast of North America. The distribution of fishers along the western coastal mountains appears to have contributed to the high levels of structure and decreasing levels of diversity from north to south. These effects were likely exacerbated by human-caused changes to the environment. The low genetic diversity and high genetic structure of populations in the Sierra Nevada mountain range suggest that the fisher is highly vulnerable to extinction.

GENETIC STRUCTURE OF A RECOLONIZING FISHER POPULATION IN ONTARIO

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Fisher (*Martes pennanti*) populations in Ontario, Canada, have recovered from near extirpation during the last century. We present an examination of individual directional movement and gene flow of the recolonizing population, through the genetic analysis of 900 fishers sampled at 20 microsatellite loci. DNA samples were collected from the 2001-2 trapping season to examine the spatial dynamics of fishers at a single point in time. The analysis of the genetic data revealed several population clusters where genetic structure was greater at the core of the distribution than at the periphery. The genetic clustering of populations correlates with the historic fragmentation through over harvesting and the strong philopatric nature of fishers. There is suitable evidence that the Algonquin and Adirondack Park trapping refuges provided emigrants that recolonized the province. The effects of the large parks resulted in the formation of protected "island" habitats rather than maintaining a continuum with the surrounding landscape matrix; as well, particular population clusters demonstrated wider geographic ranges while others demonstrated surprisingly little admixture with neighbouring fisher populations. These spatial trends indicate that geographic variables are differentially influencing the growth and functional connectivity of these population clusters.

POPULATION VARIABILITY IN PHENOTYPIC CHARACTERS OF SABLE

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In 1950 –1960th years from Baikal region sables were introduced in some Ob regions' territories where this species was almost destroyed. Introducing animals were acclimatized successfully but it has been differed from residents by dark coloration and small sizes. We have compared variations of non-metric cranial characters for three geographical samples of sables' skulls collected in 1979 to 1985 years: the sables from the Baikal region, the residents from the Ob region and the acclimatizing sables from the Ob region. We have found out that variation of non-metric characters of the acclimatizing animals are differed from the samples from the Baikal region and the residents from the Ob region significantly. The reason of this fact can be the influence of both genetic and environmental variations on phenotypic variation.

THE STONE MARTEN AND THE CITY

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Monitoring of the spread of the stone marten in Budapest started in 1996. The sightings were transported over the Capital's administrative area of 525 km² with the view to investigate the trends of this process. In order to develop and appreciation of the above public sightings were processed, and scat and hair samples were analysed. Consequently its urban sprawl cannot be attributes to diminishing natural habitat, it is a common small carnivore in Hungary. It practically lives side by side with humans, but its hideouts are often difficult to explore or completely inaccessible. It prefers attics, roofs, suspended ceilings and conduits without any "reliance" of green corridors. Food resource analysis seems to lead to the conclusion that the scale and intensity of urban presence is not driven by food availability but rather, by the availability of a large number of shelters. No doubt, the stone marten will consume domestic waste, but it is only one possible alternative on its menu, depending on the characteristics of a given habitat. Even a slight reduction is able to be observed in food diversity. In the stone marten's urban habitat the only competitors -or sometimes preys- are stray cats. It reached the inner suburbs and integrated into the city's unique and largely unexplored food network. Its sprawl is demonstrated by the register contains 248 confirmed sightings over eleven suburbs. The key to the success of the stone marten's urbanisation lies in its unique adaptability, absence of larger carnivores, competitors and the successful reproduction.

DISTRIBUTION OF PINE MARTEN *MARTES MARTES* IN PORTUGAL

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The current status of pine marten in Portugal is largely unknown. The first confirmed records of the species in the country are from the late 1980s and early 1990s. These records showed an apparent northern distribution but the exact limits remained unclear.

In order to apply the new IUCN Red List criteria, from June 2002 to May 2003 the distribution of this species was evaluated by 41 oral inquiries and postal surveys sent to all counties (3056) and hunting areas (504) in the North and centre of the country and then mapped in 10x10km Universal Transverse Mercator grid cells. The results indicate that the pine marten seems to occur in 25.6% of the study area, but it was only possible to confirm 15.2% of the reports.

Additionally, logistic regression was used to create a predictive model using only the confirmed records. This approach allowed extrapolating the distribution of the pine marten to the entire study area. The predictive model showed that only 25.4% of the area has high probability of occurrence of the species ($p > 0.65$), 35.6% medium probability of occurrence ($0.15 \leq p < 0.65$) and 39.0% low probability of occurrence ($p < 0.15$). According to this model, the pine marten seems to be influenced negatively by the presence of the Mediterranean shrubs and woodlands and positively by the presence of red squirrel *Sciurus vulgaris*.

In spite of the effort made to evaluate the present distribution and status of this species in the study area, it seems that more studies are needed in order to fully understand its real distribution and to determine more accurately what factors are influencing it.



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ECOLOGY AND CONSERVATION OF THE YELLOW-THROATED MARTEN (*MARTES FLAVIGULA*) IN NORTH-CENTRAL THAILAND

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The yellow-throated marten (*Martes flavigula*) is widely distributed through much of Southeast Asia, yet its natural history remains poorly understood. We captured 40 yellow-throated martens and radio-collared 5 (4 adult males, 1 adult female) that were tracked for 4–16 months in Phu Khieo Wildlife Sanctuary, north-central Thailand. Mean annual range size (\pm SD) (95% minimum convex polygon) for martens was 7.2 km² (\pm 4.3, n = 297 radio locations). Mean core area was 1.2 km² (\pm 1.0, range 0.5–3.0). Wet season ranges were larger for most martens (x , increase = 262%, \pm 155). Mean range overlap for 3 marten pairs was 34%. Yellow-throated marten mean daily distance was 966 m (\pm 834). An overall activity pattern of 58% indicated that yellow-throated martens were predominantly diurnal, however, increases in nocturnal activity increased during lunar nights (\pm 7 days from full moon). We recorded 5 visual observations of adult pairs of martens travelling along the main road and trails. Illegal hunting and aloewood (*Aquilaria crassna*) collecting threaten the carnivore community in Phu Khieo Wildlife Sanctuary. The conservation of the yellow-throated marten requires increased forest ranger patrols, continuing wildlife conservation education, and implementation of a sustainable-use ethic within appropriate sections of the buffer zone.

ECOLOGY OF THE AMERICAN MARTEN IN THE OREGON CASCADE RANGE

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Much research has been conducted on the American marten in late-successional fir and spruce forests, but little is known of its biology, habitat requirements, or responses to timber management in other forest types. From 1993 to 1998 we conducted a radio-telemetry study of martens in a lodgepole pine-dominated ecosystem in the central Cascade Range of Oregon. The area was subject to periodic timber harvest and, in recent years, was used primarily for salvaging insect-killed trees. Slash piles were prominent features in the area; we described the characteristics of over 1,500 slash piles in the study area. We captured martens in single-door wire live-traps, then anesthetized and fitted them with radio-collars. By tracking animals from the ground and air year-round, we were able to document home range size and habitat use, movement patterns, demographics, resting sites, denning sites, and foraging habits. We radio-tagged 115 martens and obtained over 6,200 radio-locations. Marten home ranges were large, averaging between 1200 ha (female) and 1900 ha (male) using MCP estimators, with 50% kernel core areas averaging 140 (female) to 280 (male) ha. Males had a much higher survival rate than females. Resting and denning structures were primarily downed logs (29%) and slash piles (40%). Martens preyed on a variety of rodents, particularly microtine rodents and squirrels. Current forest management practices appear to be compatible with the persistence of marten populations in this area, probably because of the presence of slash piles for shelter and large numbers of prey.

