Beavers and wolves: renewing an old relationship
key study from Central Europe

Aleš Vorel, Oldřich Vojtěch Jr., Oldřich Vojtěch, Jan Mokrý, Jan Horníček,
Matouš Oukropec, Jana Korbelová, Lukáš Žák, Micol Genazzi, Marco Heurich

Czech University of Life Sciences Prague
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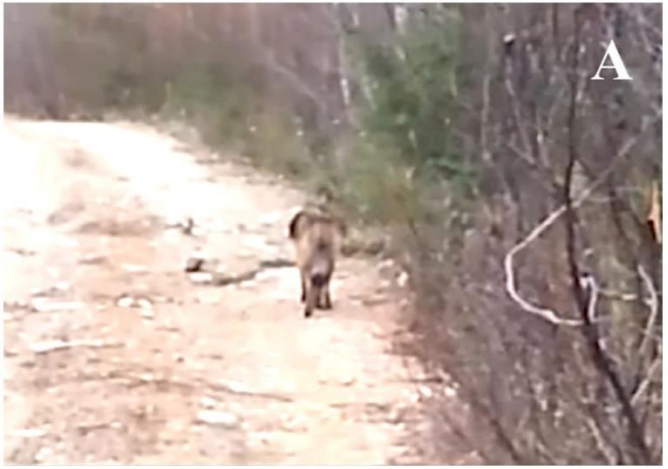

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Research

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Wolves alter the trajectory of forests by shaping the central place foraging behaviour of an ecosystem engineer

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rs can directly and indirectly alter the foraging behaviour of prey direct predation and the risk of predation, and in doing so, initiate effects that influence myriad species and ecological processes. We how wolves indirectly alter the trajectory of forests by constraining tance that beavers, a central place forager and prolific ecosystem r, forage from water. Specifically, we demonstrate that wolves wait ush and kill beavers on longer feeding trails than would be expected n the spatio-temporal availability of beavers. This pattern is driven poral dynamics of beaver foraging: beavers make more foraging d spend more time on land per trip on longer feeding trails that farther from water. As a result, beavers are more vulnerable on feeding trails than shorter ones. Wolf predation appears to be a selec- olutionary pressure propelled by consumptive and non-consumptive isms that constrain the distance from water beavers forage, which in nits the area of forest around wetlands, lakes and rivers beavers alter foraging. Thus, wolves appear intricately linked to boreal forest ics by shaping beaver foraging behaviour, a form of natural disturbance ers the successional and ecological states of forests.

Mammal Review

Mammal Review ISSN 0305-1838

REVIEW

The forgotten prey of an iconic predator: a review of interactions between grey wolves *Canis lupus* and beavers *Castor* spp.

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PLOS ONE

RESEARCH ARTICLE

Where and How Wolves (*Canis lupus*) Kill Beavers (*Castor canadensis*)

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2 Voyageurs National Park, International Falls, Minnesota, United States of America

Europe..

...scarce evidence

Mammal Review

Mammal Review ISSN 0305-1838

REVIEW

Food habits of the world's grey wolves

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William J. RIPPLE *Global Trophic Cascades Program, Department of Forest Ecosystems a Oregon State University, Corvallis, Oregon 97331, USA. Email: bill.ripple@oregonstate.e*

Acta Theriologica 49 (3): 357–367, 2004.
PL ISSN 0001–7051

Food habits of wolves *Canis lupus* in Latvia

Žanete ANDERSONE and Jānis OZOLIŅŠ*

Andersone Ž. and Ozoliņš J. 2004. Food habits of wolves *Canis lupus* in Latvia. Acta Theriologica 49: 357-367.

Diet of wolves *Canis lupus* Linnaeus, 1758 in Latvia was studied from 1997 to 2001 based on 302 scats and 107 stomachs. Wild ungulates (cervids and wild boar *Sus scrofa*) and beaver *Castor fiber* were the dominant prey. Cervids were found in 50% of samples (62% biomass), wild boar in 25% (21% biomass), beavers in 14% (12% biomass). Wolves

Europe..

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Original investigation

Responses of wolf feeding habits after adverse climatic events in central-western Belarus☆

Vadim Sidorovich[a], Annik Schnitzler[b,*], Christophe Schnitzler[c], Irina Rotenko[a], Yulia Holikava[a]

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Table 2. Wolf diet as a function of age (adult vs pups). Results are expressed as the percentage of prey biomass consumed (% CB).

Age	Adults	Pups	Sigificance
Group count	52	16	p<0.05
Number of scats	6973	1111	
Beaver	27.1±11.8	51.8±17.7	*
Roe deer	24.8±12.1	16.1±9.9	*
Wild boar	20.8±9.9	12.8±7.9	*
Red deer/elk	15.3±12.2	3.7±4.9	*
Hares	3.0±3.2	2.9±4.0	NS
Small carnivores	3.5±5.7	0.4±0.8	*
Birds	0.5±0.8	0.7±1.2	NS
Domestic dog	1.6±1.8	0.0±0.2	*
Domestic ungulates	1.8±3.9	1.3±3.6	NS
Small mammals	0.6±0.9	9.7±21.2	*
Plant matter	0.8±0.6	0.8±0.9	NS

Ethology Ecology & Evolution, 2019
Vol. 31, No. 6, 506–513, https://doi.org/10.1080/03949370.2019.1624278

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The best snacks for kids: the importance of beavers *Castor fiber* in the diet of wolf *Canis lupus* pups in north-western Poland

Robert W. Mysłajek[1,*], Patrycja Tomczak[2,3], Katarzyna Tołkacz[4], Maciej Tracz[5], Magdalena Tracz[5] and Sabina Nowak[2]

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[2]*Association for Nature "Wolf", Twardorzeczka, Cynkowa 4, Lipowa 34-324, Poland*
[3]*Institute of Romance Studies, Faculty of Modern Languages and Literature, Adam Mickiewicz University in Poznań, Al. Niepodległości 4, Poznań 61-874, Poland*

Table 1.

Diet composition of adult wolves and their pups in Drawa Forest, 2010–2015. %O: percentage occurrence in scats, %B: percentage of total biomass consumed. (+) Contribution to diet < 0.05%.

