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**Summer Course Animal Movement Analysis**

**30 June - 5 July 2019, Amsterdam**

**Scope**

The aim of this course is to provide participants with skills to assist them in working with animal movement data including data management and organization, working with large tracking datasets, data exploration, visualization, annotating track data with environmental data and analysis of movement data. The course is also a great opportunity to develop your research network in the field of movement ecology. The course content is relevant for participants studying movement in a broad range of taxa and environments, however there  is an emphasis on birds in the course exercises as most exercises use an existing bird tracking dataset. Participants will learn about the strengths and weaknesses of different tracking technologies for diverse taxa. The course will combine several guest lectures from international experts in the field of animal movement ecology, predominantly hands-on computer work, field experiments with GPS trackers, presentations given by participants and focal workshops on the last day of the course. During the course different software packages will be used with most of the work conducted in R, and participants will learn some basic programming and database skills. Course participants are expected to familiarize themselves with R before the beginning of the course, and materials for self-tuition will be provided in advance.

**Course lecturers and organizers**

Judy Shamoun-Baranes University of Amsterdam - Institute for Biodiversity and Ecosystem Dynamics

Willem Bouten University of Amsterdam - Institute for Biodiversity and Ecosystem Dynamics

Emiel van loon University of Amsterdam - Institute for Biodiversity and Ecosystem Dynamics

Bart Nolet Netherlands Institute of Ecology (NIOO-KNAW)

Elspeth Sage University of Amsterdam - Institute for Biodiversity and Ecosystem Dynamics

Morgan Brown University of Amsterdam - Institute for Biodiversity and Ecosystem Dynamics

Johannes de Groeve University of Amsterdam - Institute for Biodiversity and Ecosystem Dynamics

Felix Liechti Swiss Ornithological Institute

Geert Aarts Wageningen Marine Research

Simone Ciuti University College Dublin

Amber Heijboer Graduate School PE&RC

**Course schedule Animal Movement Analysis 2019**

*L = lecture, C = computer exercise, D = group discussion, F = fieldwork*

The course will be conducted in Science Park 904, 1098 XH Amsterdam. The lectures and computer exercises will be held in room **F2.04**. Note that the building is closed after 18:00.

***Sunday, June 30*** (**Oerknal**, University Sports Centre, Science Park 306, Amsterdam)

17.00 – 18.00 **Welcome & registration**

18.00 – 19.00 Poster Session

19.00 – 21.00 *Dinner*

***Monday, July 1***

**Software:** SQLiteStudio, R

**Instructors**: Judy Shamoun-Baranes, Morgan Brown, Emiel van Loon

8:45 – 9:00  **F2.04** *Arrival and coffee*

9:00 – 9:15 **L**  **Opening**, *Judy Shamoun-Baranes*

9:15 – 12:00 **L/C**  Introduction to course dataset & working with databases, *Judy Shamoun-Baranes*

**C**  Working with a relational database: exploration and management of movement data, selecting, filtering and aggregating data

12:00 – 13:00  **Oerknal** *Lunch break*

13:00 – 14:00 **L F2.04** **Drivers and consequences of avian movement,** *Judy Shamoun-Baranes*

14:00 – 15:00 **L/C**  Introduction to exercise: calculating basic movement statistics and visualizing data in R, *Morgan Brown*

**C**  Calculating basic movement statistics in R

15:00 -15:30  *Coffee break*

15:30 – 17:00 **C** Continue exercises

Calculating basic movement statistics in R

Visualizing data in R: scatter plots and histograms

17:00 – 18:00  Academic break – time to review your work and practice at your own pace

18:00  **Oerknal** *Group dinner @ Oerknal*

***Tuesday, July 2***

**Software**: R

**Instructors**: Elspeth Sage, Emiel van Loon, Judy Shamoun-Baranes

8:45 – 9:00  **F2.04** Coffee

9:00 – 10:00 **L**  **Understanding bird movement behaviour in response to dynamic environments***, Elspeth Sage*

10:15 – 10:30 **L/C**  Introduction to exercise: Integrating environmental data and animal movement data, *Elspeth Sage*

10:30 – 12:00 **C**  Integrating environmental data with tracking data in R

12:00 – 13:00  **Oerknal** *Lunch (+ group photo)*

13:00 – 14:00 **L F2.04 Modelling migration,** *Bart Nolet (UvA, NIOO)*.