REST SITE SELECTION OF THE PACIFIC FISHER IN THE SOUTHERN SIERRA NEVADA

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Restrictions in the range of the Pacific fisher (*Martes pennanti*) have caused concern over the status of the fisher in California. In order to gain a better understanding of the habitat requirements of the southern Sierra population, we have identified rest sites of radio-collared fishers and conducted analyses to examine stand level habitat selection. Fourteen individual fishers were radio-tagged and tracked using radio-telemetry methods during two eight-month periods (September – May). Seventy-eight rest sites were identified for ten individuals, 5 male and 5 female during the study period. Vegetation was sampled at rest sites and 100 random sites of the same habitat type using a one-hectare nested plot design. Trees and snags used by fishers for resting were large diameter and frequently had mistletoe infestations. Average live tree dbh for female rest structures was found to be 98.09cm. ($n = 43$, $sd = 28.95$) and 82.9cm. ($n = 10$, $sd = 20.63$) for live trees used by males. Habitat characteristics including high canopy closure, crown volume, log cover, basal area, canopy layering, and large snag abundance were found to be significant ($p < 0.05$) factors contributing to rest site selection.

EFFECTIVE POPULATION SIZE OF FOREST INDICATOR *MARTES AMERICANA* IS ENHANCED BY COMPENSATORY DISPERSAL

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We investigated the effect of forest habitat quality on effective population size in a mustelid carnivore (*Martes americana*) and discussed the contribution of dispersal to the demographic and genetic processes occurring in contrasted environments. To this end, the census population size, the effective population size and the number of first-generation dispersers were compared between a landscape dominated by regenerating forest ("logged" population) and a landscape dominated by old-growth forest ("unlogged" population). Based on two years of live-trapping, the abundance of martens in the logged landscape was on average 44 % lower than in the unlogged landscape. Microsatellite analyses showed, however, that the effective size of the logged population was only 7 % lower than the unlogged population. Dispersal had a critical compensatory impact on effective population size, as 45 % more first generation migrants could be detected in the logged than the unlogged population. This suggested that dispersal is a critical contributory factor to the sustainability of *Martes americana* in sub-optimal habitat

AMERICAN MARTENS ECOLOGY ON AN ALPINE SKI AREA

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Understanding the effects of forest management on wildlife has typically focused on timber harvest. The effects of another type of intensive management that associated with alpine ski areas, have received less attention. United States Forest Service planning documents for California discussed potential negative effects of habitat alteration, roads, and human activities on a number of “Sensitive” species, including the American marten, and the possibility of restricting activities associated with alpine ski areas near marten den sites. Martens and their tracks are often seen on ski areas, but little in detail is known about marten use of these areas. Using radiotelemetry, I studied the ecology of American martens on the Mammoth Mountain Ski Area, Inyo National Forest, Mono County, California during 2002-2003. I compared results to those from a similar study of martens I conducted on adjacent, unmanaged forest. Martens on the ski area were overwhelmingly male, used human structures within the ski area boundaries and components of the native forest for rest sites, used human sources of food, and showed a tendency to leave the area in the spring. On the adjacent unmanaged forest, sex ratio of captures was nearly even, all forest types were used, and no human structures were present. Both study areas were in relatively high-elevation, open-canopy forest with little structure near the ground and few riparian areas. The presence of martens on a ski area, or other location, does not necessarily mean the presence of a healthy population.

SPATIAL ORGANISATION AND HOME RANGE USE OF PINE MARTEN *MARTES* *MARTES* IN A PRISTINE DECIDUOUS FOREST

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Annual and seasonal variation of home range size and mobility of 17 radio-collared pine martens were studied in Bialowieza National Park (E Poland) in 1991-1996. Males used larger home range (2.58 km²) than females (1.41 km²) and home ranges size varied little between seasons. Home range fidelity was high in both sexes. Mean overlap of ranges was 9% in males and 2% in females, however, overlap between sexes varied strongly. Daily movement distance (DMD) averaged 5.1 km/day in females and 5.8 km/day in males. Daily ranges (DR) utilized by martens averaged 49 ha in females and 54 ha in males, and constituted 26 and 29% of annual home ranges respectively. Indices of penetration of daily ranges (IP) averaged 220 m/ha in females and 139 m/ha in males. Ambient temperature, abundance of forest rodents (main prey), sex, and reproductive activity of an animal were crucial factors shaping the variation in all studied parameters. DMD, DR and speed were positively correlated with ambient temperature. With increasing temperature, martens moved faster, covered longer distances and utilized larger daily ranges. Increasing abundance of rodents caused martens to shorten their DMD, utilize smaller DR, and penetrate them less intensively. A literature review showed that average and maximum recorded DMD of martens increased from South to North and martens had to cover longer routes in northern regions to fulfill their food requirements, due declining ecosystem productivity and shrinking prey resources.

PLENARY SESSION

MARTES ISSUES IN THE 21ST CENTURY: LESSONS TO LEARN FROM N. AMERICA

ZIELINSKI, WILLIAM J.



The talk will include my perspectives on the state of knowledge of *Martes* ecology and conservation in the US Pacific region as well as the results of a survey of North American members of the *Martes* Working Group. In the far western US (excluding Alaska) the management of *Martes* populations has shifted from regulation of a fur resource to the conservation of populations. *Martes* distributions, like other North American carnivores, have decreased and become fragmented. The science necessary to support conservation policy is expensive and should be limited to that necessary to identify, measure, and mitigate risk factors (e.g., timber harvest, fire, roads, small population size, genetic impoverishment). Traditional autecological studies have focused on microhabitat, diet, and home range characteristics of American martens and fishers. Landscape-level research has uncovered effects of landscape composition on use by martens and regional survey efforts have revealed significant changes in geographic ranges. Much of this work, however, assumes that resource selection, and *Martes* occurrence, reflect fitness. Our critics will demand to know whether the risks affect population growth rates. As our understanding of the ecology of martens and fishers grows, we should pursue a disciplined strategy of applied research on: (1) the consequences of specific forest management activities on martens and fishers, (2) broad scale methods to monitor *Martes* populations and habitat suitability, (3) multiple-scale thresholds of habitat suitability and persistence, and (4) integrating *Martes* needs in multiple-species conservation plans. The survey of MWG members reveals other perspectives that will also be discussed.



