



## **Large-scale animal ecology and management: Integrating large GPS-telemetry datasets across multiple animal populations**

### **Outline of the Workshop**

**16.00 - F. Cagnacci: Movement ecology across space and time:  
insights from studies at a species' distribution range scale**

**16.20 - M. Hebblewhite: Messages from large-scale ungulate  
studies in North-America**

**16.40 – Open contributions & Discussion:**

**What perspectives?**

**What challenges?**

**What questions?**

**17.20 – Wrap-up & summary page**

# Movement ecology across space and time: insights from studies at a species' distribution range scale

F. Cagnacci, Fondazione Edmund Mach, Italy

on behalf of

the EURODEER collaborative project- [www.eurodeer.org](http://www.eurodeer.org)



*A story of friendship, loyalty...*



*...re(in)novation....*



*...and of a journey across space, and time*





# *I: The friendship-* **the European roe deer group** *Since 1991*

## **Science first!**

10 European roe deer group meetings

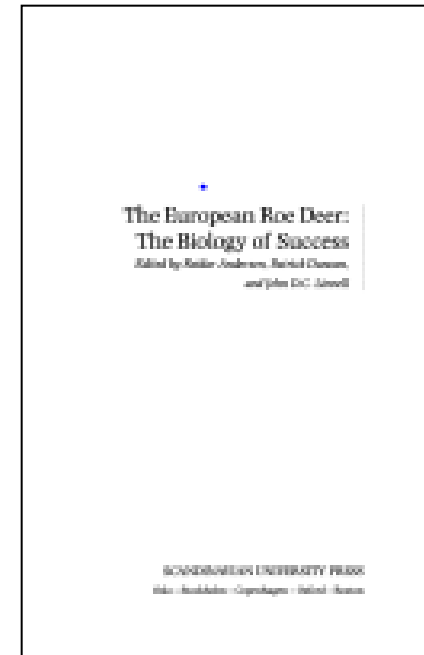
5 EURODEER meetings

1 book

> 30 collaboration papers

EURODEER paper series

Data sharing



## II: The loyalty- the European roe deer

Capreolus capreolus (Euro x)

maps.iucnredlist.org/map.html?id=42395

THE IUCN RED LIST OF THREATENED SPECIES

Scientific or Common name > GO

HOME SPECIES RANGE OBSERVATION PROTECTED AREAS

CHANGE BASEMAP

Europe

Atlantic Ocean

rica

LC > NT VU EN CR EW EX

LEAST CONCERN

Extant (resident)

Extinct

BROWSE IMAGES

ARKive (21 found)

IUCN (International Union for Conservation of Nature) 2008. Capreolus capreolus. In: IUCN 2013. IUCN Red List of Threatened Species. Version 2013.1

POWERED BY esri

IUCN SSC Species Survival Commission

Terms of Use Disclaimer f Like 0 t Tweet 0 f t DONATE NOW

01:42 20/08/2013

- High ecological plasticity
- Wide distribution under different environmental and climatic





### *III: The innovation-* **Movement ecology: the new era**

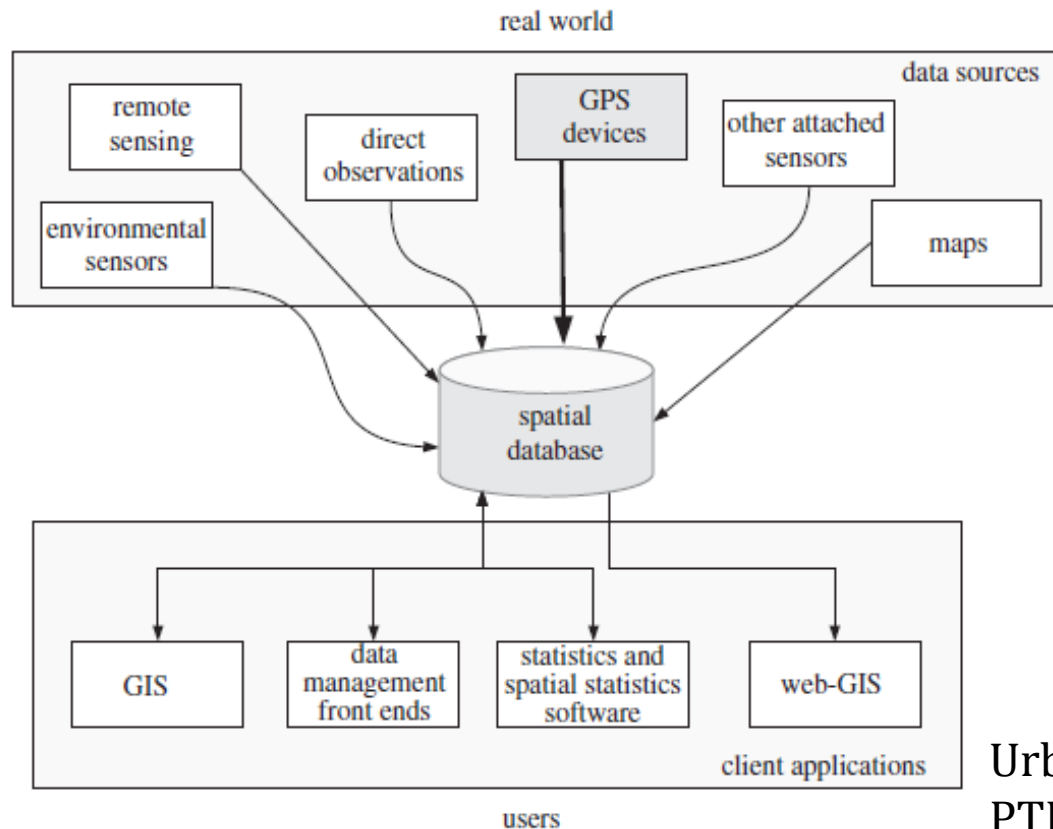


*IV: The journey-* **GPS telemetry x Remote sensing =  
robust/high-frequency spatio-temporal series**