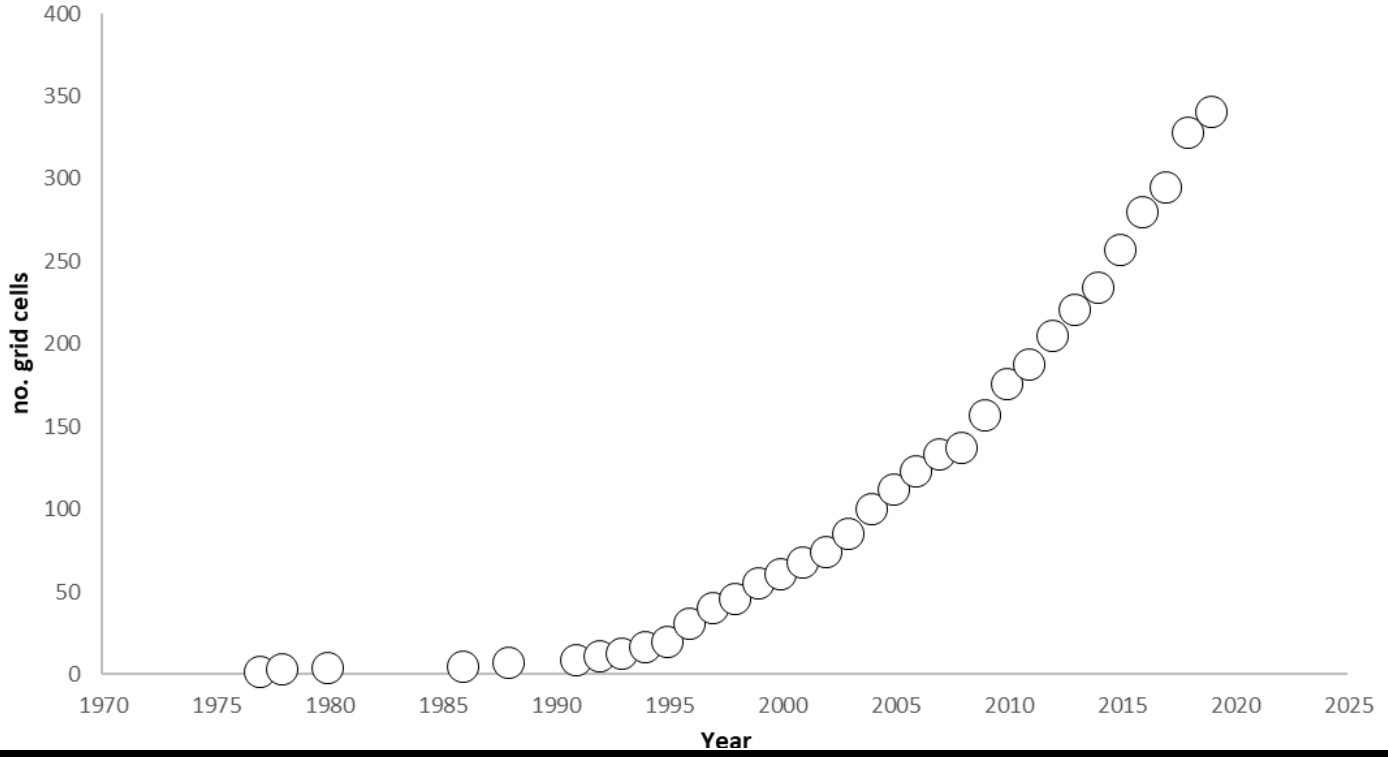
	Adult wolves						Wolf pups	
	spring-summer		autumn-winter		total		spring-summer	
Food item	%B	%O	%B	%O	%B	%O	%B	%O
Red deer *Cervus elaphus*	36.5	33.9	40.5	44.0	37.8	37.0	21.5	21.5
Roe deer *Capreolus capreolus*	39.9	44.3	55.5	46.0	45.0	44.8	46.7	48.1
Fallow deer *Dama dama*	3.9	4.3	–	–	2.6	3.0	–	–
Undetermined cervids	2.5	2.6	0.4	6.0	1.8	3.6	6.8	12.7
Wild boar *Sus scrofa*	9.7	9.6	3.5	14.0	7.6	10.9	1.3	1.3
Wild ungulates total	92.4	93.0	100.0	100.0	94.8	93.9	76.3	75.9
European hare *Lepus europaeus*	2.6	5.2	–	–	1.8	3.6	3.9	5.1
European beaver *Castor fiber*	4.6	6.1	–	–	3.1	4.2	19.8	24.1
Small rodents	–	–	+	2.0	+	0.6	–	–
Birds	–	–	+	2.0	+	0.6	–	–
Plant material	+	14.8	+	6.0	+	12.1	+	27.8
Plastic, rope	–	1.7	–	–	–	1.2	–	2.5
Number of scats analysed	115		50		165		79	
Biomass of food consumed [kg]	168.3		82.0		250.3		17.9	
Breadth of food niche B	1.16		1.00		1.11		1.57	

Central Europe is undergoing dynamic changes

Estimated trend of beavers (CZE)

2 988 terr. (SE ± 836 ter., min=2 152, max=3 867)

15 182 inds. (≈ SE ± 4 400, min=10 782, max=19 823)



Documented no. of wolves (GER)