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USING FOREST INVENTORY DATA TO PREDICT AMERICAN MARTEN DISTRIBUTION

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This study assessed the possibility of predicting American marten (*Martes americana*) distribution in the Sub-Boreal Spruce (SBS) biogeoclimatic zone of British Columbia (BC) with the BC Vegetation Resources Inventory dataset that is used to produce forestry maps. It was hypothesized that marten habitats would correspond to stands with ≥ 4 of the following criteria: 1) coniferous-dominated stands; 2) ≥ 80 years; 3) $\geq 30\%$ canopy closure; 4) ≥ 20 m²/ha basal area in trees with ≥ 27.5 -cm diameter at breast height; and 5) soils that are either submesic, mesic or subhygric. Predictive distribution maps were tested in the field by snowtracking along 10 and 12 different transects in winters 2000 and 2003, respectively. During both years, all tracks (16 in 2000 and 18 in 2003) were recorded in coniferous-dominated stands with ≥ 3 other selection criteria. Marten track distribution differed significantly ($P < 0.001$) from an expected distribution based on the proportion of inventory transects crossing such stands. This study showed that it is possible to predict the winter distribution of American marten in the SBS biogeoclimatic zone of British Columbia using simple habitat criteria and the BC Vegetation Resources Inventory dataset.

FISHER POPULATIONS IN ONTARIO: A TEMPORAL PROJECTION BASED ON ECOLOGICAL TRENDS

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In Ontario, fisher populations have withstood, with variable success, fur harvesting since colonization, resulting in regional extirpations counterbalanced by periods of re-introductions and re-colonizations. Currently, fishers are being harvested at a steady rate and appear to thrive. In this paper, we propose an overview of ecological trends for fishers in Ontario and a trajectory for future populations. In many parts of the province, harvest quotas have increased in recent time, due to high trapping success and apparent fisher recruitment. Based on approximately 1,000 specimens collected over 4 years and 4 regions, fishers appear to be in good nutritional condition: they carry more fat than sympatric marten, and appear to feed successfully on a wide variety of foods. Habitat, condition of fishers and reproductive potential of females appear relatively uniform across the landscape. Parasitism is low. Ontario fisher populations' future seems bright. In time, global warming may further improve existing winter habitats of this southern species, and/or extend their availability beyond the current northern distribution. A recent expansion of Ontario protected areas may decrease human impact, although trapping will likely continue to keep fisher populations below carrying capacity. Fisher harvest will probably continue to depend upon fur trade, which is currently moderate. Trappers, through awareness workshops, are increasingly involved in the invigilation of fisher populations. We suggest that continued monitoring will be key to revealing the direct and indirect effects of ecological changes on fisher distribution and habitat, including their competitors, prey, parasites, and forest cover.

MONITORING OF FISHER IN QUÉBEC FROM 1984 TO 1999

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In order to identify the most suitable index of status and harvest level of fisher populations in Québec, we monitored the species over a 16 year-period. Harvest numbers were obtained through mandatory fur trader reports. Trapline-specific data such as trapping effort, sex and date of capture were available through trappers logbooks. Data on age and sex came from carcass analysis. Over the years, harvest numbers rose in most regions, and average yield was 1.8 captures/100km². Over the last 7 years, four regions demonstrated average yield in excess of the maximum sustainable yields (MSY) estimated in 1995. Except for one region, trapping effort remained stable over the years. Significant correlations were observed between average yield and trapping success in only 2 regions, whereas sex ratios showed significant correlation in only one region. Juveniles / adult ratios differed significantly in most regions, although there were no significant differences among regions. Effort invested in carcass analysis did not lead to worthwhile results. There were no clear relation between average yield and age and sex ratios. However, average yield appears to be the best harvest level index, in as much as that value can be compared to MSY. The use of trapper logbooks should be maintained, whereas carcass collection should be discontinued. Population abundance should be estimated when average yield is greater than MSY. Harvest potential for fisher could then be estimated on a regional basis and used to monitor populations trends.

RESOLVING CONFLICTS GENERATED BY PINE MARTENS DENNING IN BUILDINGS IN SCOTLAND

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Pine martens typically use natural sites such as tree cavities as dens. In Scotland, however, the species increasingly uses buildings, probably in response to the scarcity of natural den sites. This behaviour leads to conflicts between pine martens and people, especially where martens breed in the roofs of dwelling houses, hotels and holiday cottages. Such conflicts threaten to damage attitudes towards a species of high conservation value. In Scotland the species is fully protected by legislation that limits the action that may be taken to exclude martens from a place or structure being used for resting. However, in the interests of public health or safety there are exceptions where a problem occurs in a domestic dwelling, but a license has to be obtained from the relevant authority if trapping or handling martens is involved. Data gathered over 22 years indicate an increase in requests from the public in connection with problems involving martens causing a nuisance in buildings. The strategies adopted to resolve such conflicts have necessarily developed in response to changes in both the legislation protecting pine martens and the attitudes and tolerance of people affected. Initially there were no restrictions on the use of live traps or on the distance to which martens could be removed from the site. Latterly, however, action seeks to avoid trapping martens or removing young from dens. Whilst legislative changes have benefited the martens, resolving conflicts legally now involves considerable effort and planning.

MULTI-SPECIES PLANNING ACROSS SPATIAL SCALES: MARTES, OWLS, HERPTILES, AND MOLLUSKS IN CALIFORNIA

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Land managers increasingly need information on combining conservation measures for well-studied species with a broader mandate for protection of many poorly-known taxa. California's forests hold two *Martes* subspecies, the Pacific fisher (*Martes pennanti pacifica*) and the Humboldt marten (*Martes americana humboldtensis*) that may be listed as threatened, and the threatened northern spotted owl (*Strix occidentalis caurina*). In 1993, a plan to protect the owl also mandated surveys of several hundred poorly-known forest species. We used the resulting data to build regional-scale habitat models for 15 mollusk and 2 salamander species, and developed similar models from owl and fisher survey data. We combined the single-species models within a site-selection algorithm to assess the degree of overlap between conservation needs for taxa that show a range of association with older forest. The contrasts between the species in the scale of source-sink dynamics and consequent needs for connectivity illustrate the relevance of metapopulation concepts even for species such as the fisher that are not obligate older forest associates. Although the 1993 plan incorporated forest reserves of a size thought to permit persistence of a viable metapopulation of owls, these may need to be augmented to protect less-vagile populations of fisher and endemic species. However, because the biogeographic factors driving the historic diversification of endemic mollusk and herptiles have also resulted in diverse vegetative communities containing species which provide abundant cavities and mast, and hence high habitat value for fisher and owls, there is a large overlap between priority areas for the taxa considered.