Cagnacci et al. 2010, PTRSB  
Hebblewhite & Haydon 2010, PTRSB

# New tools for new data

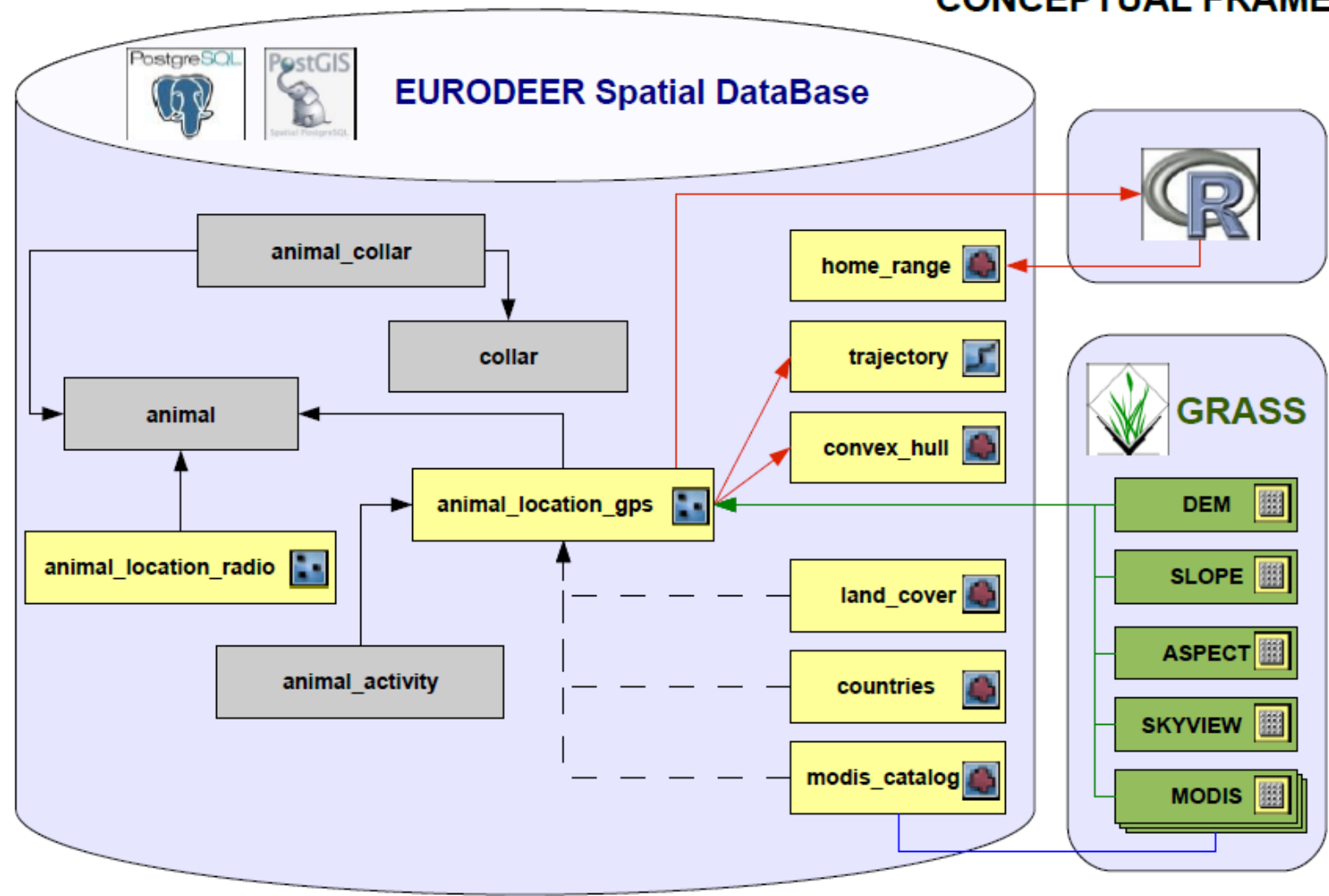


Urbano et al. 2010  
PTRSB

Characteristics	Requirements
Complex data structure – multiple data types	Data integrity, persistence & consistency, spatial data
Complex data retrieval	Data accessibility
Multiple analyses	Replicability
Multiple users	Differentiated access policy

# EURODEER information system & platform

EU.RO.DEER Information System:  
CONCEPTUAL FRAME



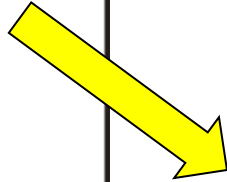
# EURODEER information system & platform

## EURODEER members

[Enter EURODEER database](#)

[Enter EURODEER group mailing list](#)

[Enter EURODEER group private pages and docs](#)



The screenshot shows the phpPgAdmin interface for a PostgreSQL 9.1.4 server. The left sidebar displays a tree view of the server structure, including a 'Test' database and the 'eurodeer\_db' database with its 'Schemi' (schemas) listed: analysis, env\_data, env\_data\_ts, lu\_tables, main, main\_reddeer, public, temp, tools, ws\_boku, ws\_cefs, ws\_dream, ws\_fem, ws\_freiburg, ws\_isc, and ws\_oncfs\_tf. The main panel shows a table of databases with columns for Database, Proprietario, Codifica, Collation, and Character Type.