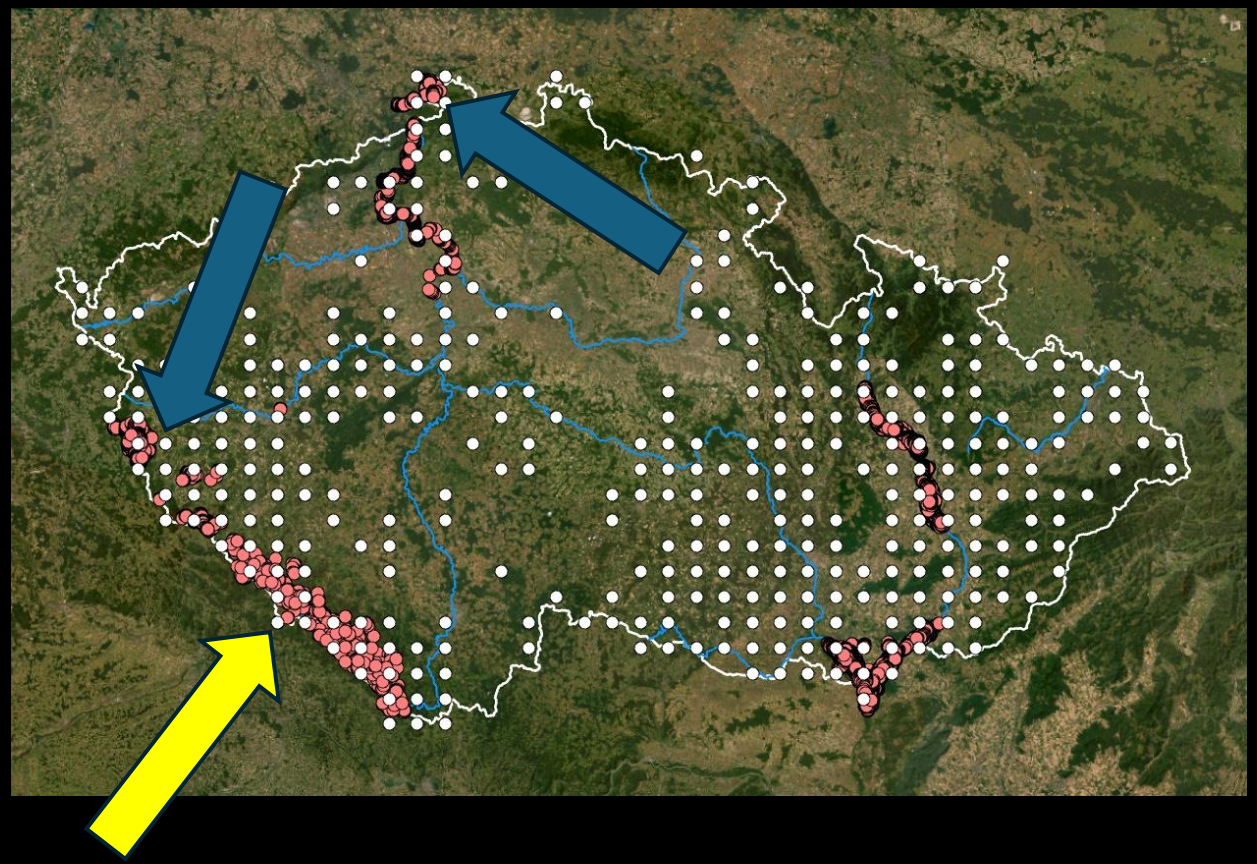
Rudel Paare Einzeltiere — Anzahl und Summe

M. Jahr	Territorien			Σ
2024/25	73	17	9	99
2023/24	209	48	18	275
2022/23	185	58	22	265
2021/22	163	58	23	244
2020/21	159	39	22	220
2019/20	130	47	11	188
2018/19	105	42	12	159
2017/18	76	42	4	122
2016/17	60	23	3	86
2015/16	47	21	4	72
2014/15	32	19	6	57
2013/14	25	12	4	41
2012/13	17	12	3	32
2011/12	14	5	4	23
2010/11	7	7	6	20
2009/10	7	2	4	13
2008/09	5	3	4	12
2007/08	3	3	2	8
2006/07	3	0	1	4
2005/06	2	1	0	3
2004/05	1	2	0	3
2003/04	1	0	1	2
2002/03	1	0	1	2
2001/02	1	0	0	1
2000/01	1	0	0	1

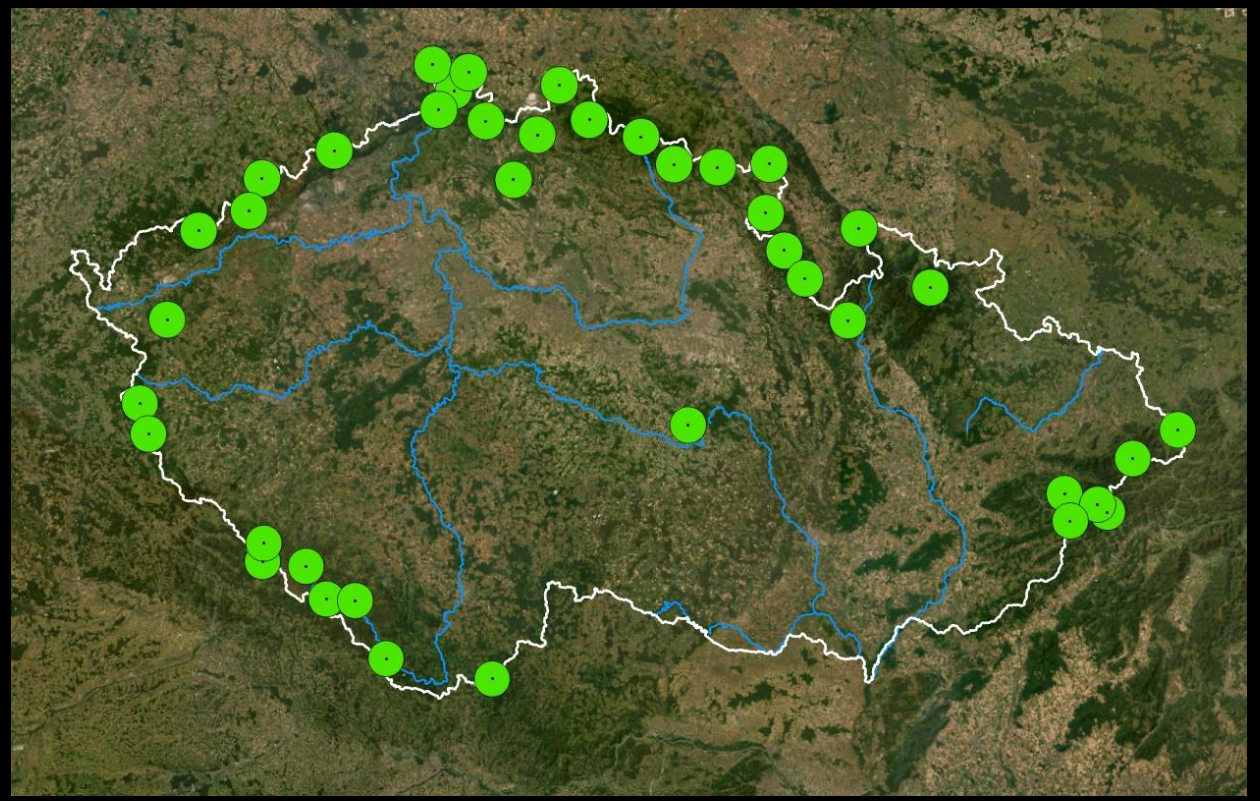
Quelle: Abfrage der DBBW-Datenbank am 15.09.2025 um 08:00:49