JULY 22ND 2004

THE PINE MARTEN *MARTES MARTES* IN VERTEBRATE COMMUNITY OF THE TRANSITIONAL MIXED FOREST ECOSYSTEMS OF BELARUS: REVIEW OF RESULTS

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To reveal consistent patterns of a functional role of the pine marten and the species positioning in the structure of vertebrate community in the transitional coniferous –small-leaved deciduous woodland, a long-term studies were conducted in northern Belarus mainly in the Gorodok, Polotsk, and Rossony districts, the Vitebsk region. Additionally, we investigated the pine marten population dwelling in the same forest type in the Smolevichi and Minsk districts, Minsk region in the central Belarus. The studies were landscape-related due to we investigated the pine marten populations in the ecologically rich woodland located on the surface ground deposits with much of clay fraction, and in the woodland characterised by poor quality habitats situated on the surface ground deposits consisting of sand only. The studies were mainly done in 1995-2003, and some of the important data were obtained since 1985. An essential part of the study was accomplished by my assistants and students from the Vertebrate Predation Research Group, namely Dmitry Krasko, Alexey Polozov, Irina Solovej, Larisa Tihomirova, Alexej Dyman, Anja Mezina, Dmitry Shamovich, Irina Shamovich, and Victor Natycanets, and despite of many helpers involved in the study just the main work on pine martens was done by the author. The collected data on pine martens include 10 radiotracked individuals, 389 carcasses investigated, 1703 scats analysed as well as a lot of snowtracking was fulfilled, track trail registration were conducted each year by early and late winter, food supply and woodland structure were investigated etc. As to prey stock, first of all, small rodent population were monitored during the study on landscape-related and seasonal basis. Also, abundance of small perching birds, hares and wild ungulates supplying pine martens with the carrion was estimated. Simultaneously, we obtained similar detailed data on predatory species which are ecologically closely related to the pine marten. Those are the red fox *Vulpes vulpes*, the weasel *Mustela nivalis*, polecat *Mustela putorius*, the Ural owl *Strix uralensis*, the tawny owl *Strix aluco*, the Tengmalm's owl *Aegolius fureneus*, the pygmy owl *Glaucidium passerinum*, and the common buzzard *Buteo buteo*. Basing on the whole data obtained, the structural and functional roles of the pine marten in vertebrate community of the transitional coniferous – small-leaved deciduous woodland were investigated.

DIET COMPOSITION AND HABITAT USE OF SYMPATRIC RED FOX AND PINE MARTEN IN OJCOW NATIONAL PARK, SOUTHERN POLAND

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Food habits of red fox (*Vulpes vulpes*) and pine marten (*Martes martes*) are compared by faecal analysis. Scats have been collected during over a year period, beginning from November 2002. Both frequency of occurrence and volume of the different foods were quantified. In 306 analysed scats, 151 of martens and 155 of red foxes, rodents were an important prey for both species. Red foxes mainly fed upon hare (*Lepus europaeus*) and common vole (*Microtus arvalis*) constituted 36% and 12% respectively of consumed biomass, whereas martens consumed mainly bank vole (*Clethrionomys glareolus*) comprising 17% of consumed biomass. Fruits and insects were seasonally taken by both predators. Birds were mainly captured by martens. In 6 scats of red foxes we have found remains of domestic cat. This fact is not surprising as there is a numerous population of cats the Park, and most of them are free-ranging giving a possibility of being additional prey of red foxes.

STONE MARTEN'S URBAN HABITAT: DO RED FOX ACTIVITIES EXPLAIN THEIR DISTRIBUTION?

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Stone marten (*Martes foina*) is often presented as an opportunistic mammal, rather undisturbed by human activities. Although it is sometimes preyed upon by the Red fox (*Vulpes vulpes*), diet studies have shown that the trophic niches of these two species can sometimes largely overlap, if considering groups of resources (e.g. birds, small mammals, etc), and especially under some constraining conditions (e.g. season, resources distribution, habitat structure, etc.). However, the spatial consequences of these overlaps and the two species interactions have not been much documented. We address here this question through the study of the driving factors determining the Stone marten's habitat in urban areas. We modeled its potential habitat on the base of radio-tracking data collected in Nantes, a 200 000-inhabitants town of western France (220 points, obtained from 1993 to 1994). The model, based on the "Ecological Niche Factor Analysis" (ENFA), reveals that the most suitable areas for the Stone marten are mainly distributed in the town centre, i.e. the more constructed areas. These results are in contradiction with previous studies, which showed that Stone marten's home range generally includes vegetation. In addition, the strong restriction of this habitat to town centre contrasts with the known adaptability of these animals. By modeling the potential habitat of the Red fox in Nantes, with the same methods, we find that the prey-predator relationships may partly explain the spatial distribution of the two species. We then discuss the possible reasons of the observed strong spatial-segregation of the two species habitats.

ECOLOGICAL NICHE OVERLAP OF SYMPATRIC STONE MARTENS AND PINE MARTENS

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Pine martens (*Martes martes*) and Stone martens (*Martes foina*) are the European predators with the most similar characteristics. They have a great resemblance in morphology, their trophic niche is greatly overlapping and they are sympatric in central and southern Europe. Therefore, some authors have hypothesised a competition between the two species.

Two factors were considered to limit this competition and explain their coexistence: habitat segregation and spatial dominance of the pine marten. Aim of our study, conducted in Italy between 1991 and 1995, was to assess the ecological niche overlap in sympatric populations of the two martens and to discuss some key parameters, other than their diet, that limit the competition. We assessed differences in activity budget, habitat use, spacing patterns and resting site use. Particularly, we tested the hypotheses of habitat segregation and spatial dominance of pine martens. Sixteen stone martens (11 males and 5 females) and 3 pine martens (males) were trapped and intensively radio-tracked. The activity rhythms in the 24 hours period were analysed with circular statistics. Niche breadth and overlap were estimated by Levins standardized measure and Morisita's original measure respectively. Habitat use overlapped largely (0.89) and was almost identical in woodland (0.988). Even when home ranges overlapped, the two species did not show spatial segregation. The parameter with the minimum recorded overlap was resting site use (0.0135). We failed to detect habitat segregation and spatial dominance. However, our analysis suggests that differences in activity patterns and resting site use could account for their coexistence.

SPACE USE AND FORAGING STRATEGY OF PINE AND STONE MARTENS IN POLAND

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We examined the diet of two sympatric species pine and stone marten, by analysis of their faeces. To distinguish the scats we applied the method of microsatellite analysis, using DNA extracted from faeces. For species identification we used two microsatellite markers: *Mel 10* and *Ma 18*. On the basis of 27 tissue samples: 12 of pine martens and 15 of stone martens we showed that the marker *Ma 18* also allows to differentiate the two European species of martens. For the identification of individuals of both species, we analysed 8 microsatellite markers, which had previously been used in the study of genetic structure of European pine martens. We found that these markers were polymorphic in both European species of martens. Therefore, this approach enabled to recognize both the species and individuals. The possibility of assigning the faeces to particular individuals let us to determine the home ranges and to estimate the density of both marten species in different environment variants. We found that rodents are the main component of both species' diet. Other important components are fruits and birds. Shrews and insects constitute the complimentary food. We found statistically significant differences in food composition of two species. Fruits are more important component of stone marten's diet, while birds are more important for pine marten. We found that both species of martens can exploit the interiors and the edges of forests and it is impossible to infer on the marten species only from the place where the faeces were found.

PATTERNS OF RESTING SITES USE BY STONE MARTENS AND GENETS INHABITING A CORK OAK WOODLAND

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The stone marten (*Martes foina*) and common genet (*Genetta genetta*) are nocturnal species that stay inactive during the entire diurnal period. Therefore, selection of protective daytime resting sites assumes a vital importance in their survival, because during this time individuals are particularly vulnerable to attacks from other predators, to anthropogenic action, and to thermal stress.