Database	Proprietario	Codifica	Collation	Character Type
<input type="checkbox"/> Test	postgres	UTF8	Italian_Italy.1252	Italian_Italy.1252
<input type="checkbox"/> eurodeer_db	postgres	UTF8	C	C
<input type="checkbox"/> gps_migration	postgres	UTF8	Italian_Italy.1252	Italian_Italy.1252
<input type="checkbox"/> gps_tracking_db	postgres	UTF8	C	C
<input type="checkbox"/> postgres	postgres	UTF8	Italian_Italy.1252	Italian_Italy.1252
<input type="checkbox"/> wa_phenology	postgres	UTF8	Italian_Italy.1252	Italian_Italy.1252

Below the table, there is a section for 'Azioni su righe multiple' (Actions on multiple rows) with a dropdown menu and an 'Esegui' (Execute) button. At the bottom, there is a 'Crea database' (Create database) link.

# Communication, Dissemination, Transparency

## EURODEER members

[Enter EURODEER database](#)

[Enter EURODEER group mailing list](#)

[Enter EURODEER group private pages and docs](#)

## EURODEER collaborative project



European roe deer is a very well studied species, because of its crucial role in European ecosystems and because it is a very good model species, both for ecological and evolutionary reasons. However, the time might have come for synthesising our knowledge into a wider and more complex picture, that would allow to clarify ecosystemic relationships (e.g., resource balance), reveal evolutionary patterns (e.g., animal performance), and underpin predictions on future scenarios (e.g., climate change effect). Recent technological advancement, such as GPS collars and activity sensors, allowed to obtain more data and of better quality. However, existing tools and procedures of analysis may under-exploit the potential of those data. Everybody agreed that a spatial database populated with data from different areas would strongly support the attempt to develop a complete picture of roe deer biology, within a ecological and evolutionary context. At the same time, it would offer the opportunity to join the data of different research groups into a well supported repository, with transparent accessibility.

These are the premises that brought us to develop the European ROe DEER Information System (EURODEER). It is an open project to support a collaborative process of data sharing to produce better science. It is based on a spatial database that store shared movement data on roe deer to investigate variation in roe deer behavioural ecology along environmental gradients or population responses to specific conditions, such as habitat changes, impact of human activities, different hunting regimes. EURODEER group is trying to fully explore the opportunities given by the new monitoring technologies for conservation and management at both local and global scale. The spatial database, built upon open source software (PostgreSQL + PostGIS) and hosted at Fondazione Edmund Mach, can be connected to a large set of client applications (GIS, web interfaces, statistics) to help storing, managing, accessing and analysing GPS data from several research groups throughout Europe.

### EURODEER web site

- Home**
- Activities
- Animal tracking and spatial DB
- Who we are
- Publications
- Dissemination and Conferences
- Calendar
- Sponsorship
- Software platform
- The open source option
- Data model
- Links
- Would you like to join?

### Database statistics

Total locations	>1,500,000
Animals	560
Study areas	24
Countries	9

### EURODEER members



## Eurodeer Group

### Home page

- Publications
- Papers
- Protocols
- Data
- Documents
- Terms of use
- Who is joining
- Contacts

EURODEER (European ROe DEER Information System) is an open, collaborative project based on a spatial database that stores shared movement data on roe deer to investigate variation in roe deer behavioural ecology along environmental gradients or population responses to specific conditions, such as habitat changes, impact of human activities, different hunting regimes. The spatial database, built upon open source software (PostgreSQL + PostGIS) and hosted at Edmund Mach Foundation, can be connected to a large set of client applications (GIS, web interfaces, statistics) to help storing, managing, accessing and analysing GPS data from several research groups throughout Europe.

EURODEER is currently sponsored by [Vectronic Aerospace GmbH](#). On top of support money for development and maintenance, Vectronic Aerospace applies 10% discount on roe deer collars to all Eurodeer members! Vectronic Aerospace has extended the sponsorship to 2013 and 2014!

A web site open to general public is also on line ([www.eurodeer.org](http://www.eurodeer.org)), to give visibility to the project, and a quick shortcut to these private pages, that can be entered only by EURODEER members logged in with their google account, and the database itself (<http://eurodeer.fmach.it/nhnnadmin/>). that can be logged in with the Password and ID provided by the EURODEER project coordinator.





The image shows a screenshot of a Facebook post from the 'EURODEER project public group on fb'. The post is in Italian and welcomes members to the public group. It includes a small version of the EURODEER logo and a link to the group's page. The post is dated 4 agosto 2012.

# ...but Science First! Working Groups & EURODEER paper series

- Signed terms of use by partners
- Topic list and working groups
- Pager for papers
- Periodical meetings