Czech Republic

Beaver distribution in 2020/21



Wolf terr. distribution in 2022/23



First close encounters records in Czech Rep. began in 2015 (wolf occupation from 2011)

AGENTURA OCHRANY PŘÍRODY A KRAJINY ČESKÉ REPUBLIKY

NATIONALPARK Bayerischer Wald

VOYAGEURS WOLF PROJECT

Lupus Institute

General research questions:

1. How important is the beaver in wolves' diet?
2. How does the predation affect the beaver biology?

Specific aims:

1. General description of species interactions
    a. Wolves' presence in Beaver territories
    b. Beavers in Wolves' diet
2. Impacts on beaver biology
    c. Beaver Territoriality
    d. Beaver Activity Patterns
    e. Beaver Foraging
    f. and Demography

Methods

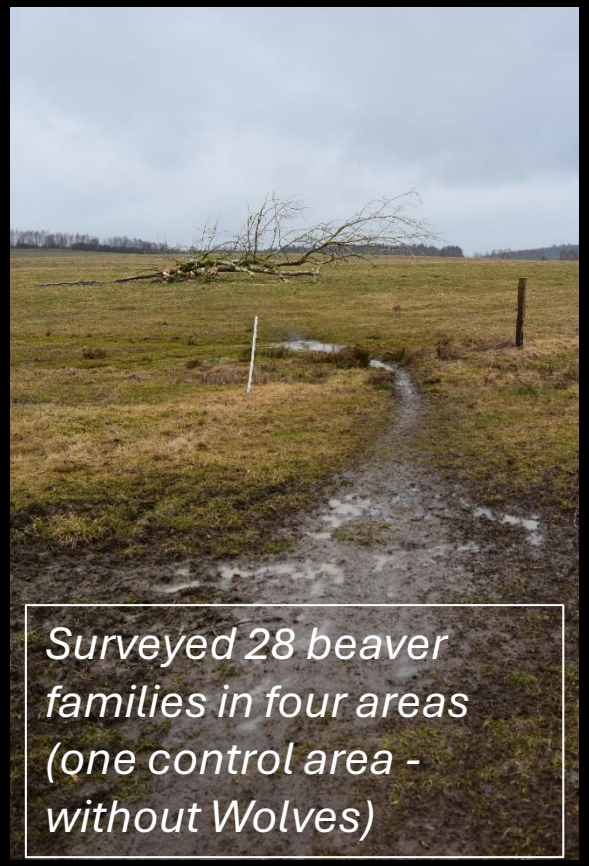
- Wolf GSM telemetry
- Beaver VHF telemetry
- Wolf scat analysis
- Kill sites evidence
- Beaver foraging survey

Methods

…

- Beaver foraging survey

  Has the consideration of predatory risk by beavers changed following the reoccupation of wolves?



Surveyed 28 beaver families in four areas (one control area - without Wolves)

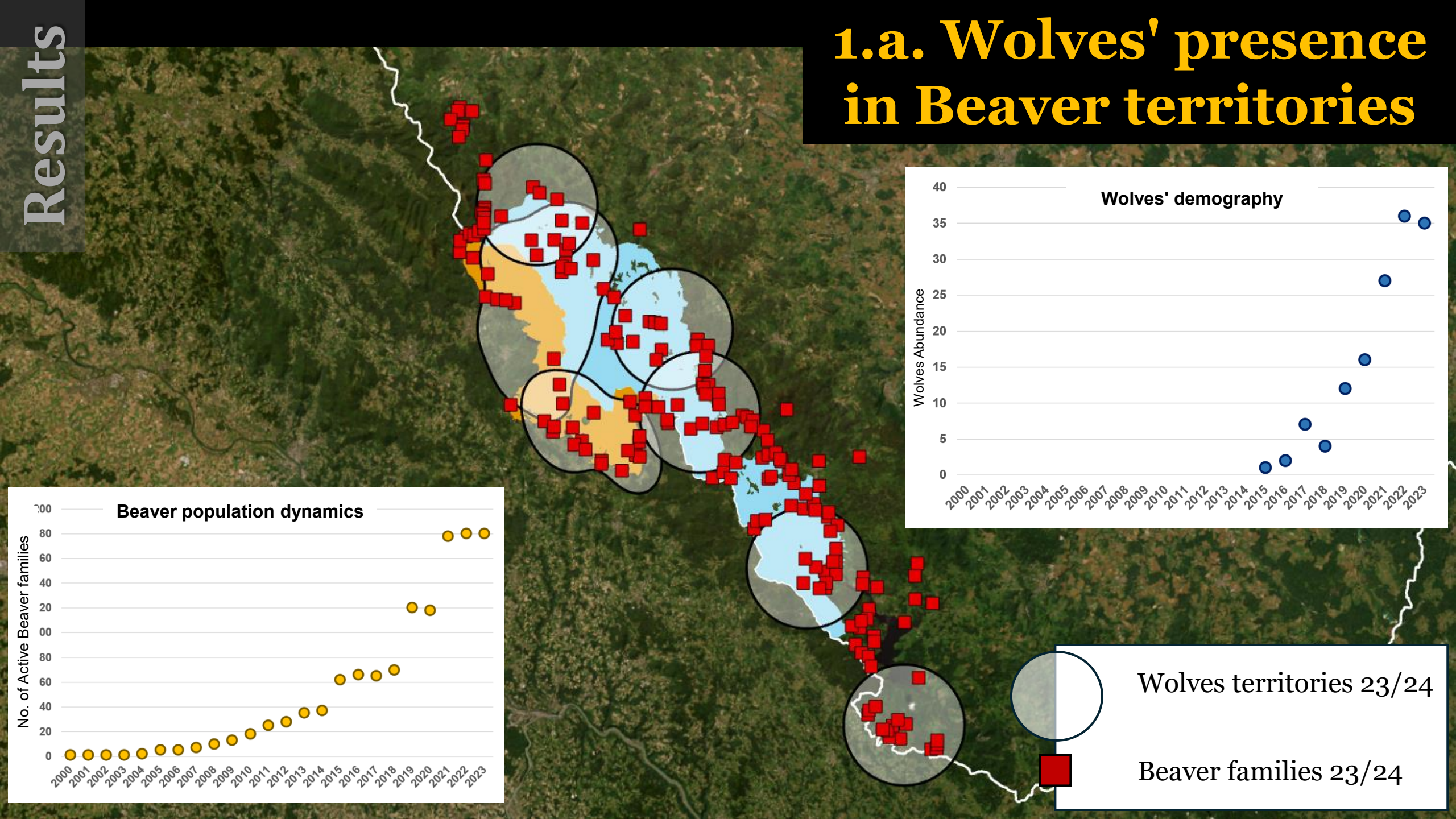
foraging.distance.1 ??? <-> foraging.distance.2