We wanted to assess how these two sympatric species use, share, and/or compete for rest-sites. We analyzed characteristics of resting sites, factors conditioning its selection, and the distribution pattern of these sites within individual home ranges. We radio-tracked three genets and three stone martens in a cork oak woodland area of SW Portugal, collecting a total of 417 daytime locations, from which we identified 148 different rest-sites. The most used structures were trees (mainly cork trees) and shrubs located along riparian corridors.

Our results suggest low or non-existent intra- or interspecific competition for resting places, which seems to be a direct consequence of the high availability of these structures within the study area. The low re-use rates of resting sites corroborate these findings. From the analysis of potential factors affecting selection of sites, we confirmed that genets and stone martens did not preferentially select any specific site and evidenced that suitable resting sites were homogeneously distributed within the area. Martens and genets showed individual differences in their use of resting sites, and a higher interspecific tolerance, mainly intrasexual. The importance of reproductive strategy in the use of rest-sites was also evidenced in this work.

SHOULD WE LOOK FOR SEXUALLY SELECTED INFANTICIDE IN MARTENS?

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Sexually selected infanticide (SSI) is an adaptive behaviour linked to competition among males over fertile females. The most widely known examples are in lions, domestic cats and primate species, but this behaviour has been recorded in over 100 species of different *taxa*, including (amongst mammals) rodents, Perissodactyla, and several carnivores (hyena, lynx, clouded leopard, leopard, tiger, bears). Some evidence from stone martens in Italy (1) frequent association of adult males and adult females in the den; 2) association of adult male parent with cubs; 3) incursion of a non-parent adult male into the den of a neighbouring pair with cubs) may be explained with SSI. I discuss a hypothesis of SSI in stone martens on the basis of eco-ethological data on the species. Furthermore, I try to identify the main biological and ethological data we should look at for testing this hypothesis.

COMPARATIVE HABITAT USE OF SYMPATRIC *MARTES* POPULATIONS FROM TWO REGIONS IN CALIFORNIA

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The local distributions of martens and fishers have been described as an interaction between competition and adaptation to different physical environments, especially in regard to snow depth. We investigated the local distribution of the American marten and fisher in two regions of California where they are generally sympatric. The Sierra Nevada has high annual snowfall while the Coast Range is largely snow-free. We used 5 and 10-km systematic grids with an array of 6-station track plate stations located at each grid-point to determine coarse-scale distribution of both *Martes* species. Two-km systematic grids with single or paired track plate stations were used to describe fine scale distributions. We compared habitat and topographic variables measured at stations and those available in GIS. In the Sierra, the species are segregated by elevation, with martens occurring above fishers. In the Coast, however, martens and fishers share the same elevational range but appear to be spatially segregated, perhaps based on the constraints of the physical structure of habitat. Martens in the Coast are highly selective for conifer-dominated stands of old-growth forest with dense, spatially-extensive and impenetrable shrub cover. Fishers used stands in most seral stages and cover types, but which are distinguished by sparse or moderate shrub cover. In the Coastal forests, thick shrub cover may discourage the larger-bodied fisher, much like the hypothesized role of deep snow. If true, this may help explain why fishers occurred more commonly in landscapes that have been converted from late-seral forest to young conifer stands with lower shrub densities.

PLENARY SESSION

MARTES ISSUES IN THE 21ST CENTURY: LESSONS TO LEARN FROM ASIA

SAEKI, MIDORI



Five *Martes* species occur in Asia; Japanese marten (*M. melampus*), yellow-throated marten (*M. flavigula*), and Nilgiri marten (*M. gwatkinsi*) only inhabit Asian countries. Ecological information on those species is very limited, and it is also true for other two species, beech marten (*M. foina*) and sable (*M. zibellina*) in their Asian range. Most Asian countries are developing countries, and the populations doubled since 1960s. Forest depletion has been taken place throughout Asia, especially in natural forests. For example, approximately 10% of natural forests disappeared in 20 South, East and Southeast Asian countries in 1980s. Addition to the habitat loss, a lack of ecological studies and conservation plans is a key problem; there are specific aspects in Asia accounting to the problem. Attitudes towards nature and wildlife are different from those in western countries, where natural sciences originated and prospered. Language is another problem, limiting accumulation and circulation of findings into the international communities. I will introduce ecological studies on the Japanese marten, including habitat selection and landscape management. Habitat consideration for martens has been seldom an issue for both ecological studies and conservation perspectives in Japan. This is a pilot study on habitat and landscape ecology of the martens. Species diversity of small-to-medium-sized carnivores is relatively rich in Asia, and many of them are threatened. In addition to the habitat ecology, species interactions among native and introduced carnivores need to be clarified.



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MARTES SP. DISTRIBUTION IN A SYMPATHRY AREA USING DNA ANALYSES OF SCATS

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In the province of Alava (Basque Country, North of Spain) they live several species of mustelids, among them, two European species of the genus *Martes*, the pine marten (*Martes martes*) and the stone marten (*Martes foina*). The first one of them is catalogued like "Rare" in the Catalogue of "Especies Amenazadas de la Flora y Fauna, Silvestre y Marina del País Vasco" (Decree 167/1996 and Order of July 8, 1997). The knowledge and studies realized on this first species in the Basque Country are slightly exhaustive, and very little it is known on its real distribution, since in many zones it lives in coexistence with the stone marten and turns out very difficult to differentiate morphologically the tracks and excrements of both species. Until nowadays, all the distribution information is based on hasty individuals and diverse appointments, many of them of few reliability. To be able to advance in the knowledge of the distribution of both species, we have initiated a study of identification of the pine marten and the stone marten from excrements gathered in the field, by means of PCR-RFLP's technology applied on a portion of the control zone of the mitochondrial DNA. The samples have been gathered in routes stipulated inside the squared patterns 10 x 10 UTM of the province of Alava. This analysis identifies correctly the species to which the sample of excrement belongs. Thanks to these results, there is known the real distribution of both species, being able to analyze correctly several aspects till now unknown like, the seasonal feeding, the existing interaction between both in the sympatry zones and the use of the habitat of each one of them for a better management of the natural research.

USING SNOW-TRACKING DATA TO INVESTIGATE CARNIVORE HABITAT-USE AND BEHAVIOUR

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In the past, biologists have examined animal tracks in the snow as a means of studying food habits and movements. With the advent of more advanced technology, some scientists replaced snow-tracking with sophisticated techniques such as radio-telemetry to study animal movements and habitat use. Others declined using snow-tracking methods, because of their concerns regarding non-independence of tracks (e.g., tracks of a single animal may be recorded more than once within a stand or transect) and potential problems with spatial autocorrelation in the data. In the midst of the technological and statistical debate, there is a lack of consideration of the unbiased aspect of tracking data (e.g., animal movements are not influenced by baiting), their accuracy (e.g., snow tracks correspond to accurate locations, without error polygons), and their biological significance (e.g., tracks may be directly associated with particular microhabitat types). Snow-tracking may provide researchers with unique insight into the ecology of carnivores, and yield behavioural and habitat information that may be unavailable or only inferred using the more technologically advanced techniques. Here we give examples of such insights, and provide suggestions on avoiding some analytical pitfalls associated with tracking data.