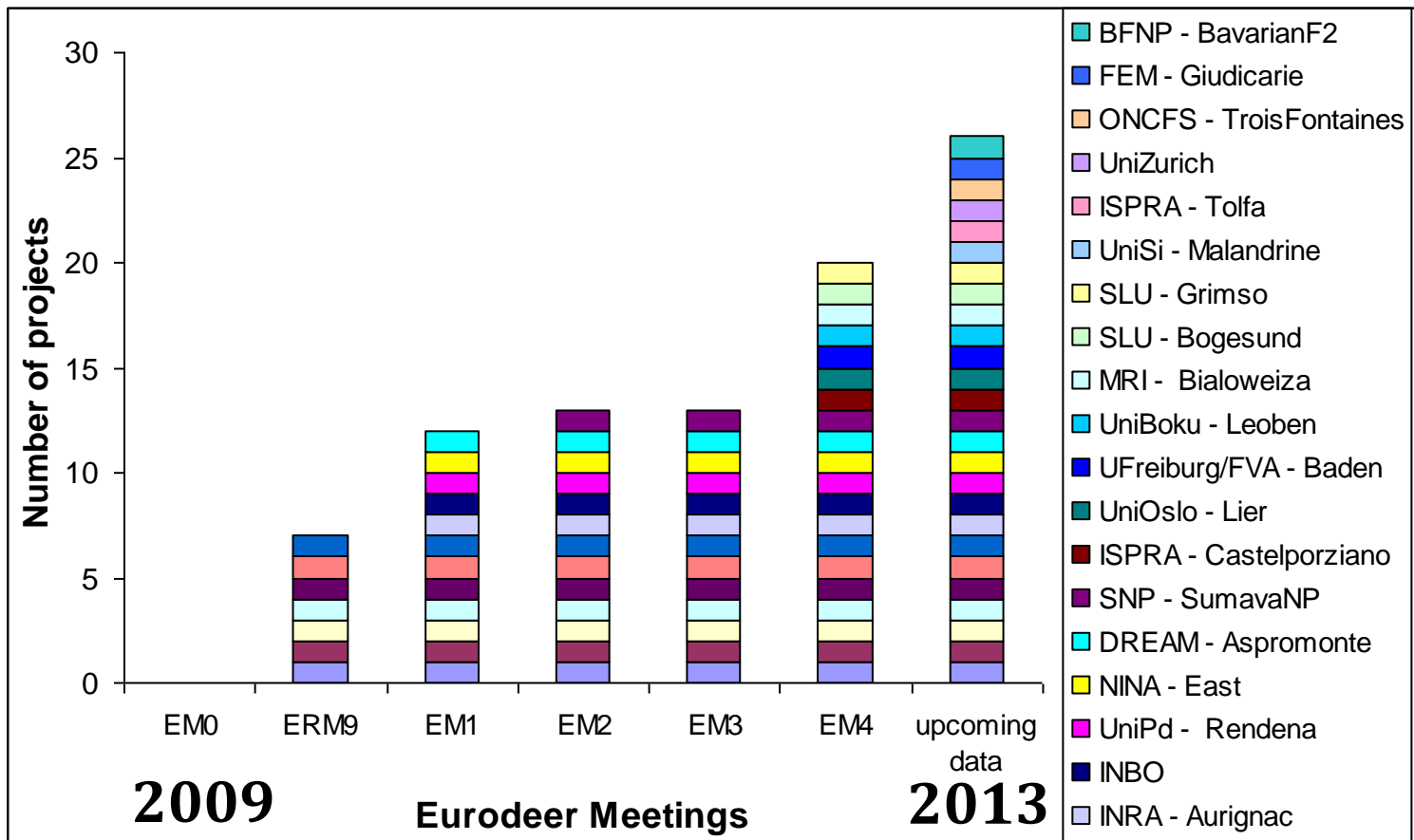
One and a half-pager for EURODEER papers

Phase 1

<b>Title</b>		
<b>Investigator</b>		
<b>Working group</b>		
<b>Proposed partners §</b>		
<b>Proposed journal</b>		
<b>Time line</b>	<i>Data selection</i>	
	<i>Analysis</i>	
	<i>Writing</i>	
	<i>Submission</i>	
<b>Data</b>	<i>Date requirements</i>	
	<i>Primary variables</i>	
	<i>Potential covariates</i>	
<b>Date of approval</b>		

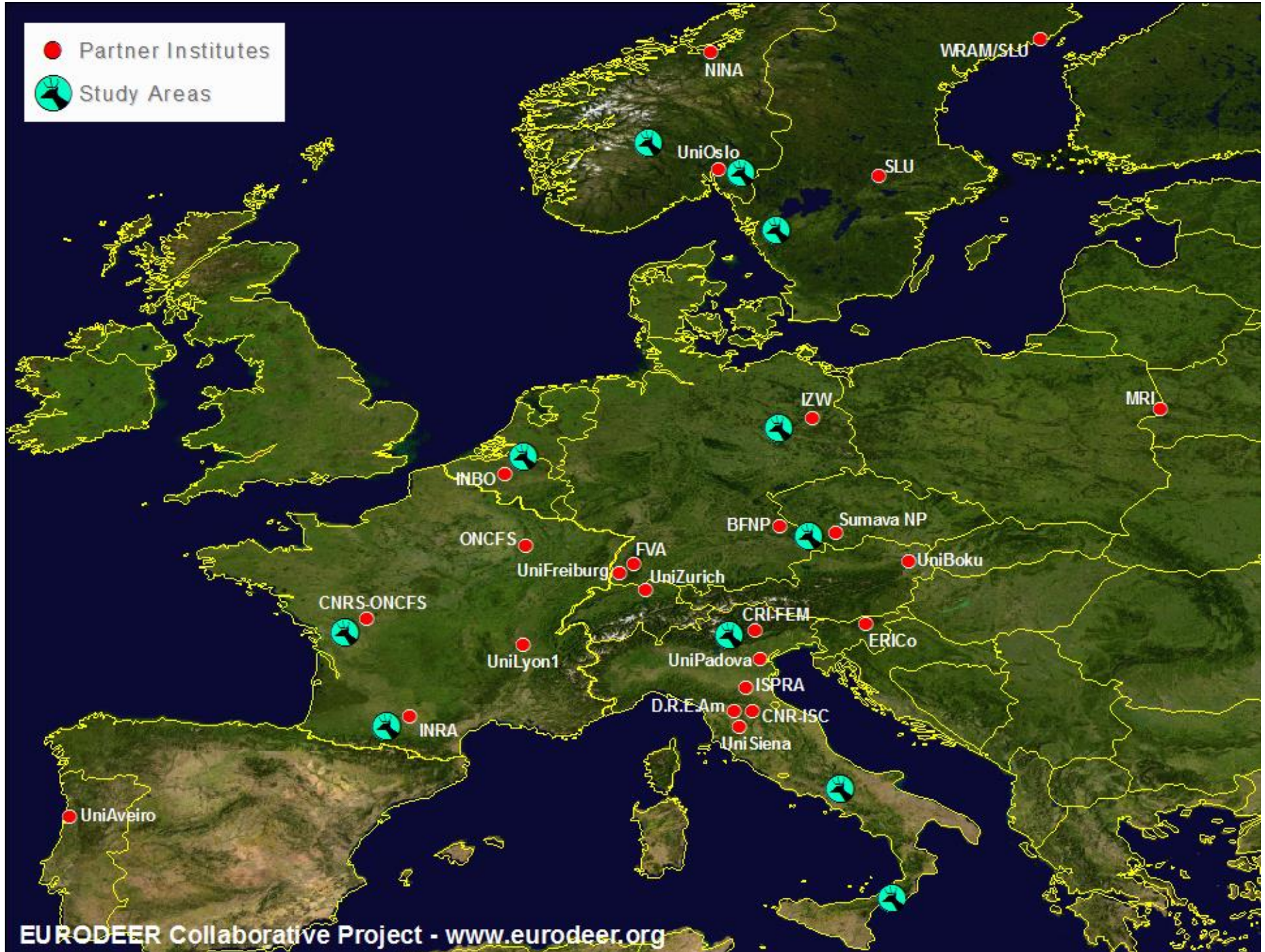
# A fast growing family...the EURODEER collaborative project

