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3° International jackal symposium
02-04 November 2022 Gödöllő, Hungary

Exploring the ecology of the golden jackal (*Canis aureus*) using the first telemetry data collected in Italy

Frangini L., Franchini M., Stokel G., Madinelli A., Pesaro S., Ferfolja S., Filacorda S.

Department of Agri-Food, Environmental and Animal Sciences, University of Udine

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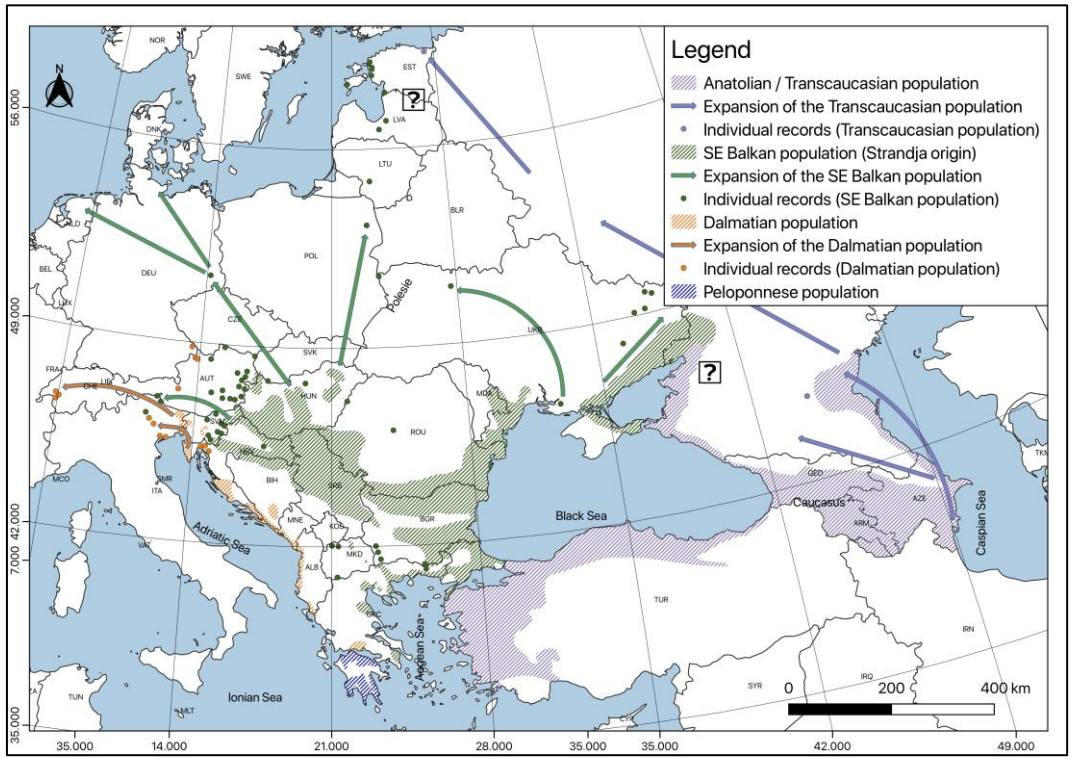
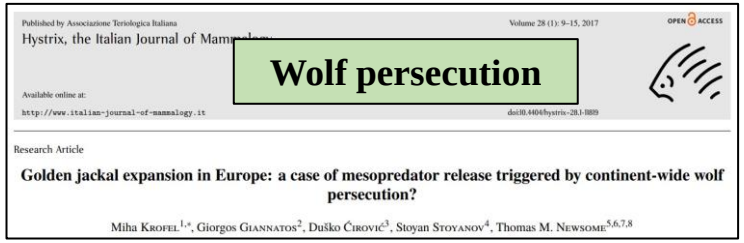
The golden jackal: a rapidly expanding mesocarnivore

Range «explosion» over the last 40 years



Spassov & Acosta-Pankov. 2019

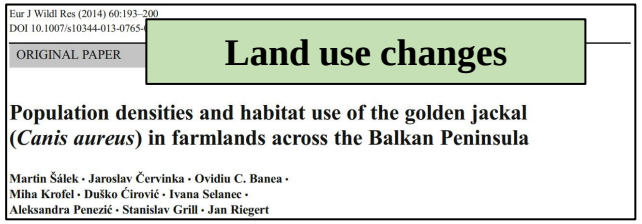
Some factors promoting the expansion


Published by Associazione Teriologica Italiana
Hystrix, the Italian Journal of Mammalogy
Volume 28 (1): 9–15, 2017
OPEN ACCESS
Available online at:
http://www.italian-journal-of-mammalogy.it
doi:10.4404/hystrix-28.1-11889
Research Article

Golden jackal expansion in Europe: a case of mesopredator release triggered by continent-wide wolf persecution?

Miha KROFEL[1,*], Giorgos GIANNATOS[2], Duško ĆIROVIĆ[3], Stoyan STOYANOV[4], Thomas M. NEWSOME[5,6,7,8]

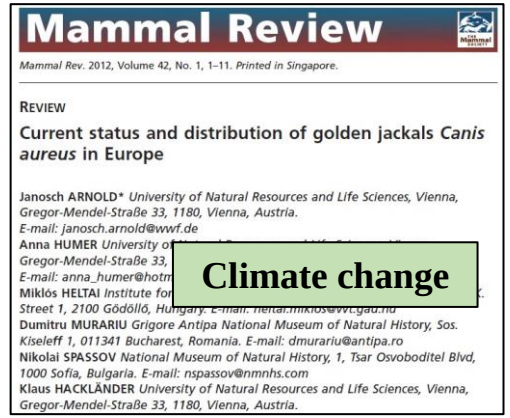
Wolf persecution


Eur J Wildl Res (2014) 60:193–200
DOI 10.1007/s10344-013-0765-4
ORIGINAL PAPER

Population densities and habitat use of the golden jackal (*Canis aureus*) in farmlands across the Balkan Peninsula

Martin Šálek · Jaroslav Červinka · Ovidiu C. Banea · Miha Krofel · Duško Ćirović · Ivana Selanec · Aleksandra Penezić · Stanislav Grill · Jan Riegert

Land use changes


Mammal Review
Mammal Rev. 2012, Volume 42, No. 1, 1–11. *Printed in Singapore.*

REVIEW

Current status and distribution of golden jackals *Canis aureus* in Europe

Janosch ARNOLD* *University of Natural Resources and Life Sciences, Vienna, Gregor-Mendel-Straße 33, 1180, Vienna, Austria. E-mail: janosch.arnold@wwf.de*
Anna HUMER *University of [illegible] Gregor-Mendel-Straße 33, [illegible] E-mail: anna_humer@hotm[illegible]*
Miklós HELTAI *Institute for [illegible] Street 1, 2100 Gödöllő, Hungary. E-mail: heltai.miklos@[illegible]*
Dumitru MURARIU *Grigore Antipa National Museum of Natural History, Sos. Kiseleff 1, 011341 Bucharest, Romania. E-mail: dmurariu@antipa.ro*
Nikolai SPASSOV *National Museum of Natural History, 1, Tsar Osvoboditel Blvd, 1000 Sofia, Bulgaria. E-mail: nspassov@nmnhs.com*
Klaus HACKLÄNDER *University of Natural Resources and Life Sciences, Vienna, Gregor-Mendel-Straße 33, 1180, Vienna, Austria.*

Climate change

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Habitat use for Golden jackal

- The species expansion in a human-dominated landscape (i.e., Europe) asks for habitat use analyses to better understand its ecology
- Spatial ecology studies performed with high quality data (i.e., GPS collars) provide deeper insights compared to other monitoring techniques

Bio-acoustic stimulation (i.e., Jackal howling)

European Journal of Wildlife Research (2021) 67: 14
https://doi.org/10.1007/s10344-021-01457-7

ORIGINAL ARTICLE

Habitat use of golden jackals (*Canis aureus*) in riverine areas of northern Bosnia and Herzegovina

Aldin Selimovic[1] · Eva Maria Schöll[2] · Larissa Bosseler[2] · Jennifer Hatlauf[2]

Eur J Wildl Res (2014) 60:193–200
DOI 10.1007/s10344-013-0765-0

ORIGINAL PAPER

Population densities and habitat use of the golden jackal (*Canis aureus*) in farmlands across the Balkan Peninsula

Martin Šálek · Jaroslav Červinka · Ovidiu C. Banea · Miha Krofel · Duško Ćirović · Ivana Selanec · Aleksandra Penezić · Stanislav Grill · Jan Riegert