A QUALITY-SCORING SYSTEM FOR USING SIGHTINGS DATA TO ASSESS PINE MARTEN DISTRIBUTION

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Populations of the pine marten in England and Wales are sparse and difficult to detect by standard methods. Occasional sightings reported by people offer an opportunity to gather useful quantities of data. However, such data must be treated cautiously because reports cannot usually be verified conclusively. In response to a targeted publicity exercise 525 reported marten sightings were received between 1996 and 2003. Their distribution was highly clustered in the known pine marten range determined by an earlier, independent data set. Even allowing for the distribution of publicity for the survey (which was also concentrated in the known range) and spatial autocorrelations, the intrinsic clustering and the association with known distribution were both very highly significant ($p < 0.001$). All reports were assessed through interviews based on a structured questionnaire designed to record details of the sighting, including contextual elements such as duration and distance between animal and observer; subsequently a quality score was assigned subjectively. During analysis, an objective score was also applied to each record. This was calculated using a genetic algorithm based on the individual quantitative elements of the interview. All records were then categorised by their score and each category compared individually with known pine marten distribution. For both subjective and objective scores there was a significant improvement in association between the sightings records and known marten distribution for the higher scoring records. These results strongly support the use of questionnaires for assessing distribution of sparsely occurring mammals, especially if the questionnaires are scored for quality.

AN INTERACTIVE WEBSITE FOR ARCHIVING AND EVALUATING RESULTS FROM REGIONAL CARNIVORE SURVEYS

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During the past 10 years, state and federal resource management agencies in the northwestern United States have conducted standardized surveys to detect the presence of fishers (*Martes pennanti*) and American martens (*M. americana*) using techniques that produce verifiable evidence of their presence (remote cameras and track-plate boxes). Sampling protocols were designed to provide reasonable assurance that if a species is present, it will be detected and, conversely, that if a species is not detected, it is not present. By establishing standard protocols, resulting surveys provide information on the distribution of fishers and martens that can be combined and compared across administrative boundaries, and that is far more reliable and useful to conservation than the compilation of opportunistic and anecdotal observations. However, data on survey efforts and results have not been compiled into a centralized regional database. Thus, not only are survey data unavailable for general use, it is also likely that these extremely valuable data will eventually be forgotten, misplaced, or discarded. To meet this need, we developed an Internet website that consists of a permanent data repository and an interactive mapping application. Data on standardized surveys can be displayed at any spatial scale, the contents of the database queried, new survey data input, and both text and graphical reports produced. We believe this tool has applications in many regions of the world where opportunities exist for biologists and managers to apply standardized survey and/or occurrence data to the conservation of forest carnivores.

**MARTES VARIABILITY, DISTRIBUTION AND STATUS****P.01. PHENOGEOGRAPHIC PICTURE OF SABLE INTRASPECIFIC VARIABILITY IN RUSSIA (COLORATION, SKULL MORPHOLOGY)**

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Geographic variation in 18 measurements of adults ($n = 4859$ including 2604 males); one nonmetric trait (totally 5453 skulls including 2874 males) and fur coloration ($n = 1,102,774$ pelts) have been assessed for 43 samples of sable *Martes zibellina* from Siberia and Far East. Morphological features of autochthonous and allochthonous populations have been studied by methods of craniometry, phenetics, phenogeography and multivariate statistics. In the eastern part of a specific range the translocations have exerted little influence on subsequent intraspecific reformations and in the western part these have resulted in formation of some unique and mediate forms of sables between the founders and autochthons. The allochthonous forms of sables, as a rule, the small dimensions, darker fur and larger expression of the phenetic features have appeared in new populations in relation to indigenous. In these cases appearance of new forms of animals and sometimes even subspecies rank is possible.

P.02. THE PINE MARTEN IN NORTHWESTERN PORTUGAL: ECOLOGICAL CONSTRAINTS AND POTENTIAL AREAS OF OCCURRENCE

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The Pine Marten is one of the less known carnivores in the Iberian peninsula. Although records are scarce and mostly ancient, apparently there are isolated populations in the mountain areas of North and Central Portugal. Within the last 15 years, six confirmed records were collected (direct observation of pelts or dead specimens), and 20 other probable records (indirect evidences obtained through inquiries) from several decades of 20th century, mostly (80%) from Peneda-Gerês National Park (PGNP) or nearby areas. In order to understand the distribution of the species, and to determine potential areas of occurrence in this area, an "Overlap Analysis" was performed at 1x1km square grid, using 14 biophysical variables. The species presence is related with intermediate altitudes (400-1000m), high precipitation levels (1800-3000mm/year), high cover of oak forests (>75%), and absence of agricultural fields and pine, eucalyptus and Cork-oak forest. The potential area of occurrence is fragmented and totals about 10% (200km²) of study area. A wider continuous potential area was identified in the mountains of Amarela and Gerês. Current data on territorial behaviour, population density and dispersal of the Iberian Pine martens supports a metapopulation structure with a total population size of less than 80 individuals. In all potential areas of occurrence, the habitat loss/disturbance during the last decades (fires, road construction, tourist activities), suggests a decrease in habitat quality. Other potential areas of occurrence in northern Portugal and north-western Spain are reproductively isolated, suggesting ecological and biogeographical constraints, which might compromise the long-term survival of these marginal populations.

P.03. RECORDS OF PINE MARTEN *MARTES MARTES* IN THE ARAGONIAN PREPYRENEES, SPAIN

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Pine marten has only been recorded in the axial area of the chain in Aragon. In 2003 we found evidence of the presence of pine marten in two isolated Prepyrenean mountain areas, which represent the Southern-most distribution of the species known in the central part of the Pyrenees. A total of 8 records were 3 from Guara Range (1 of historic presence and 2 from reliable enquiries) and 5 from San Juan de la Peña Massif (3 reliable enquiries and 2 individuals from a scientific collection).

The habitat where the species has been found is widespread throughout the Prepyrenees. Further research is needed to assess its conservation status, distribution and level of isolation.

MARTES RESEARCH TECHNIQUES

P.04. ASSESSING A RE-ESTABLISHED POPULATION OF PINE MARTEN (*MARTES MARTES*) IN KNP, IRELAND.

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The last national survey of pine marten (*Martes martes*) in Ireland suggested this species to be absent from areas where once present. Survey results prompted National Parks and Wildlife Service to re-establish one population: Killarney National Park (KNP). In the early 1990's several problem animals were translocated from Co. Clare to KNP to prevent their persecution and to boost/re-establish the population. We report on the findings of an initial multi-evidence approach for assessing their current status. We surveyed 13 transects (2-10km long) in a variety of woodland habitats (yew, oak-holly, mixed and disused commercial forests). Transects were visited three times in six months for one or more of the following treatments: scat survey (all), hair-trapping (1-4, 6, 8-10) and live trapping (1-8). Of the thirteen transects surveyed all but one (transect 2) showed signs of marten activity. 277 scats and 101 hair samples were collected. Eleven pine martens, 6 females and 5 males, were trapped and handled (ear puncture, ID chip fitted, hair sample, weighed and measured) without sedation. The initial survey has highlighted that while hair-traps maybe an effective alternative to scat surveying, particularly in areas of woodland without established paths and/or walls, their success rate can be low (5-27%). The study also shows that pine marten are now widely distributed throughout the park. Further investigation of this population using molecular techniques on scat, hair and ear tissue samples is currently underway and aims to provide a fuller picture of the distribution and structure of the KNP pine marten population.