<b>Total locations</b>	<b>&gt; 1.500.000</b>
Animals	> 600
Study areas	24
Countries	9





- Partner Institutes
- Study Areas



# EURODEER #001: Should I stay or should I go? Migratory behaviour depends on climate related factors and spatial heterogeneity

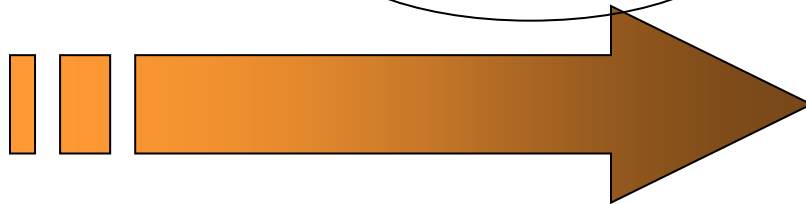
Oikos 120: 1790–1802, 2011  
doi: 10.1111/j.1600-0706.2011.19441.x  
© 2011 The Authors. Oikos © 2011 Nordic Society Oikos  
Subject Editor: Ben Chapman. Accepted 5 September 2011

Partial migration in roe deer: migratory and resident tactics are end points of a behavioural gradient determined by ecological factors

Francesca Cagnacci, Stefano Focardi, Marco Heurich, Anja Stache, A. J. Mark Hewison, Nicolas Morellet, Petter Kjellander, John D. C. Linnell, Atle Mysterud, Markus Neteler, Luca Delucchi, Federico Ossi and Ferdinando Urbano

## RESIDENCE

Commuting

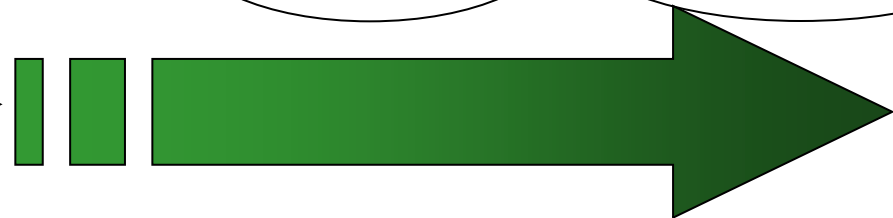


■ **Spatial Heterogeneity**  
(topography, hiding cover)