Telemetry

Mammalian Biology (2021) 101:619–630
https://doi.org/10.1007/s42991-021-00109-2

ORIGINAL ARTICLE

Movement, space-use and resource preferences of European golden jackals in human-dominated landscapes: insights from a telemetry study

Skye Fenton[1,2] · Paul R. Moorcroft[1] · Duško Ćirović[3] · József Lanszki[4] · Miklós Heltai[5] · Francesca Cagnacci[1,2] · Stewart Breck[6,7] · Neda Bogdanović[3] · Ilija Pantelić[3] · Kornél Ács[4] · Nathan Ranc[1,2,8]

Journal of Mammalogy, 102(2):636–650, 2021
DOI:10.1093/jmammal/gyab014
Published online March 20, 2021

Home range, habitat selection, density, and diet of golden jackals in the Eastern Plains Landscape, Cambodia

Jan F. Kamler,* Christin Minge, Susana Rostro-García, Tazarve Gharajehdaghipour, Rachel Crouthers, Visattha In, Chen Pay, Chanratana Pin, Prum Sovanna, and David W. Macdonald

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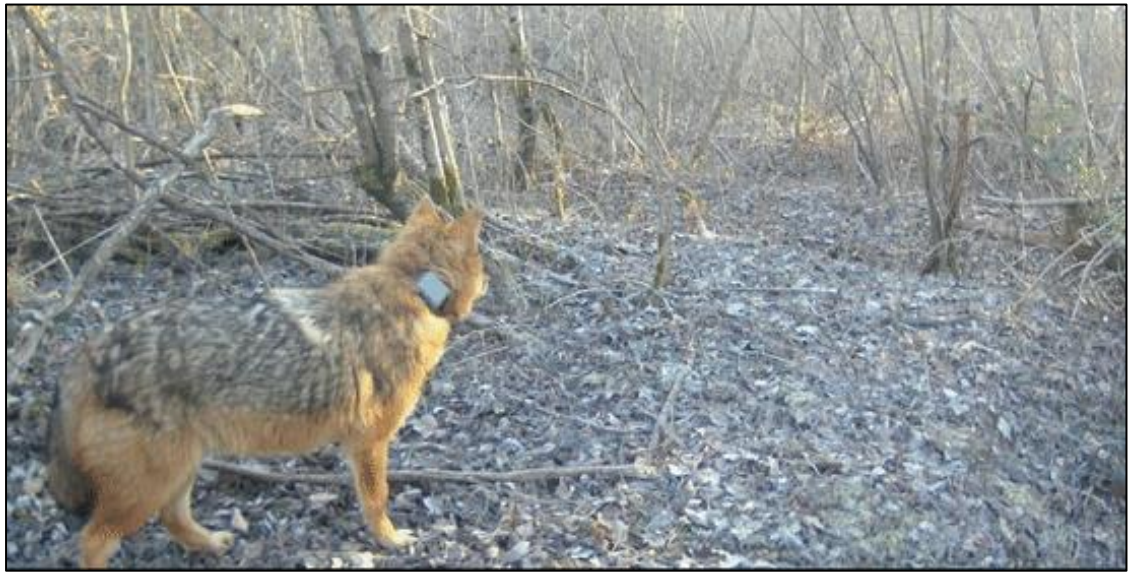
Aims of the study

Using the first telemetry data on golden jackal in Italy, we aimed to investigate its spatial ecology within a high anthropic pressure area focusing on:

1. Home range estimation

2. Exploratory analyses on habitat selection

3. Exploratory analyses on activity patterns



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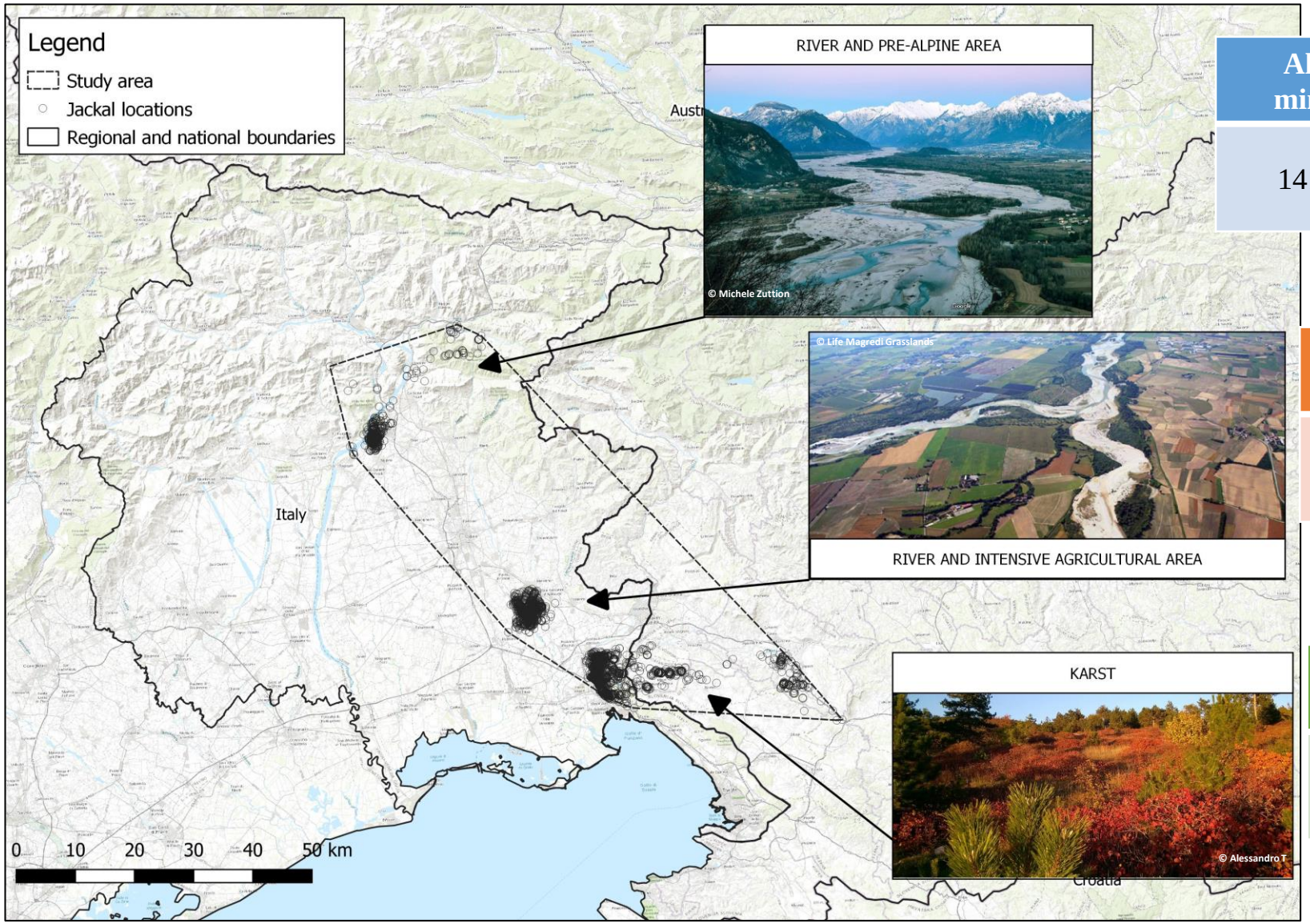
Study area