14:00 – 15:00 **C**  Integrating environmental data with tracking data in R & time budget analysis

15:00 – 15:30  *Coffee break*

15:30 – 17:00 **C**  Continue exercises and short wrap up

17:00 – 17:45  Academic break – time to review your work and practice at your own pace

17:45 – 19:00  **Oerknal** *Dinner @ Oerknal*

19:30 – 20:30 Special activity: active movement workshop

Location: Studio 2, University Sports Centre

Required: positive energy, light and loose clothes for physical activity.

***Wednesday, July 3***

**Software:** R, Google Earth

**Instructors**: Willem Bouten, Judy Shamoun-Baranes, Johannes de Groeve, Elspeth Sage

8:45 – 9:00  **F2.04** *Coffee*

9:00 – 10:00 **L** **Fundamentals of GPS tracking**,*Willem Bouten*

10:00 – 10:30 **L**  Introduction to experiment: Working with GPS loggers, *Willem Bouten*

10:30 – 13:00 **F**  Experimenting with GPS loggers including lunch break: pick up bagged lunch at Oerknal

13:00 – 14:00 **L F2.04 Monitoring biomass in the aerosphere by radar and relating it daily flight patterns of individuals**,*Felix Liechti (Swiss Ornithological Center)*

14:00 – 15:00 **C**  Visualizing GPS data (trajectories, summary plots) and exploring GPS performance characteristics

15:00 – 15:30 *Coffee break*

15:30 – 16:15 **C**  Continue exercises

16:15 - 17:15 **D**  Student presentations of experiment results and group discussion

17:15 – 18:00  Academic break – time to review your work and practice at your own pace

18:00 **Oerknal** *Dinner @ Oerknal*

***Thursday, July 4***

**Software:** R

**Instructors**: Emiel van Loon, Simone Ciuti, Judy Shamoun-Baranes, Morgan Brown

8:45 – 9:00  **F2.04** *Coffee*

9:00 – 10:00 **L Integrating methods to study seal movement and distribution,** *Geert Aarts**(Wageningen Marine Research)*

10:05 – 10:30 **L**  **Introduction to exercises: home range analysis and utilization distributions**, *Emiel van Loon*

10:30 – 12:00 **C**  Calculating home ranges, utilization distributions, core areas and areas of intensive use: exercise in R

12:00 – 13:00  **Oerknal** *Lunch break @ Oerknal*

13:00 – 14:00 **L F2.04** **The concept behind a Resource Selection Function (RSF) and its applications in ecology and conservation,** *Simone Ciuti**(University College Dublin)*

14:00 – 15:00 **L/C**  How to build an exponential RSF using mixed-effect models,*Emiel van Loon & Simone Ciuti*

15:00 – 15:30  *Coffee break*

15:30 – 16:30 **C**  Continue exercise

16:30 – 17:00 **D**  Wrap up and discussion (including tricks and tips in RSF analysis) *led by Emiel van Loon & Simone Ciuti*

17:00 – 18.00  Travel to excursion

18:00 – 19.30 *Dinner @ Naardermeer*

19:30 – 21.00 Hike and bird watching around part of Naardermeer

21.00 – 21.30 Return to Amsterdam

***Friday, July 5***

**Instructors**: Willem Bouten, Emiel van Loon, Simone Ciuti, Felix Liechti, Judy Shamoun-Baranes

8:45 – 9:00 **F2.04** *Coffee*

9:00 – 10:00 **L Using accelerometers to study behaviour**, *Willem Bouten* (interactive lecture)

10:00 – 10:30 **L**  Brief introduction to workshops (instructors)

10:30 – 10:45  *Coffee break*

10:45 – 12:00 **C**  Workshops (each participant selects one workshop):

**C C4.215** Analysis of geolocation data including analysis of data collected during the course (Felix Liechti)

**C F2.04** Testing for the repeatability of movement metrics (Simone Ciuti)

**C GIS Studio** Annotating and classifying accelerometer data (Willem Bouten)

**C C3.265** Work with own data: selecting the right method, scale & features to answer your question (Emiel van Loon)

**C C3.211** Organizing your data in a database & working with SQL (Judy Shamoun-Baranes)

12:00 - 13:00  *Lunch break @ Oerknal*

13:00 – 15:30 **C**  Workshops continued

15:30 – 16:30 **D F2.04** participant presentations

16:30 – 17:30  *Closing & drinks*