foraging.distance.1

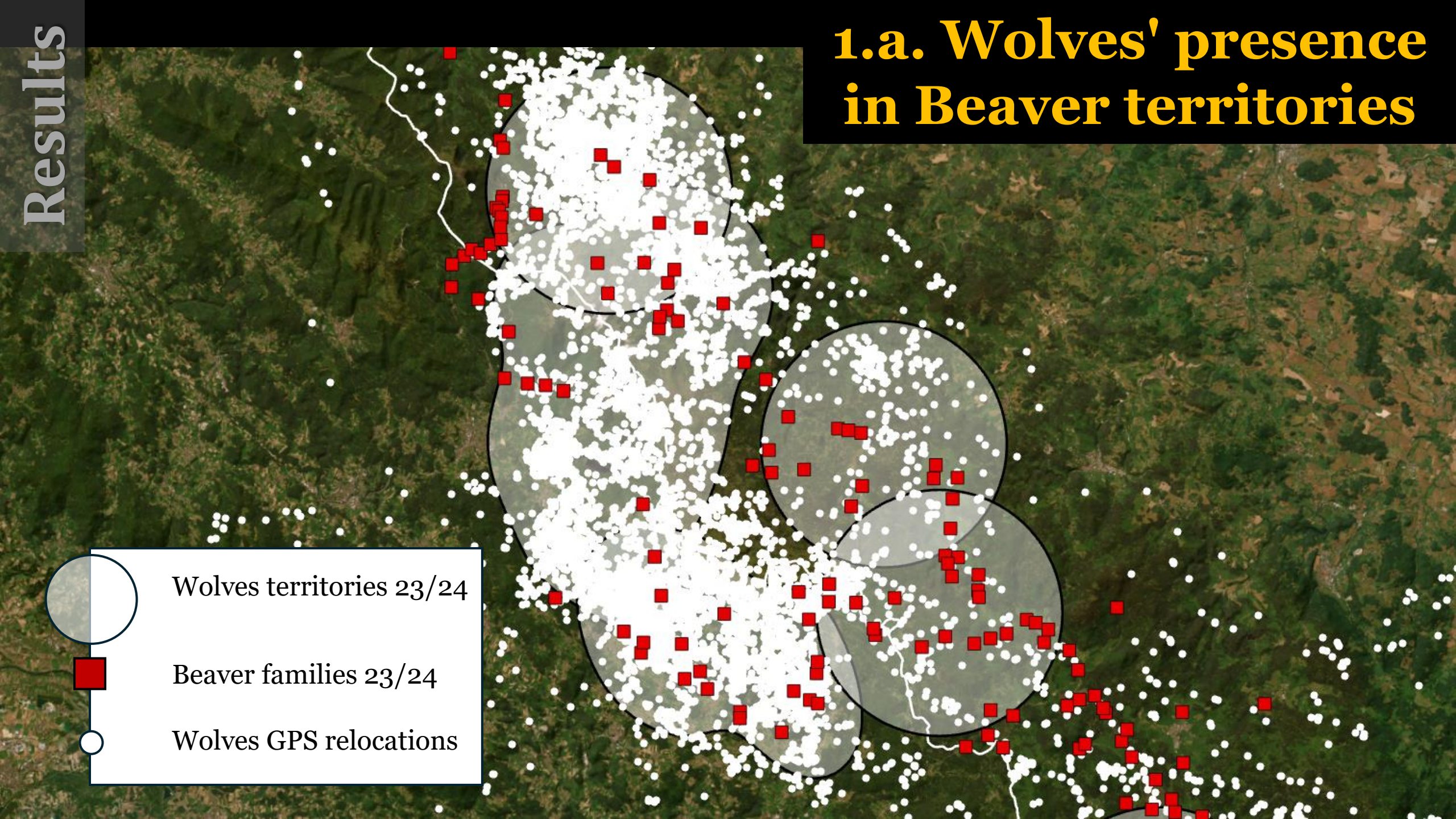
foraging.distance.2

Results

1.a. Wolves' presence in Beaver territories



1.a. Wolves' presence in Beaver territories

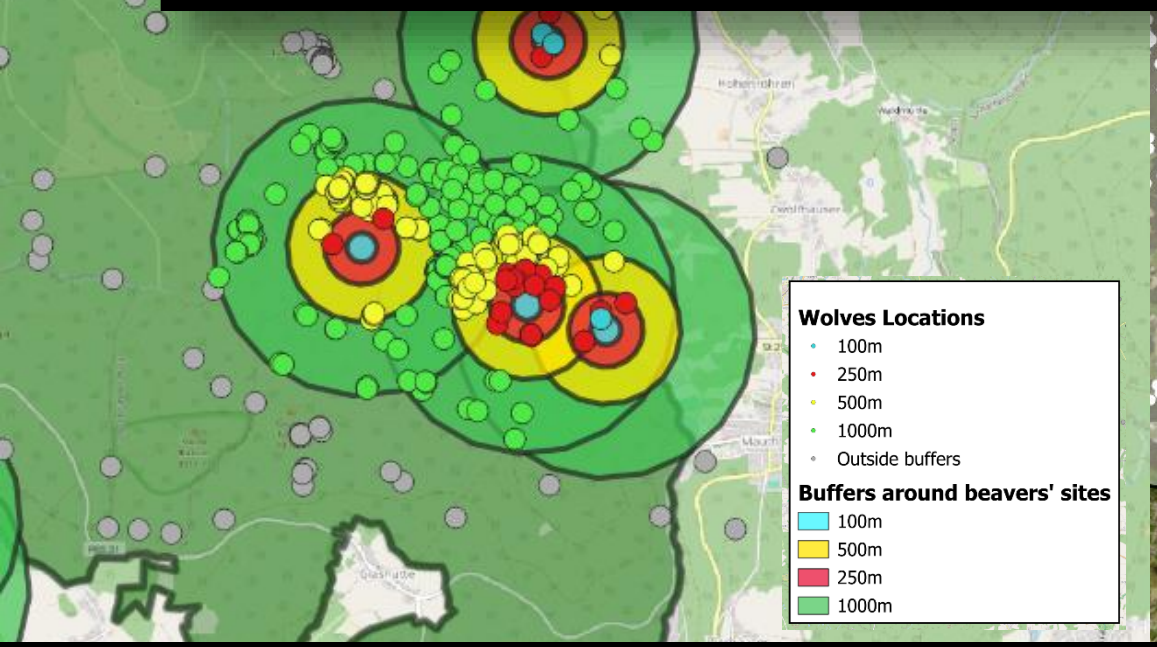


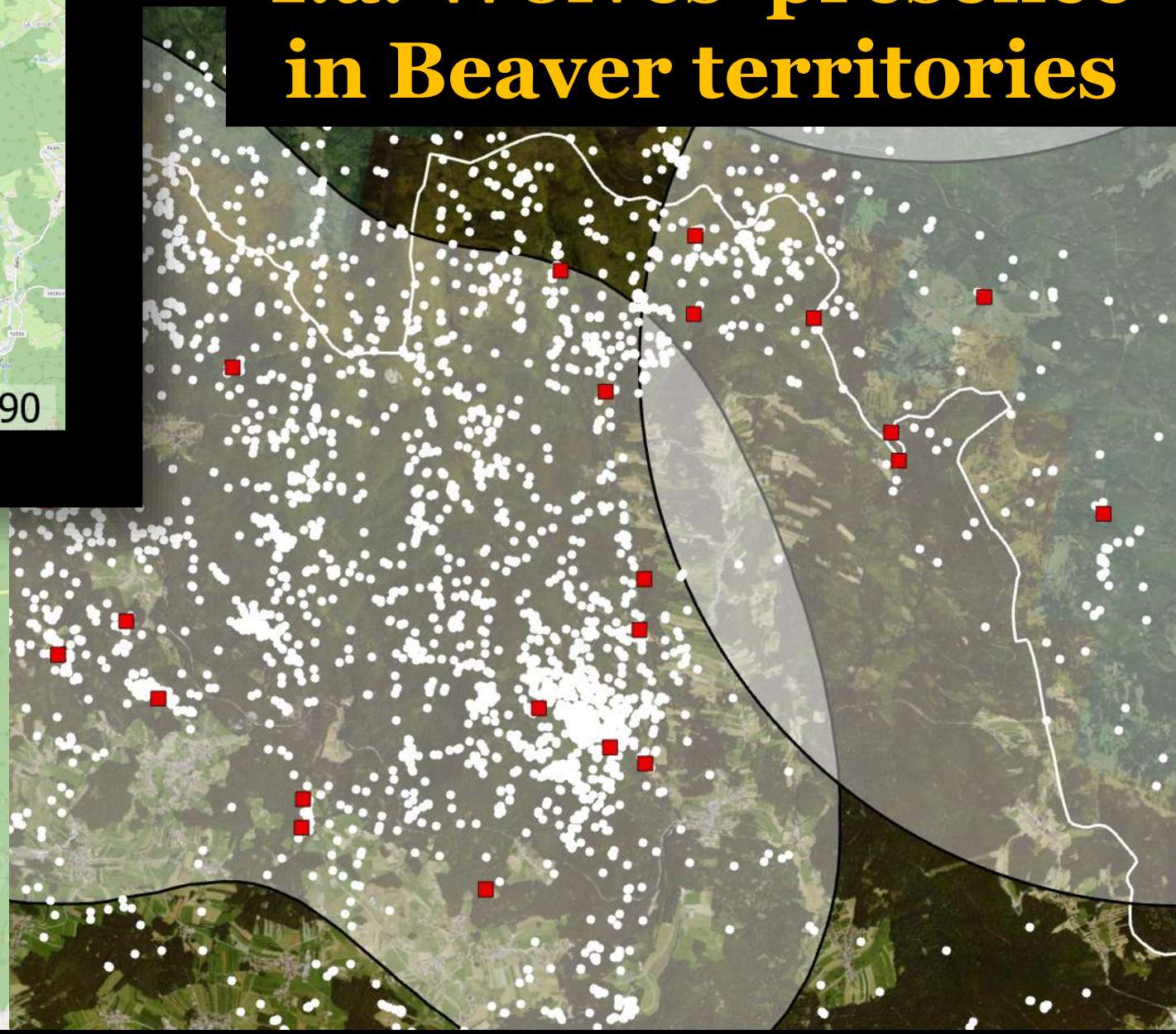
Results

1.a. Wolves' presence in Beaver territories

Buffers(m)	No. of Sarah's locations
100	19
250	155
500	823
1000	2,611

Total number of Sarah's locations = 2,990





Spatial analysis of collar relocations (Sarah) in buffers around beavers' sites

Period: 01-2021 03-2025		*Cervus elaphus*	***Castor fiber***	*Capreolus capreolus*	*Sus scrofa*	*Ovis gmelini*	*Lepus europaeu*	*Aves*	*Cervidae*	*Unknown*