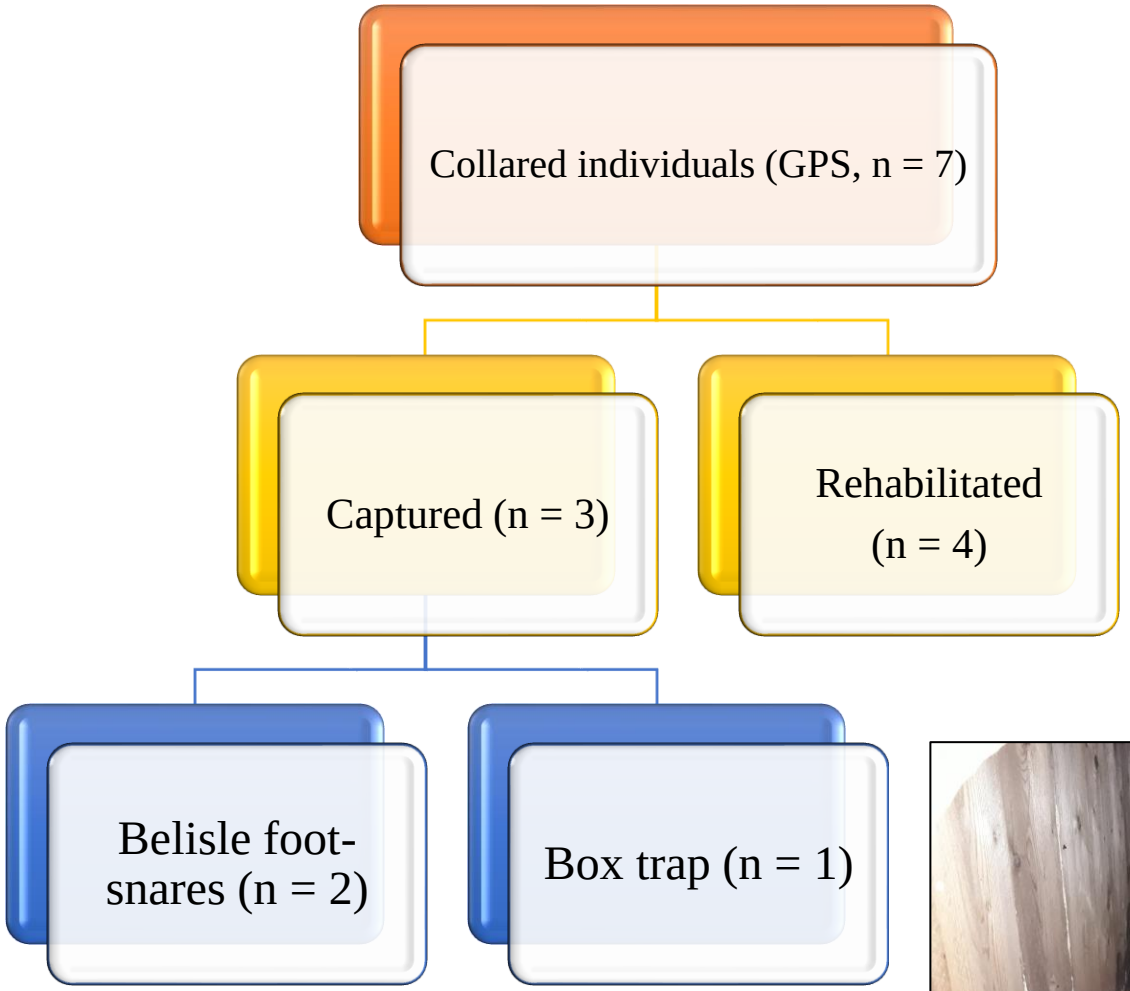


Altitude minimum	Altitude maximum	Main landcover types
141 m asl	1870 m asl	• Broad-leaved vegetation (43%) • Mixed forests (19%)

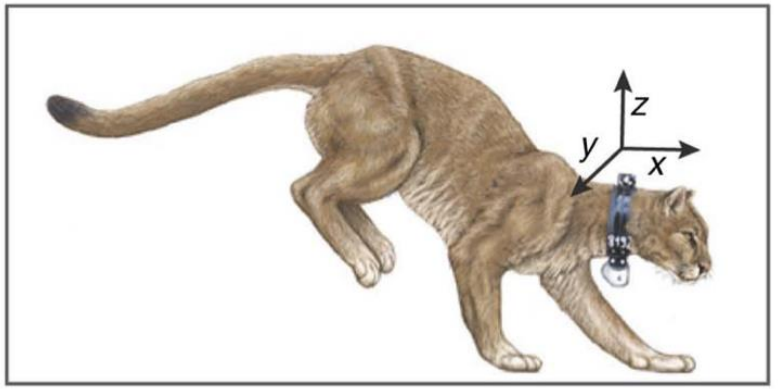
Altitude minimum	Altitude maximum	Main landcover types
25 m asl	63 m asl	• Urban areas (14%) • Arable lands (38%) • Complex cultivations (29%)

Altitude minimum	Altitude maximum	Main landcover types
0 m asl	616 m asl	• Broad-leaved vegetation (52%) • Mixed forests (10%)

Materials and methods: data collection



Collar Type	Brand	GPS location schedule	Acceleration burst
GPS	Vectronic – Vertex Lite	3-4 fixes per day	Every 5 minutes on 2 axes



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Materials and methods: data analysis

GPS LOCATIONS

1. Home range estimation (50% and 95%)

Assessing movement behaviour:
Net Square Displacement (NSD)

↓

Home range estimation:
Autocorrelated Kernel density estimation (AKDE)

'migrateR' R package and ctmmweb

2. Habitat selection

Utilization distributions (UD): Brownian Bridge Movement Model

↓

Tree cover density 2018 (reclassified)

Corine Land Cover 2018 (reclassified)

↓

Selection Ratios within Home range (Design III)

'adehabitatHS' and 'adehabitatHR' R packages

ACCELEROMETER BURSTS

3. Activity pattern

Accelerometer data

↓

Diurnality Index

'Activity Pattern' Vectronic Software

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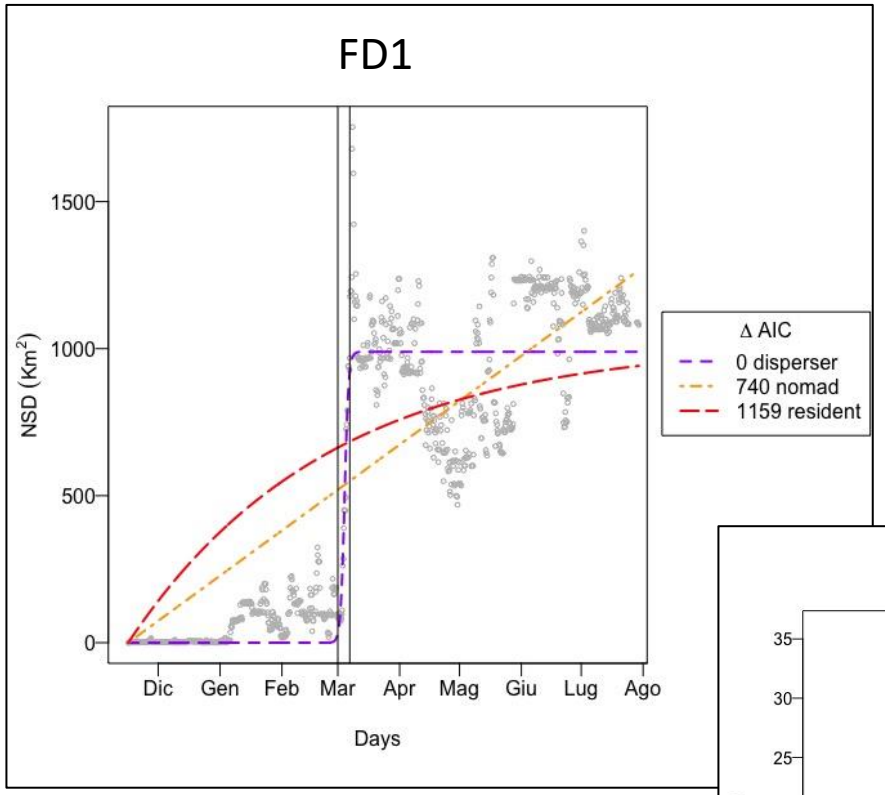
Results

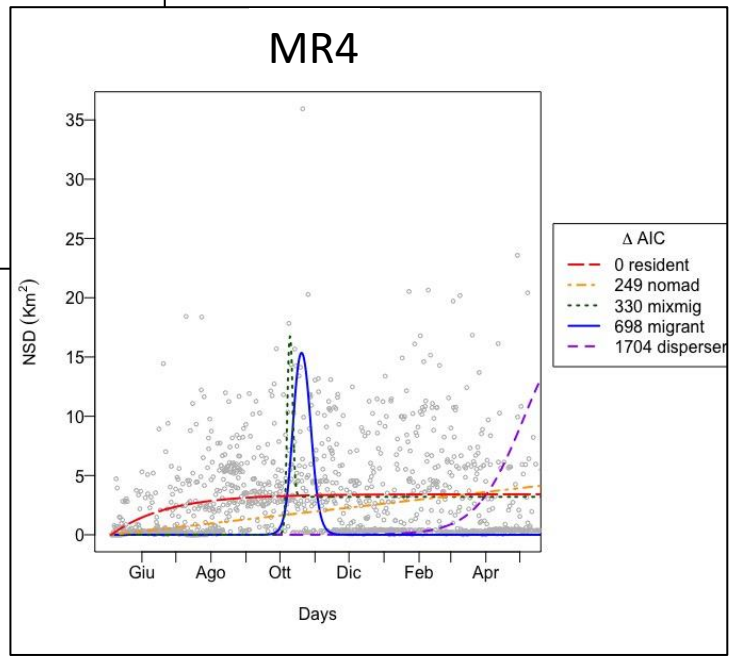
Name	Sex	Age	Collar	Method	Days monitored	Fix obtained	Fate	Acceleration burts
MD1	Male	> 1 year	GPS-GSM	Rehabilitation	342	703	Alive	/
MR1	Male	> 1 year	GPS-GSM	Capture	36	140	Roadkilled	/
FR1	Female	> 1 year	GPS-GSM	Capture	188	619	Roadkilled	27,390
MR2	Male	> 1 year	GPS-GSM	Capture	96	399	Poached	25,717
MR3	Male	> 1 year	GPS-GSM	Rehabilitation	50	198	Unknown	/
MR4	Male	> 1 year	GPS-GSM	Rehabilitation	453	1,370	Alive	/
FD1	Female	< 1 year	GPS-Iridium	Rehabilitation	256	993	Alive	/