## MIGRATION

Partial

Obligatory

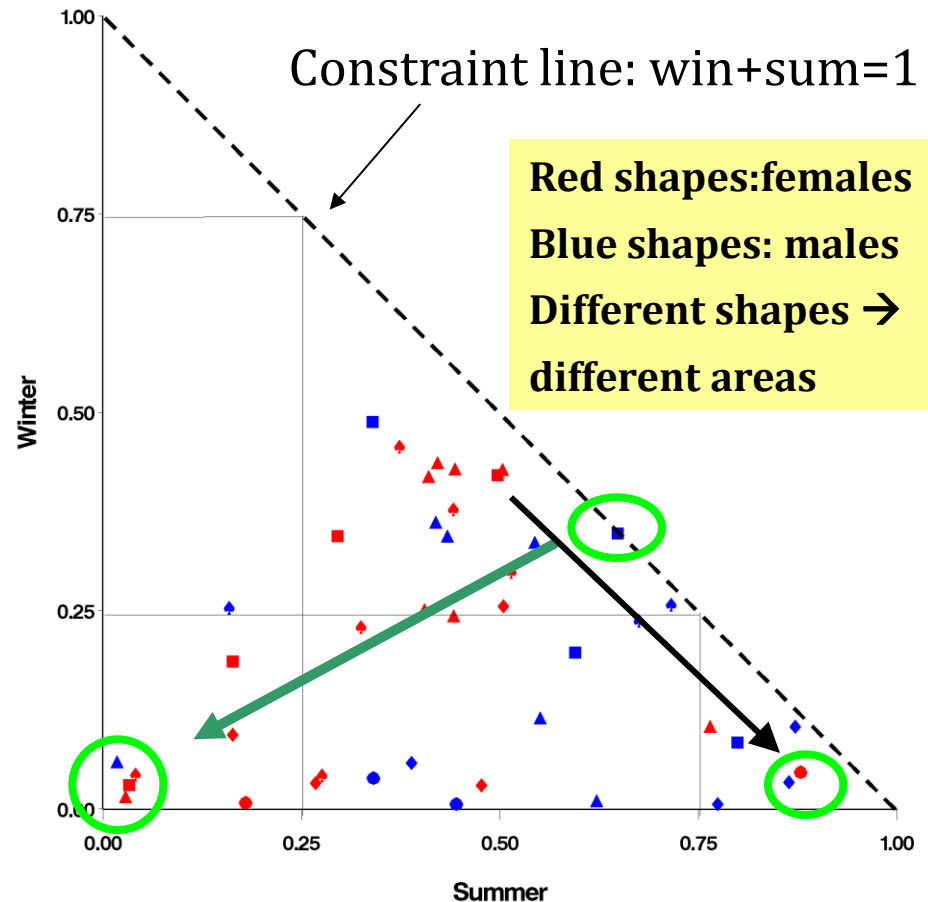
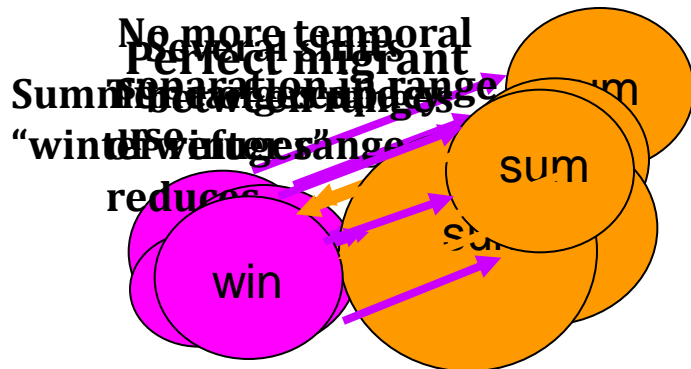


**Temporal Predictability**  
(snow cover)



# In presence of spatially separated ranges: from perfect migration to opportunistic use in dependence of snow and hiding cover

Maximal residence time in  
summer and winter ranges



# EURODEER #002: Tiny luxury apartments or large houses in the outback? Adjusting the home range size in dependence of climate, and resources

Journal of Animal Ecology



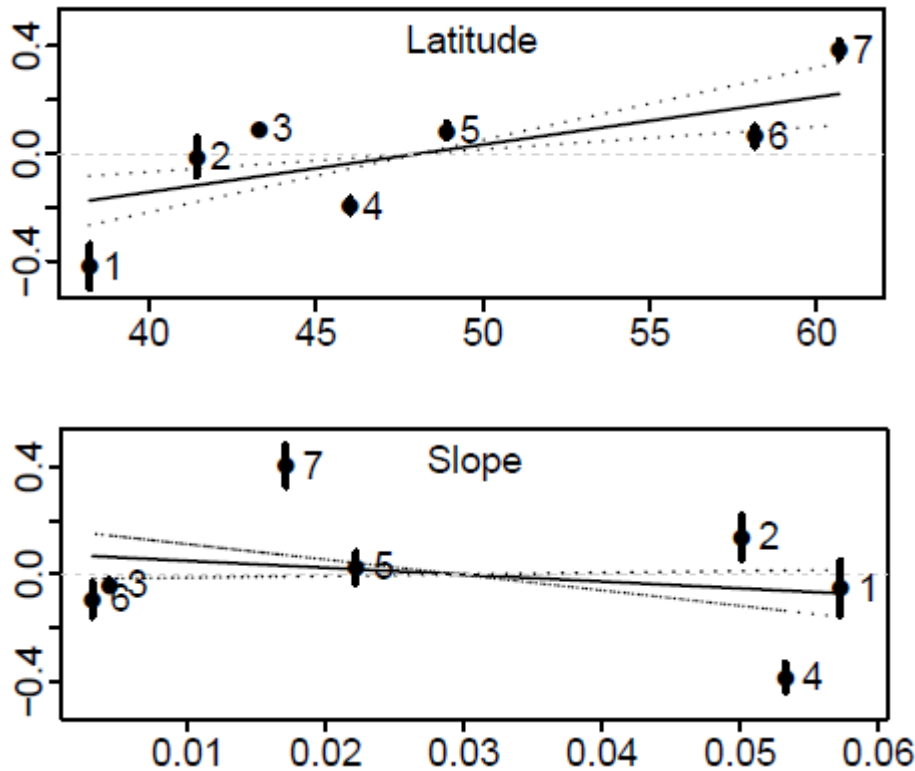
Journal of Animal Ecology 2013

doi: 10.1111/1365-2656.12105

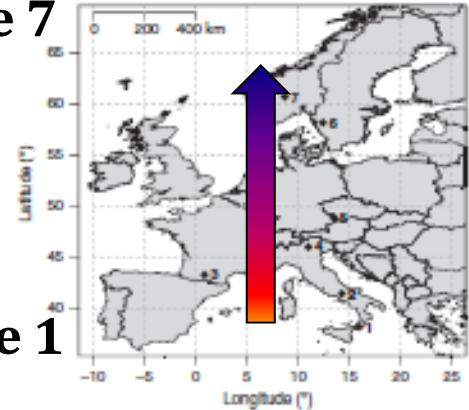
Seasonality, weather and climate affect home range size in roe deer across a wide latitudinal gradient within Europe