P.05. MORPHOLOGICAL AND RFLP MARKERS FOR DISTINGUISH ITALIAN PINE AND BEECH MARTEN SPECIES

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The distribution and status of pine marten (*Martes martes*) and beech marten (*Martes foina*) in Italy are very different: pine marten has a patchy, fragmented eco-geographical distribution, limited to a narrow ecological niche; beech marten is spread with continuity in a wide range of natural, semi-natural and urban habitats. Therefore, we assume a greater ecological vulnerability of the former. Conservation programmes are needed to preserve pine marten and to cull beech marten in Italy.

For these purposes we performed genetic and morphological methods to distinguish pine and beech marten. Forty-four individuals from the entire Italian peninsula were analysed. The taxonomic attribution was performed according to several morphological and metrical characters, such as the coat-colour and markings pattern, and the *baculum* length.

In addition an RFLP analysis was carried out on *Cytb* gene using muscles, hair and faeces as mtDNA sources. Template was cut through both *AluI* and *HaeIII* restriction enzymes that generated two diagnostic fragments in beech marten, but not in pine marten.

Coat-pattern analysis assigned 20 individuals to pine and 24 to beech marten; *baculum* analysis and genetic data confirmed entirely the former, but only 22 of the latter. Therefore two specimens defined as “beech martens” according to the coat-pattern analysis, resulted to be “pine martens”. These results allowed to define the coat-pattern as a partial diagnostic character and the *baculum* length as a reliable analysis, but applicable only on adult dead males.

P.06. IDENTIFYING INDIVIDUAL FISHERS FROM TRACK PLATE FOOTPRINTS

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The patterns present on the foot-pads of fishers (*Martes pennanti*) are often visible in track plate footprints and constitute a potential new resource for identifying individuals. Prints of a fisher's metacarpal pad are typically made up of rows of dots, corresponding to the morphological structures of the pad. We explored the possibility of using the relative position of these dots to identify individuals. We first constructed a probabilistic model of uniqueness by quantifying the variation in spacing between 1400 pairs of dots measured in prints of 14 different fisher feet. These data suggest that the probability of encountering a similar pattern of x dots in the print of a different foot by chance alone is less than 0.35^{x-1} . Next, we measured 24 pairs of dots occurring in multiple prints of the same foot (using 7-10 examples of each footprint) and found relatively little variation (typical $\sigma = 0.02$ mm). Combined, these two results suggest that the dot patterns in fisher track plate footprints are both unique to the individual and consistent between multiple printings of the same individual. We applied this technique to 62 fisher detections collected on track plates from 10 trails in the Adirondack region of New York State, USA, with 85% of fisher detections resulting in at least one footprint that was of suitable quality to allow comparison with other high quality prints. Only 2 trails produced a clear indication of visits by multiple individuals. This technique shows promise in reducing the cost of fisher population surveys.





P.07. PINE MARTEN'S DIET AND HABITAT USE IN SANDY AND CLAY PLAINS, LITHUANIA

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The seasonal diet and winter habitat use of pine marten (*Martes martes*) were studied in two predominated types of landscape in Lithuania – in sandy plains and clay plains. The feeding habits of pine marten carry seasonal character (amount of biomass consumed of most food items differed significantly in both study localities). All year round, rodents were the main food item in both study sites, comprising no less than 1/3 of biomass consumed. Importance of other food items depended both on season and study site. In summer, plants, birds, and insects were frequently consumed in sandy plains, whereas, in clay plains, only plants were of significant importance. In autumn, plants and carcasses were consumed in large quantities in both study sites. In winter, carcasses and birds made important food items. In spring, consumption of birds increased; also amphibians were important in sandy plains, and reptiles – in clay plains. In all seasons food niche was broader in sandy plains.

In sandy plains, pine marten is significantly more frequent in coniferous stands; it is, however, rarely met in meadows and in arable land. In forest habitats, pine marten was rarely found in pine stands, whereas in spruce stands or mixed coniferous stands they are more frequent. In clay plains, pine marten intensively uses mixed stands (especially spruce with hard-broad or soft-broad leaved stands). It also rarely uses meadows, arable lands and clear-cutting. In both study localities, pine marten is more frequent in premature–mature stands. Habitat niche was broader in clay plains.

P.08. PINE MARTEN (*MARTES MARTES*) FEEDING ECOLOGY IN CONTINENTAL AND INSULAR ENVIRONMENTS OF EUROPE

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Mammals represent the dominant food category of the pine marten diet on the mainland. The species should be expected to exhibit a different trophic spectrum on the islands where prey species diversity is low compared to the mainland. The aims of this study are: 1) to describe the diet of the pine marten on Elba island (Italy), 2) to compare its feeding ecology in continental and insular environments of Europe. We studied the diet through the analysis of 605 scats collected over 2 years. Rodents (wood mice, fat dormice and above all rats), were the dominant food category (Total Volume Vt 68.1%); fruits (Vt 16.8%), and insects (Vt 8.2%) formed the other primary food resources. Data on the diet of continental and insular populations of the pine marten were taken from literature. We selected 8 studies matching the following criteria: 1) diet was investigated by scat analysis; 2) the study reported year-round data; 3) sample size was > 100; 4) seasonal sample sizes were comparable; 4) food composition was assessed by volumetric methods. The principal component analysis generated two components (80.7% explained variance). The first component clearly showed a group formed by martens which feed mainly on mammals and birds and live both on the mainland and Elba Island and a group formed by Balearic martens which consume chiefly birds, fruits and invertebrates. The diet of the pine marten in insular conditions seems to change in relation to the animal and vegetal community of each island and then the geographic variation of the diet seems to be higher on the islands than on the continent.

P.09. HABITAT REQUIREMENTS BY EUROPEAN PINE MARTEN IN NORTHWEST SPAIN

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In Iberian Peninsula the biology and ecology of pine marten (*Martes martes* Linnaeus, 1758) are still largely unknown. The information about habitat selection in Spain is limited, with no specific studies on this aspect of their ecology. Nowadays, the studies on pine marten habitat selection are of vital importance to avoid the transformations of their habitat and to secure their long-term conservation. In this work the habitat requirements were studied in pine marten at Montes do Invernadeiro Natural Park (NW Spain). With this aim, transects of 200 m in each cell were surveyed on foot, searching for scats in the study area. Then, the abundance index was related with the habitat conditions registered in each one of the surveyed cells. The use of cells in the study area was compared with the proportion of the surveyed habitats. The results show that pine marten is not distributed evenly throughout the study area, and habitats are differentially selected. The proportion of deciduous forests and mature pine forests, the watercourses less than 100 m from the transects and the presence of rocky areas were all positively associated with the occurrence of martens. However, cells with low tree cover and those of high altitude were avoided. This study shows that in the study area pine marten preferentially selects forest. These results may to serve as a framework for future comparisons in more altered habitats and for the conservation and management of this species and their habitat in Iberian Peninsula.