1. Results: Assessing movement behaviour

Net Square Displacement (NSD)

Name	Sex	Age	Movement behaviour
MD1	Male	> 1 year	**Disperser**
MR1	Male	> 1 year	Resident
FR1	Female	> 1 year	Resident
MR2	Male	> 1 year	Resident
MR3	Male	> 1 year	Resident
MR4	Male	> 1 year	Resident
FD1	Female	< 1 year	**Disperser**





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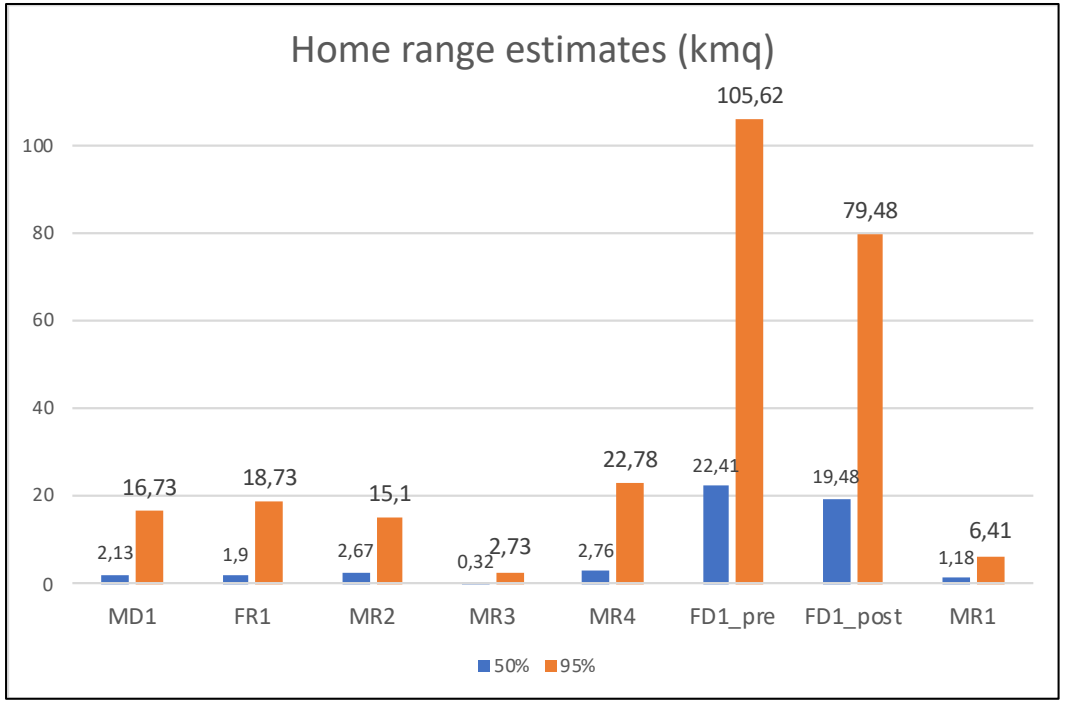
1. Discussion: HR estimation



HR estimation (km²)

	50%	95%
Average	**6.06**	**33.45**
SD	8.92	37.70
Average (No FD1)	**1.83**	**13.75**
SD (No FD1)	0.94	7.65

AKDE area (km^2)

	50%	90%	95%
Average	2.39	11.17	15.26
SD	2.79	10.34	13.96

Mammalian Biology (2021) 101:619–630
https://doi.org/10.1007/s42991-021-00109-2

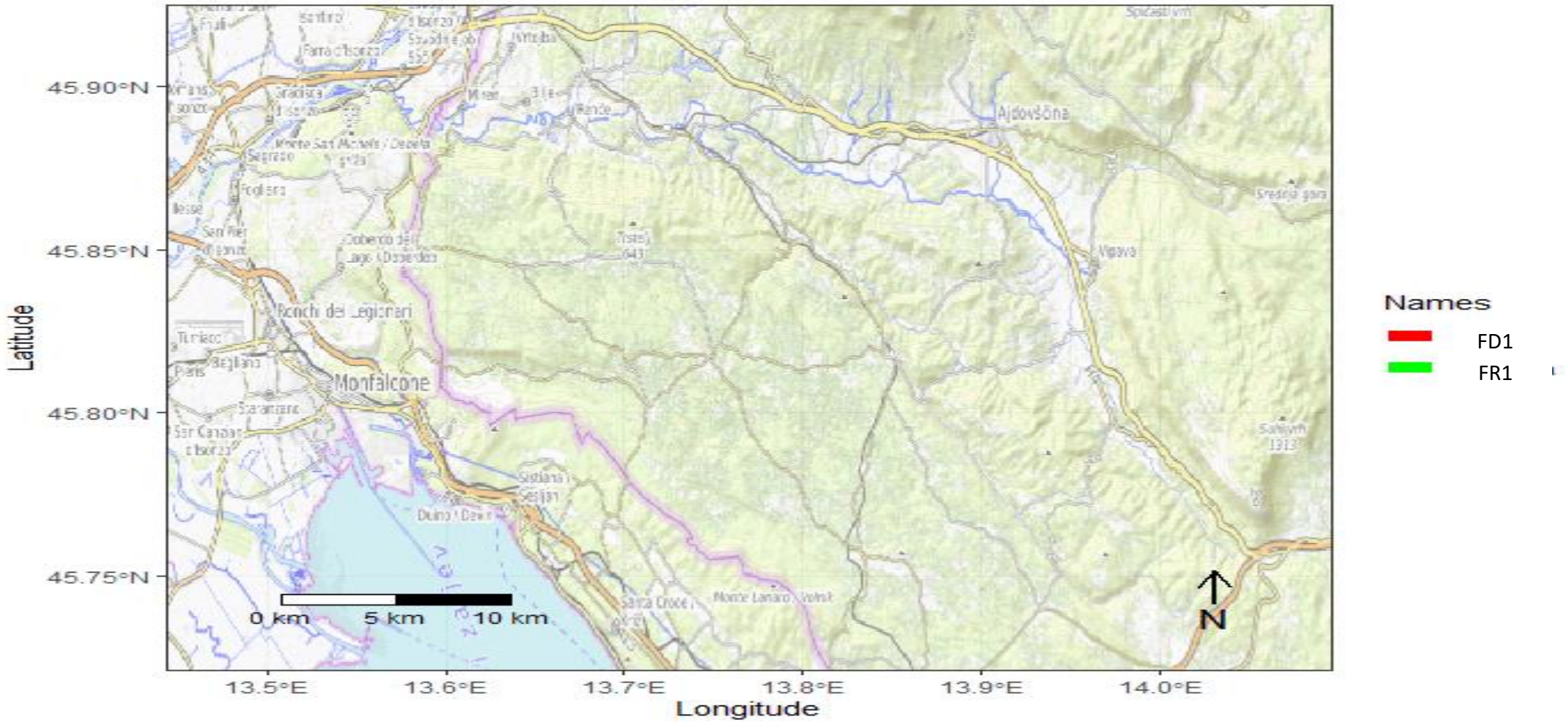
ORIGINAL ARTICLE

Check for updates

Movement, space-use and resource preferences of European golden jackals in human-dominated landscapes: insights from a telemetry study

Skye Fenton[1,2] · Paul R. Moorcroft[1] · Duško Ćirović[3] · József Lanszki[4] · Miklós Heltai[5] · Francesca Cagnacci[1,2] · Stewart Breck[6,7] · Neda Bogdanović[3] · Ilija Pantelić[3] · Kornél Ács[4] · Nathan Ranc[1,2,8]