Nicolas Morelet<sup>1\*</sup>, Christophe Bonenfant<sup>2</sup>, Luca Börger<sup>3</sup>, Federico Ossi<sup>2,4</sup>, Francesca Cagnacci<sup>4</sup>, Marco Heurich<sup>5</sup>, Petter Kjellander<sup>6</sup>, John D. C. Linnell<sup>7</sup>, Sandro Nicoloso<sup>8</sup>, Pavel Sust<sup>9</sup>, Ferdinando Urbano<sup>10</sup> and Atle Mysterud<sup>11</sup>

Deviation from average HR size

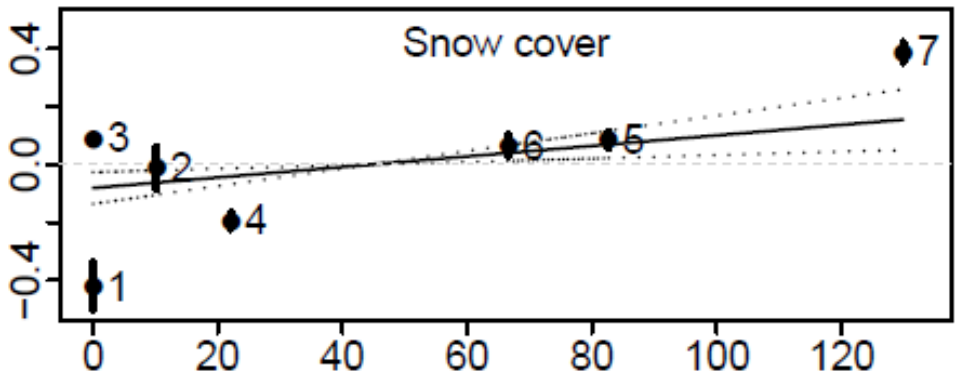
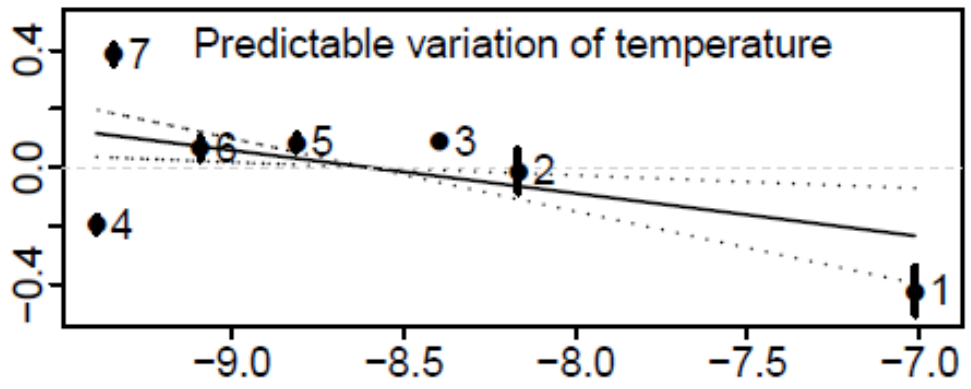
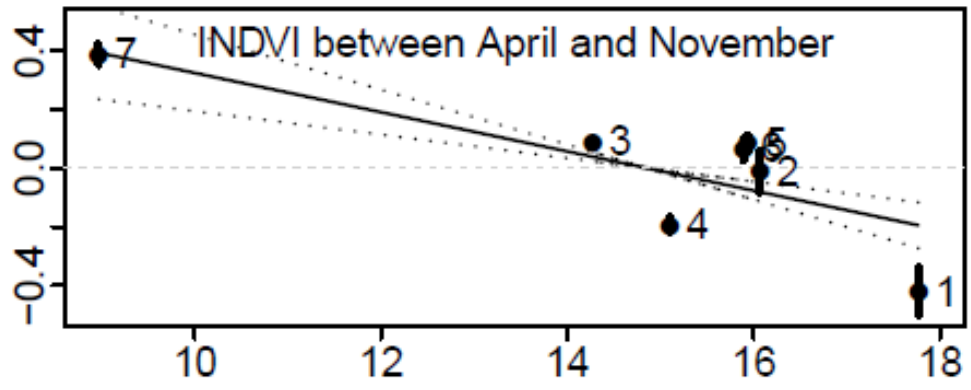