Evzen	RUD	19	**0**	0	0	0	0	0	0	2
Mirecek	RUD	9	**4**	0	0	0	0	0	0	2
Nina	RUD	3	**0**	0	0	0	0	0	0	0
Sarah	LUS	13	**2**	2	0	0	0	1	0	5
Stepanka	PAN	14	**0**	2	1					
Vojta	BOR	2	**0**	0	0					
Zina	SRN	7	**0**	1	1	0	0	0	0	0
Winter		67	**6**	5	2	3	3	1	0	9
Vojta	RUD	0	**0**	0	0	0	0	0	0	0
Evzen	RUD	8	**0**	2	2	0	0	0	1	5
Mirecek	RUD	3	**5**	2	1	0	0	0	0	0
Nina	LUS	0	**0**	0	0	0	0	0	0	0
Sarah	PAN	3	**2**	1	0	0	0	1	0	4
Stepanka	BOR	3	**0**	0	1	1	0	0	0	0
Zina	SRN	0	**0**	0	0	0	0	0	0	0
Summer		17	**7**	5	4	1	0	1	1	9
Proportion		59.6%	9.2%	7.1%	4.3%	2.8%	2.1%	1.4%	0.7%	12.8%
Total		**84**	**13**	**10**	**6**	**4**	**3**	**2**	**1**	**18**