KARST AREA


45.90°N
45.85°N
45.80°N
45.75°N
Latitude
Monfalcone
0 km
5 km
10 km
N
13.5°E
13.6°E
13.7°E
13.8°E
13.9°E
14.0°E
Longitude
Names
FD1
FR1

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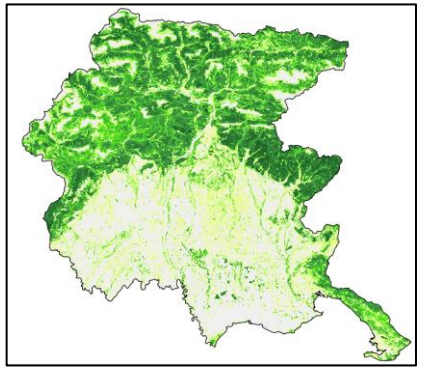
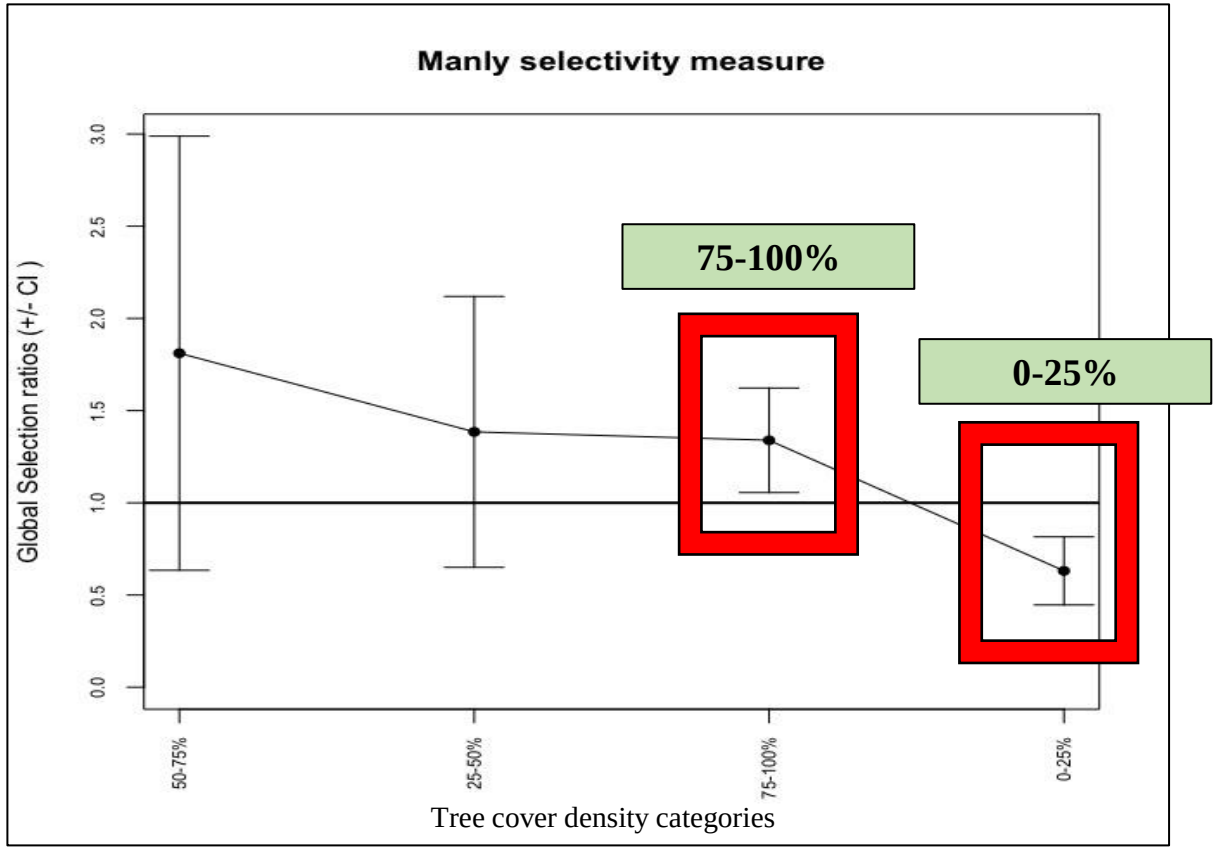
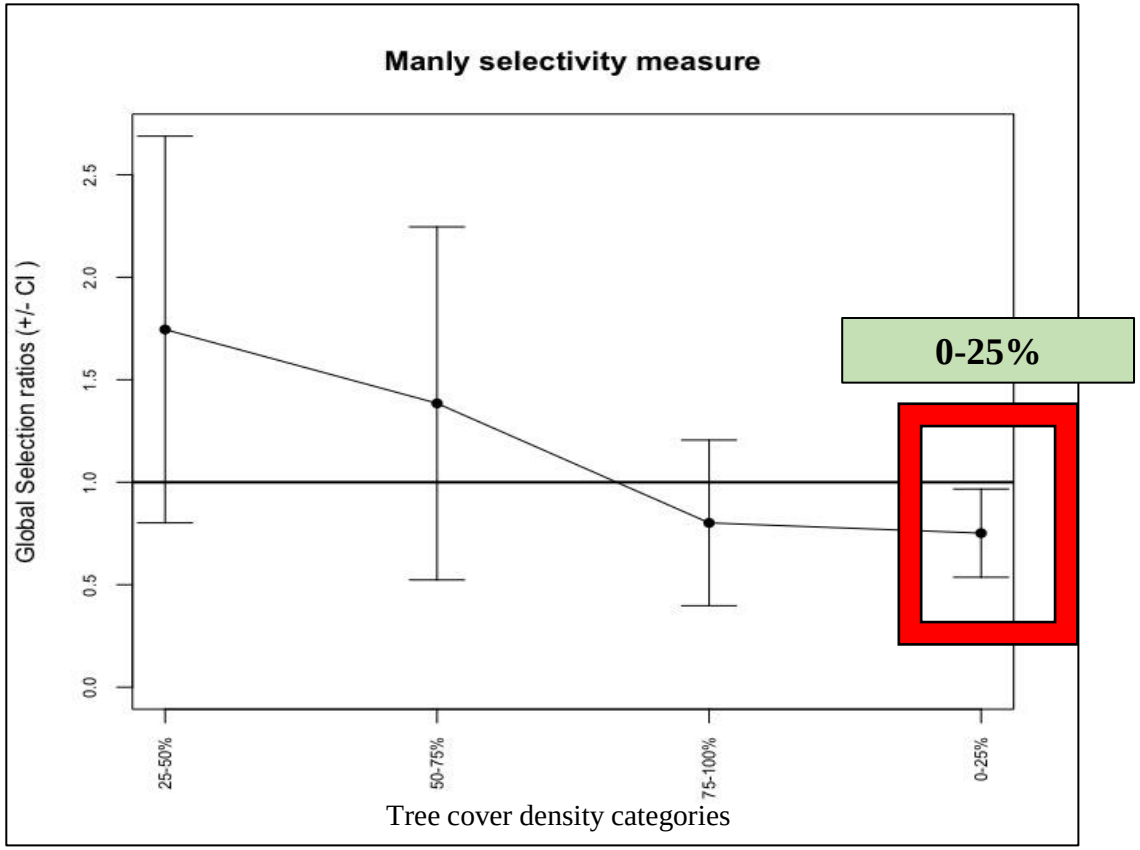
2. Results : Habitat selection (Tree cover density)



50% Utilization distribution (Core area)