Site 7

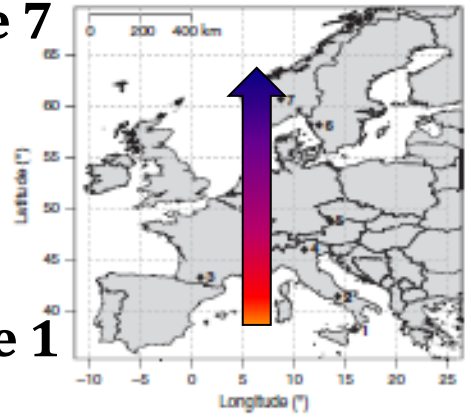


Site 1

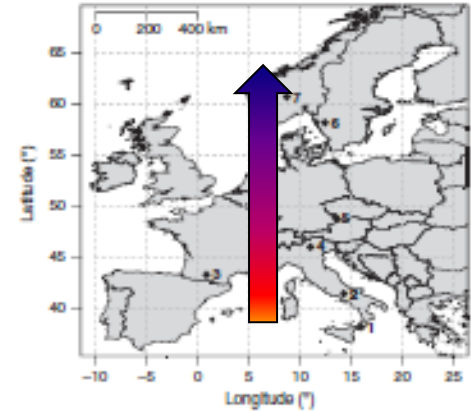
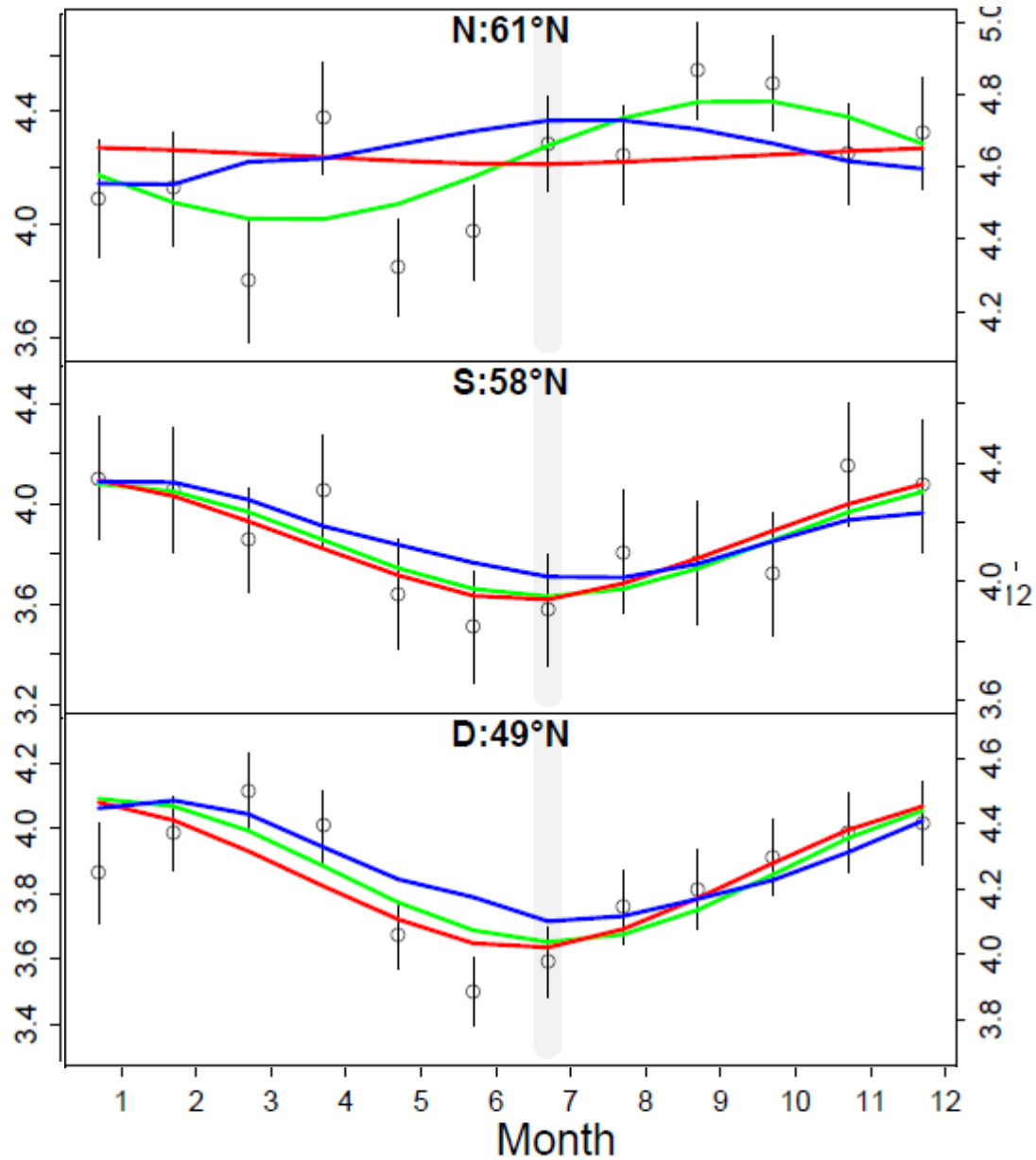
Deviation from average HR size



Site 7



Log(HR in ha)



- Time variation
- Day length
- Temperature

# Beyond the borders: from studying global ranging species....

**TOPP** Tagging Of Pacific Predators

TOPP Home | TOPP Predators | TOPP Team | In the News | About TOPP | My Account | TOPP Data | Search

**TOPP PREDATORS TAGGING MAP**

TOPP Near Real-Time Animal Tracks

**ELEPHANT SEALS BLOG**

About Me:  
**ELEPHANT SEAL HOMECOMING DAYS 2009!!**  
Penelope here. Tagged in last June, I'm out in the North Pacific and getting ready to return to my home beach at **Año Nuevo State Reserve**, California, where I'll give birth to my seventh pup sometime between January and February.

I spent seven months in the wild North Pacific Ocean, deep-diving dozens of times a day, and traveled nearly 9,000 miles. Although thousands of other gals are heading home, too, to **celebrate ELEPHANT SEAL HOMECOMING DAYS!!! and pop out the Weaner Class of 2009. Find out more about ESHD 2009!**

We're all celebrating the end of our long migration. The friendly researchers at TOPP will be out on the beach almost every day to greet us, take our photos, maybe even witness

**HOW TO TAG AN ELEPHANT SEAL**

Hi, I'm Penelope

I'm on the beach at Año Nuevo and I swam 8914.04 miles while I was tagged!

Right now, I'm near San Francisco

**TOPP**

...to studying local ranging species at their distribution range scale:

- Environmental and climatic gradient
- Variation of human practices/impacts
- Scale effect

**Thanks to the EURODEER group...**



**...and our sponsor**



**VECTRONIC  
Aerospace**