P.10. SPATIAL BEHAVIOUR AND MATING SYSTEM IN SYNTOPIC BEECH MARTENS AND POLECATS

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In mammals without male parental care, such as in mustelids, male's reproductive success depend mainly on number of matings. Tactics adopted to maximize the matings affect differently range size: largest ranges are expected in the mating season when males roam to achieve multiple matings, and little range size variation during the year when males attempt to monopolize one or more females. To compare the spatial behaviour of males during the mating season in syntopic beech martens and polecats, monthly ranges of adult individuals were analysed. Data on 13 martens and 16 polecats were collected by radiotracking between 1996 and 1999 in a rural area of the Central Italy. Ranges were estimated by the 100% MCP for animals with ≥ 15 locations/month. Areas used by martens varied little from mating to non-mating season. Polecats showed larger ranges in the mating season than in the non-mating season: females' range size doubled and males were able to use ranges up to 25 times larger. In martens, size of range of males didn't differ in each season from that would be expected based on the relationships between body mass and range size in carnivores. On the contrary, range increment in polecat males appeared not to be explained only by energetic requirements. Dynamics of range size suggest a 'female defense polygyny' in martens and a promiscuous mating system with roaming males in polecats. Also travelled distances and patterns of range overlap supported differences in the reproductive tactics adopted by males of the two species.



MARTES CONSERVATION AND MANAGEMENT



P.11. A NATAL DEN BOX FOR PINE MARTENS

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Pine martens in Britain are probably constrained by the scarcity of woodland tree cavities suitable as natal dens. Such cavities are rare because active harvesting and establishment of commercial plantations has produced woodlands dominated by young trees with low deadwood volumes. Cavity availability is higher elsewhere in the species' range due to the presence of the black woodpecker *Dryocopus martius* that excavates nesting chambers commonly used as natal dens by pine martens. This bird is absent and other woodpeckers are scarce or absent in the main areas of pine marten distribution in Britain. Artificial den boxes provide one mechanism for improving habitat quality for pine martens in the short term. We produced a wooden den box designed to meet the particular needs of breeding female martens. Because of the energetic constraints facing breeding female martens the design incorporates measures to minimise heat loss through convection and conduction. 20 boxes were field-tested in commercial woodland in Scotland where pine martens were present; a further 10 were tested on pine martens held in captivity. Patterns of use suggest that the widespread provision of such boxes in commercial woodland may be an important conservation tool for pine martens in the absence of natural tree cavities.

P.12. THE ECOLOGY AND GENETICS OF THE PINE MARTEN AND OTHER IRISH MUSTELIDS

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The pine marten is the only member of the *Martes* genus present in Ireland. Other members of the family Mustelidae in Ireland are the Badger, Otter, American Mink and Irish Stoat. The pine marten is considered rare in Ireland. Marten numbers have dwindled due to hunting for fur or sport, loss of habitat and poisoning by strychnine. In the 19th century they were classified as vermin and hunted on large estates with organised game shooting. Due to direct observation of pine marten being difficult, its presence is usually determined by the presence of its scat. Recent work has shown that these may be confused with other small carnivores. The aim of this study is to develop ecological and genetic techniques that reliably determine the presence of the marten. The first ecological technique employed is the scat survey, this involves walking a transect collecting suspected marten scats. The second is hair trapping; this involves using traps that pluck hair from the animal while not detaining it. These techniques give ecological data that is used to determine marten presence, habitat use, and diet.

Ecological samples are species typed using the mitochondrial D-loop sequence and sexed by amplification of genes on the sex chromosomes. This data can then be compared to other populations around the country and the rest of Europe. To help conserve this native species it is important that large organisations and government bodies have reliable data on marten presence and habitat use to devise and implement an effective management programme.



P.13. PINE MARTEN CONSERVATION IN AN INTENSIVELY USED BOREAL FOREST IN CANADA: THE CASE OF MONTMORENCY RESEARCH FOREST

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Since Pine marten (*Martes americana*) is often associated with unfragmented forests, the question of its conservation in intensively used forests is an issue in the development of sustainable management strategies for the southern section of Canada's boreal forest. This question has been studied in Montmorency Forest, Laval University's 66 km² research forest, which is part of the coniferous balsam fir (*Abies balsamea*) ecological domain. It is located 70 km north of Quebec City (Canada), a town with a population of more than 650,000. This territory has been managed, during the past 40 years, for multiple uses that include summer and winter recreation as well as wood production. However, there is no trapping. Forest harvesting is done by dispersed patch cutting (1 to 30 ha) conducted in a way to maintain a forest mosaic composed of 1/3 mature stands, 1/3 young stands and 1/3 regenerating stands by 10 km² landscape units. Consequently, it has an extensive permanent road system with a density of 1.5 km /km². Study and monitoring of marten has been conducted by different winter tracking methods. Results indicate that marten has been maintained in all 5 landscape units. More than 75% of tracks have been found in mature and young stands (>7m tall). Regenerating stands have been used proportionally to their availability, marten activity in these stands being related with the hunting of snowshoe hare. Recently harvested stands (< 5 years) are clearly avoided. Winter recreational activities do not seem to negatively affect marten in the conditions of Montmorency Forest. Skiing trails did not influence marten track location while higher densities of tracks were found near cottages.

P.14. COMPARISON OF FEEDING BEHAVIOUR BETWEEN STONE MARTEN AND COMMON GENET: LIVING IN COEXISTENCE.














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The stone marten is a solitary mustelid that is found widely throughout the Palaearctic zone. It weighs on average between 1.2 and 1.5 kilos. Although it is associated with areas with minimal vegetation, it is classified as generalist in these areas and even adapts to environments with human presence. The genet is a viverrine introduced into Europe from Africa where it originates. It has colonised Mediterranean areas in South-west Europe, but is restricted by low temperatures from central Europe and higher altitudes. Like the stone marten, its social behaviour is solitary, with the males occupying exclusive territories. Its average weight is a bit higher (1.8 kg). As with the stone marten, the male is bigger than the female. These two species really are very similar, which makes them likely to compete with each other, although we find them in the same environments in the sympatric area where they both live, mainly Mediterranean forest eco-systems. However, the presence of two species with so many similarities should end in the disappearance of one of them, as they require the same resources. Food is one of the resources limiting the populations of these species. To examine this competition, the diet of the two species under similar conditions in their sympatric area was analysed. The findings were based on 14 published papers on stone martens and one on genets, which identified 12,305 and 8,861 prey, respectively. To calculate usual diet behaviour, the proportion of prey in each group, the proportion of biomass in each group, the mean size of the prey and the mean diversity of the prey were calculated.

It was concluded from the results that, despite the apparently similar diets of the two species, there are subtle differences that allow two such similar species to coexist in their Mediterranean habitats. The genet behaves like a genuine carnivore, whereas the stone marten has adapted to a fruit diet with the addition of animal prey to make up for biomass deficiencies.







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