95% Utilization distribution



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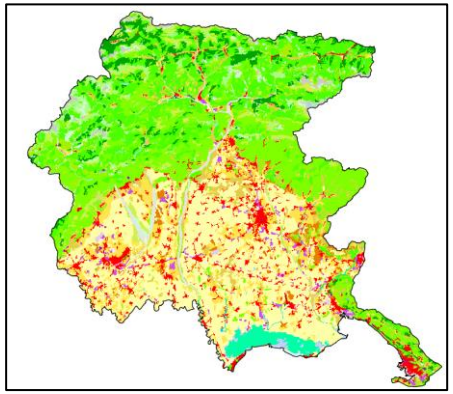
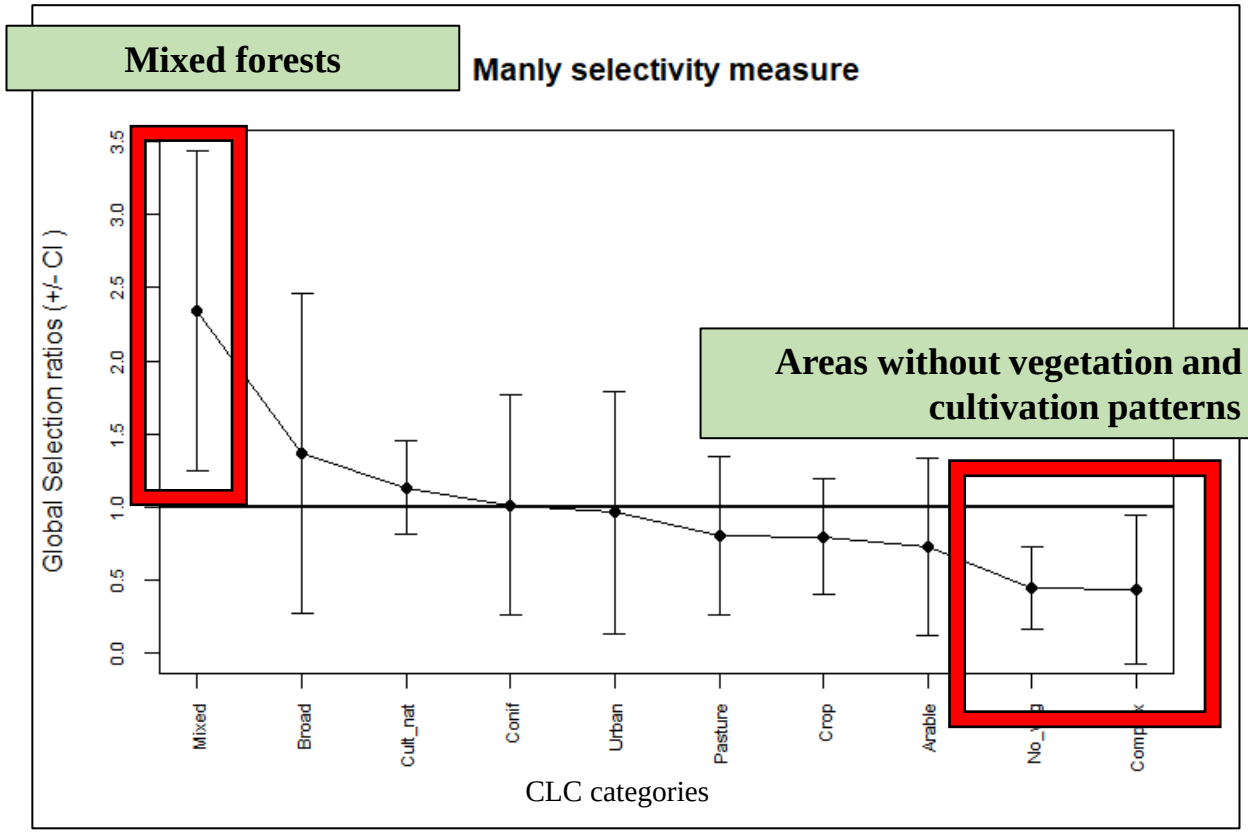
2. Results : Habitat selection (Landcover)



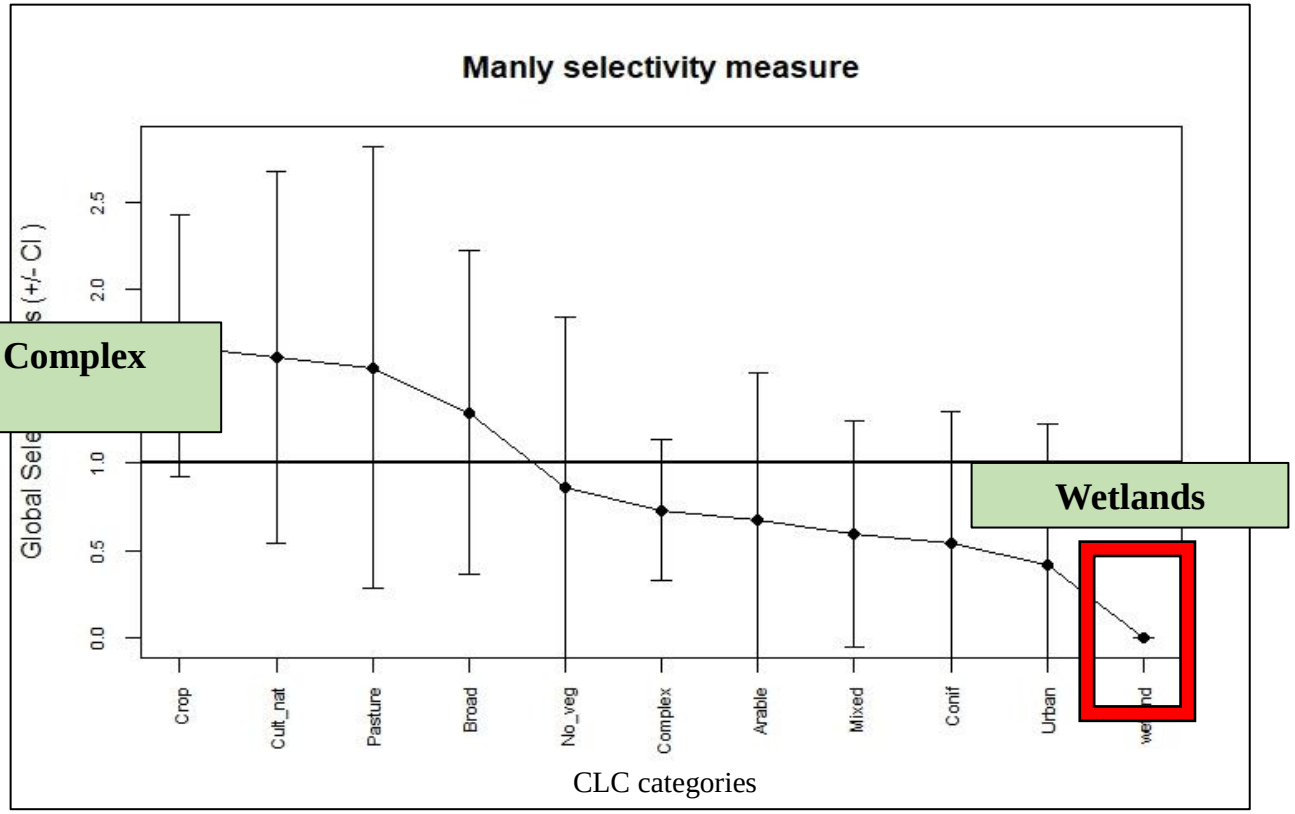
50% Utilization distribution (Core area)