Beavers on Wolves Kill Sites

1.b. Beavers in Wolves' diet

Results

territory	*SRN*	***RUD***	*VYS*	*FLA*	*LHE*	*LUH*	*HHW*	*CUN*	*Total*
No. scat samples	89	61	156	52	80	73	113	110	734
Capreolus capreolus	0.0	8.2	37.6	28.0	30.6	23.7	35.2	64.0	32.9
Sus scrofa	20.6	13.0	1.4	4.8	17.7	33.1	48.8	23.3	12.1
Cervus elaphus	60.4	49.4	51.3	52.1	44.2	30.9	0.0	0.2	43.7
Cervus dama	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0
Ovis musimom	0.7	8.2	0.0	0.0	0.0	0.0	0.0	0.2	0.0
Cervidae indet.	0.0	16.1	0.0	0.0	0.0	0.2	0.0	1.8	0.1
Medium size mammals	**3.0**	**2.7**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
Small mammals	0.3	0.0	0.0	0.0	0.0	0.1	0.5	0.0	0.0
Livestock	0.0	0.0						7.8	1.6
Mammalia non-det.	0.0	0.0					3	0.0	9.4
Aves	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0
Ichthyes	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Vegetation	0.6	0.9	0.0	0.0	0.0	0.0	0.0	0.1	0.0
Other food	1.7	25.2	9.7	15.1	7.5	12.1	15.8	10.1	11.2