95% Utilization distribution

Mixed forests



Areas without vegetation and Complex cultivation patterns

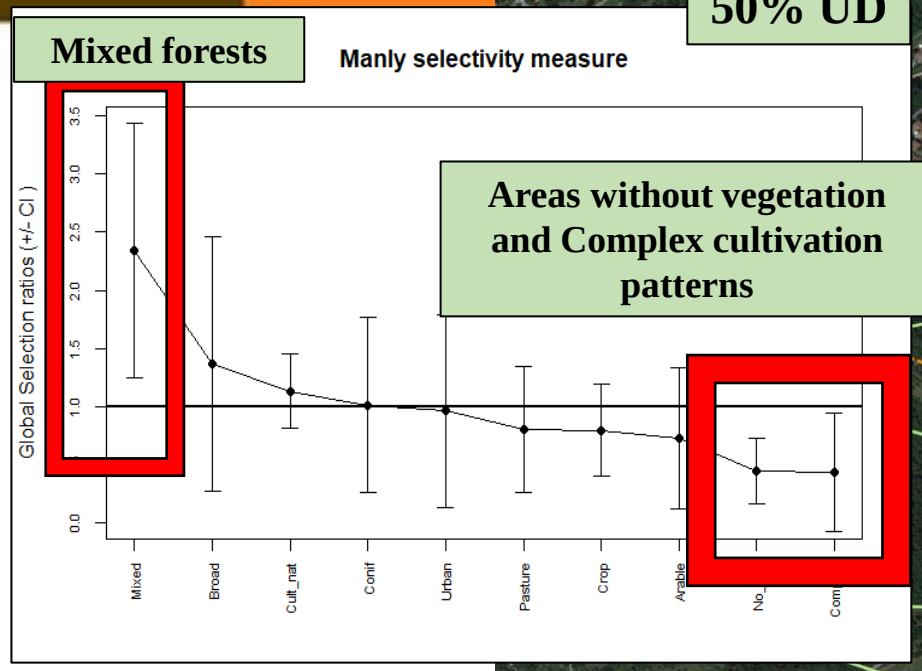


Wetlands

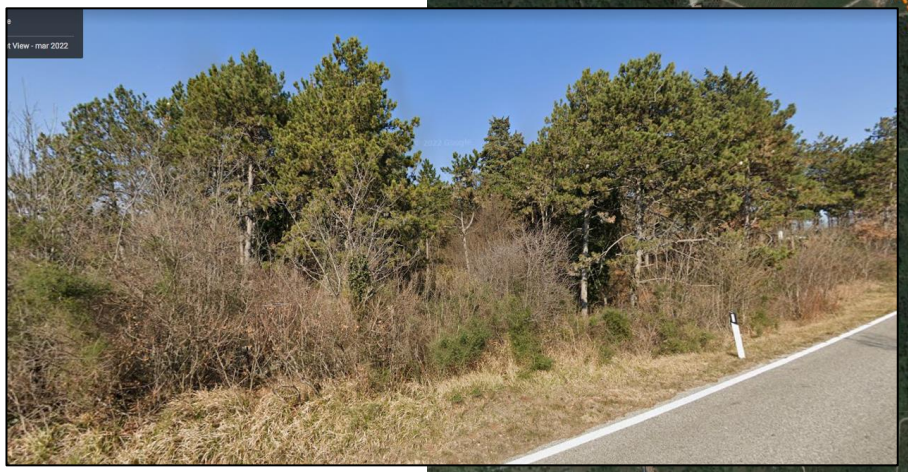
MR3 – Adult and resident

KARST AREA

50% UD



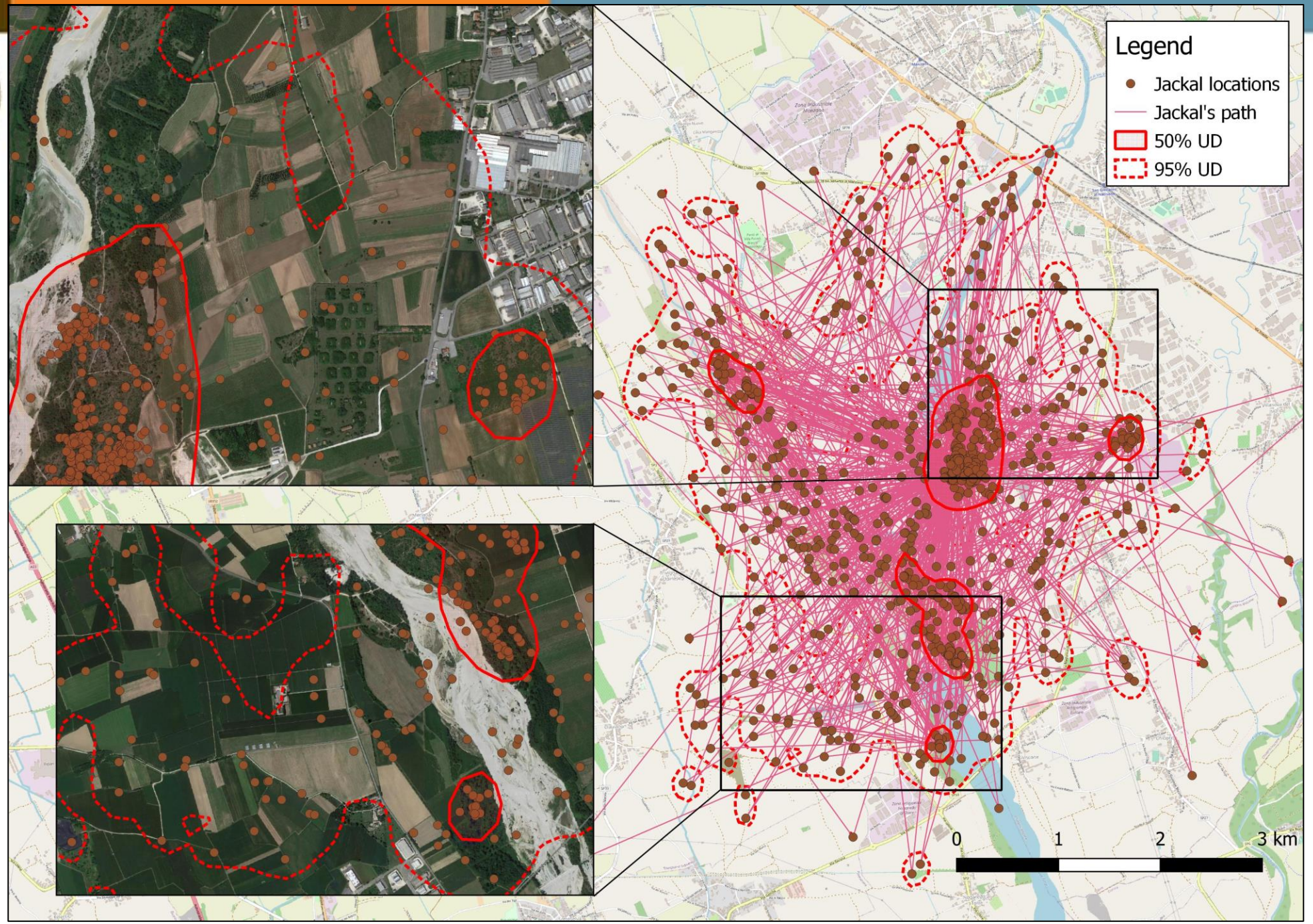
CLC categories



Legend

- Jackal locations
- Jackal's path
- 50% UD
- 95% UD

0 1000 2000 km


Legend
Jackal locations
Jackal's path
50% UD
95% UD
0
1
2
3 km

TAGLIAMENTO RIVER

MD1 – Subadult and disperser

0 100 200 300 400 500 m

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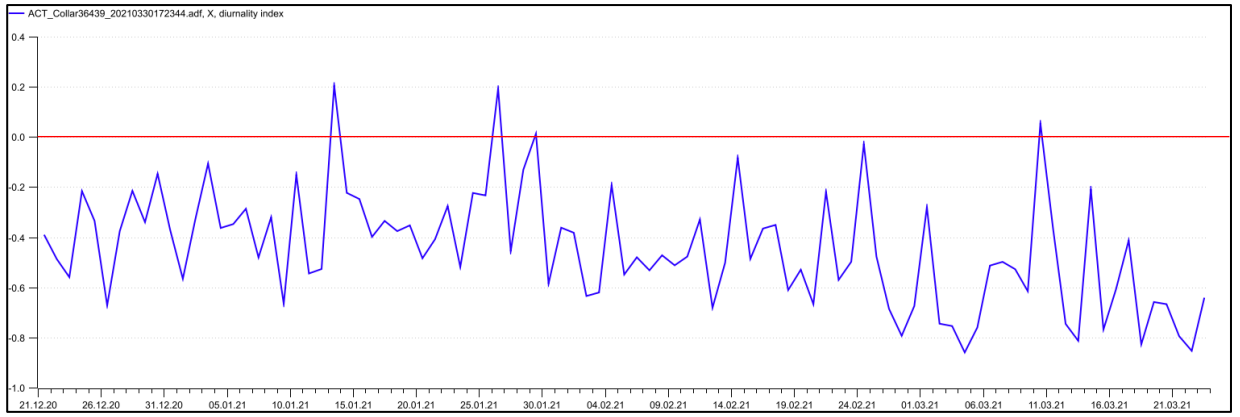
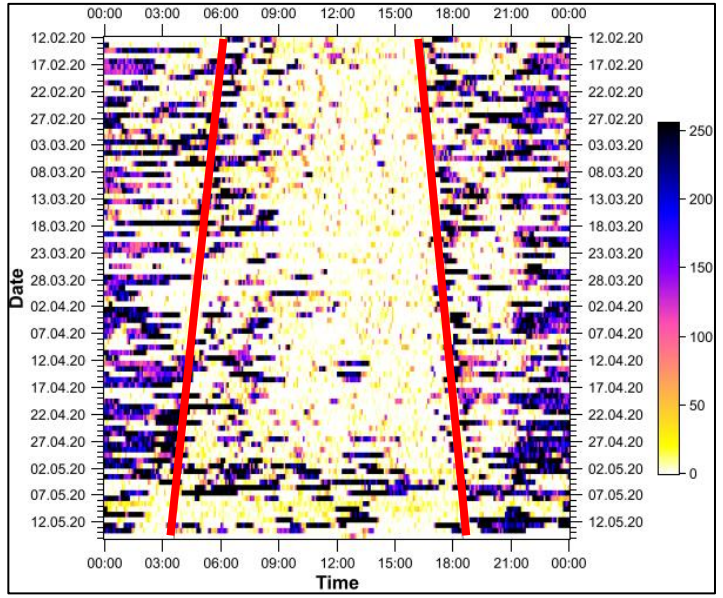
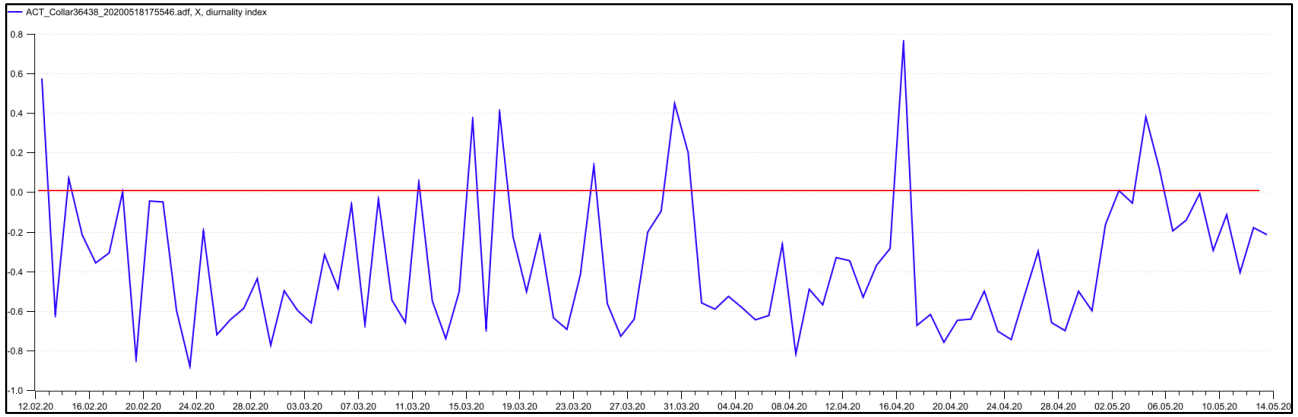
3. Activity Pattern

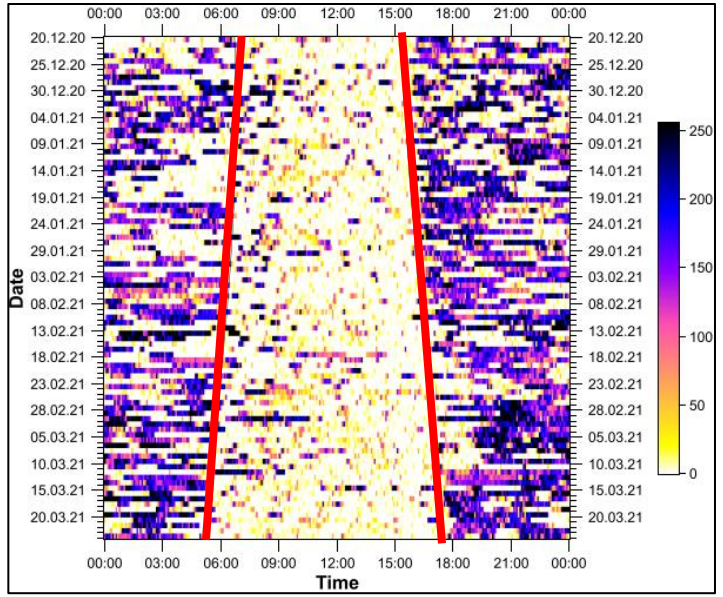
$$DiurnalityIndex = \frac{\frac{c_d}{t_d} - \frac{c_n}{t_n}}{\frac{c_d}{t_d} + \frac{c_n}{t_n}}$$

Hoogenboom et al. (1984)









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Conclusion

Main Limitations:

- Low individual number
- Different monitoring periods
- Different study areas

Strengths:

- First telemetry data in Italy
- High quality data
- Individual monitoring

We point out:

- HR analyses showed high variability but results were similar to other published studies

- **Ecological plasticity** → importance of natural habitats within human dominated landscape→ expansion in Europe

Future perspectives

- Deeper habitat selection analyses→ e.g., Resourse selection functions – Step selection functions
- Collaring more individuals → International research network → e.g., Habitat suitability, exploitation of human resources
- To study interactions with competitors (e.g., wolf, fox, wildcat) and preys (e.g., hare, pheasant, roe deer)

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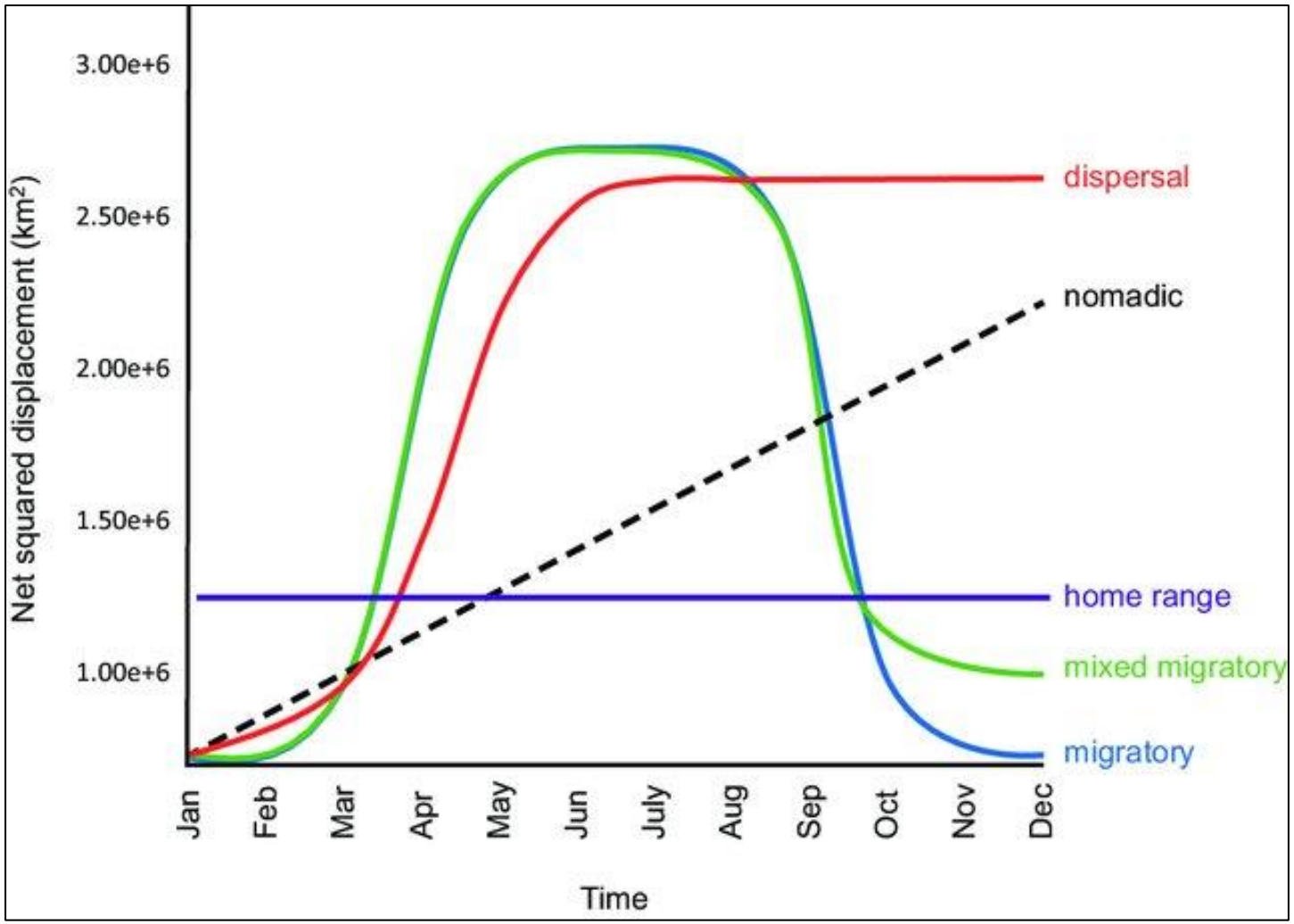
Thank you for the attention


3.00e+6
2.50e+6
2.00e+6
1.50e+6
1.00e+6
Net squared displacement (km²)
dispersal
nomadic
home range
mixed migratory
migratory
Jan
Feb
Mar
Apr
May
Jun
July
Aug
Sep
Oct
Nov
Dec
Time