Beavers in Wolves scats

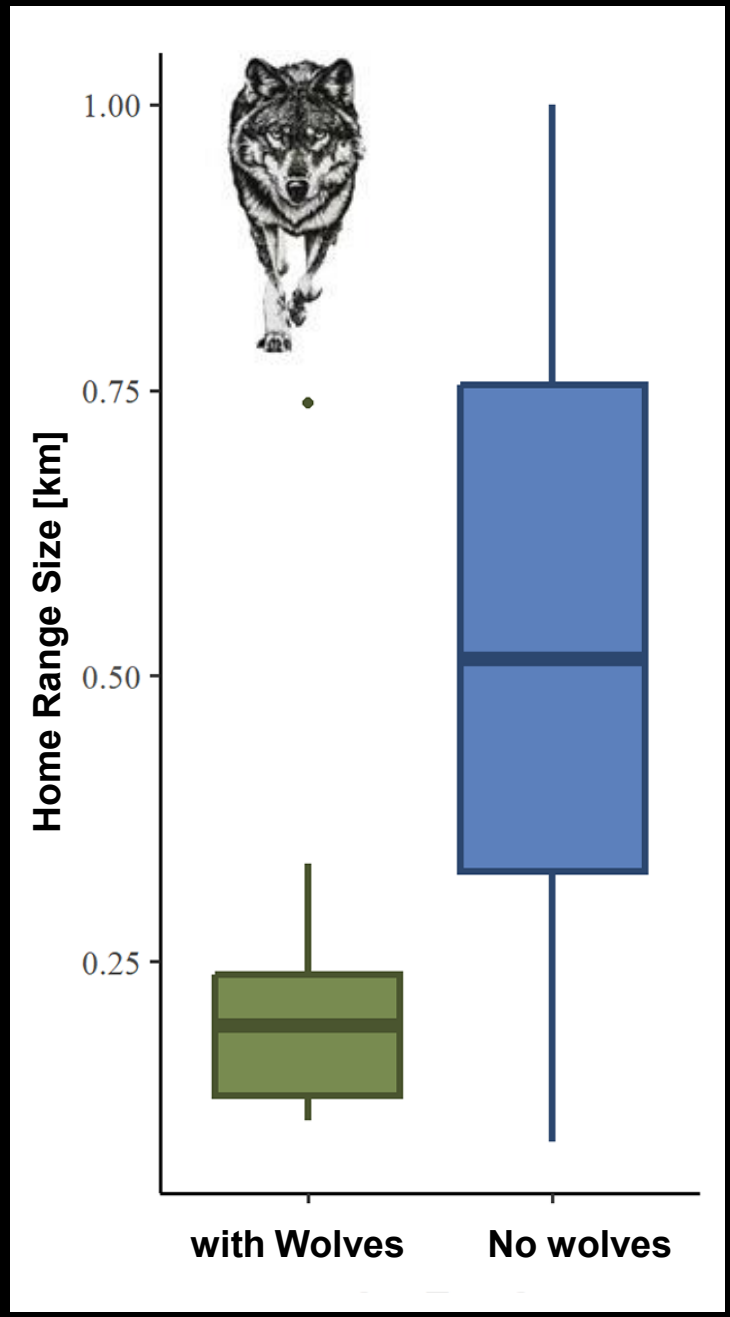
2.c Beaver territoriality

Results

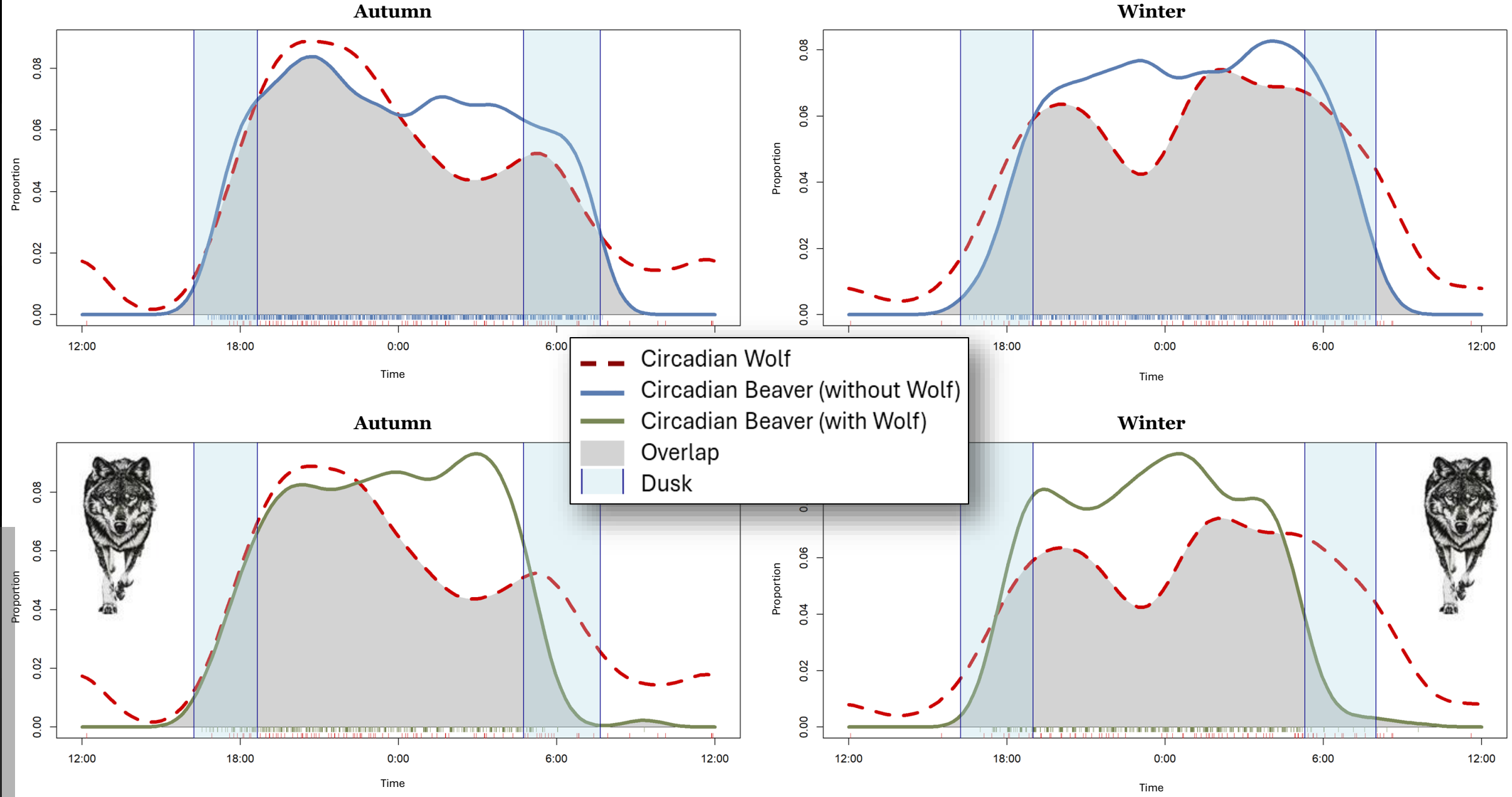
The wolves have squeezed the beaver HomeRanges by 2.27 times

HR Size (without wolves): mean 752.8 ± 420.4 m
HR Size (with Wolves): mean 332.2 ± 250.7 m

t-test:
t = -2.9385; p = 0.0078



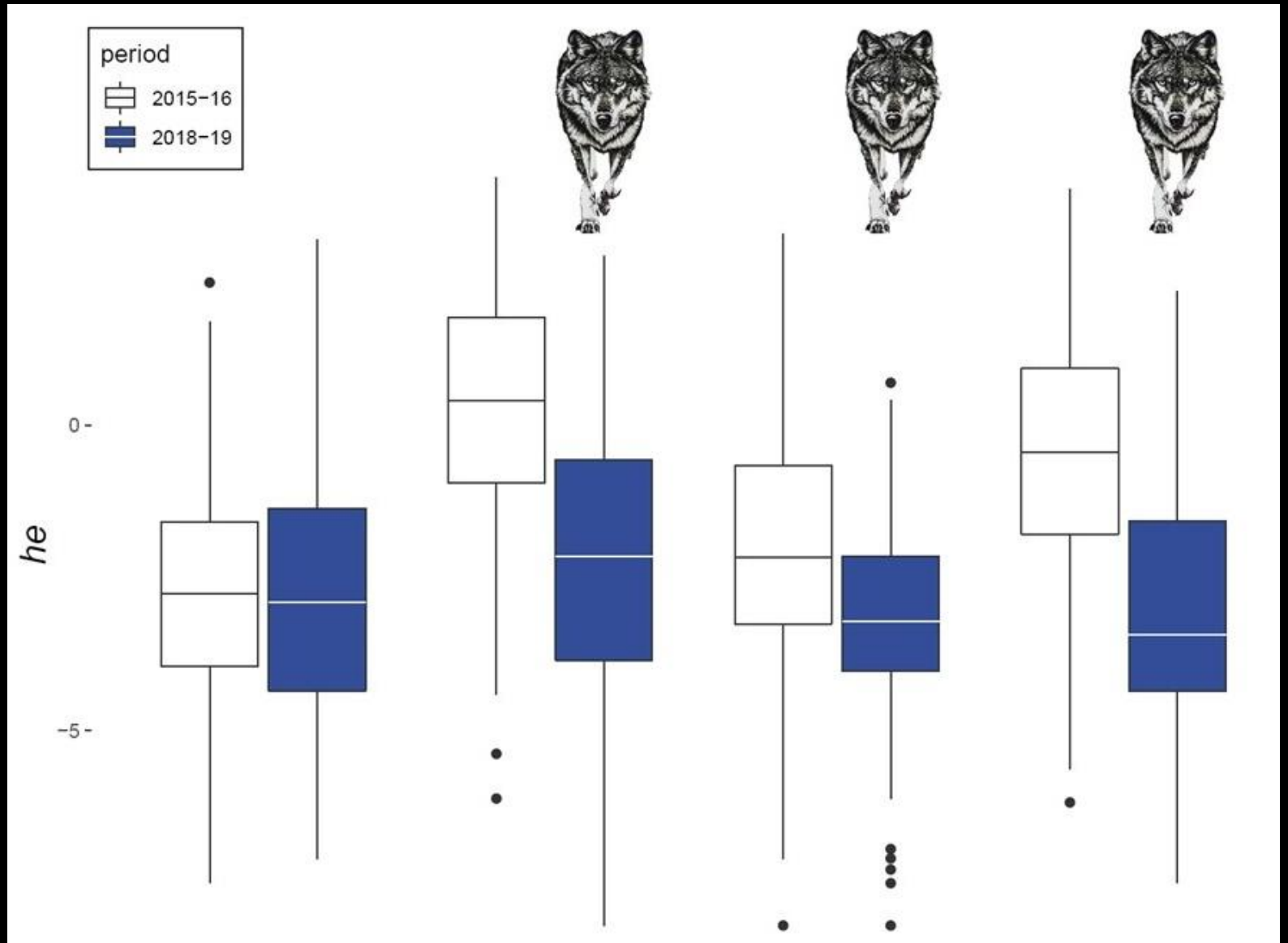
2.d Beaver Activity Patterns



Results

2.e Beaver Foraging Patterns

Under predation risk beavers reduced foraging distances

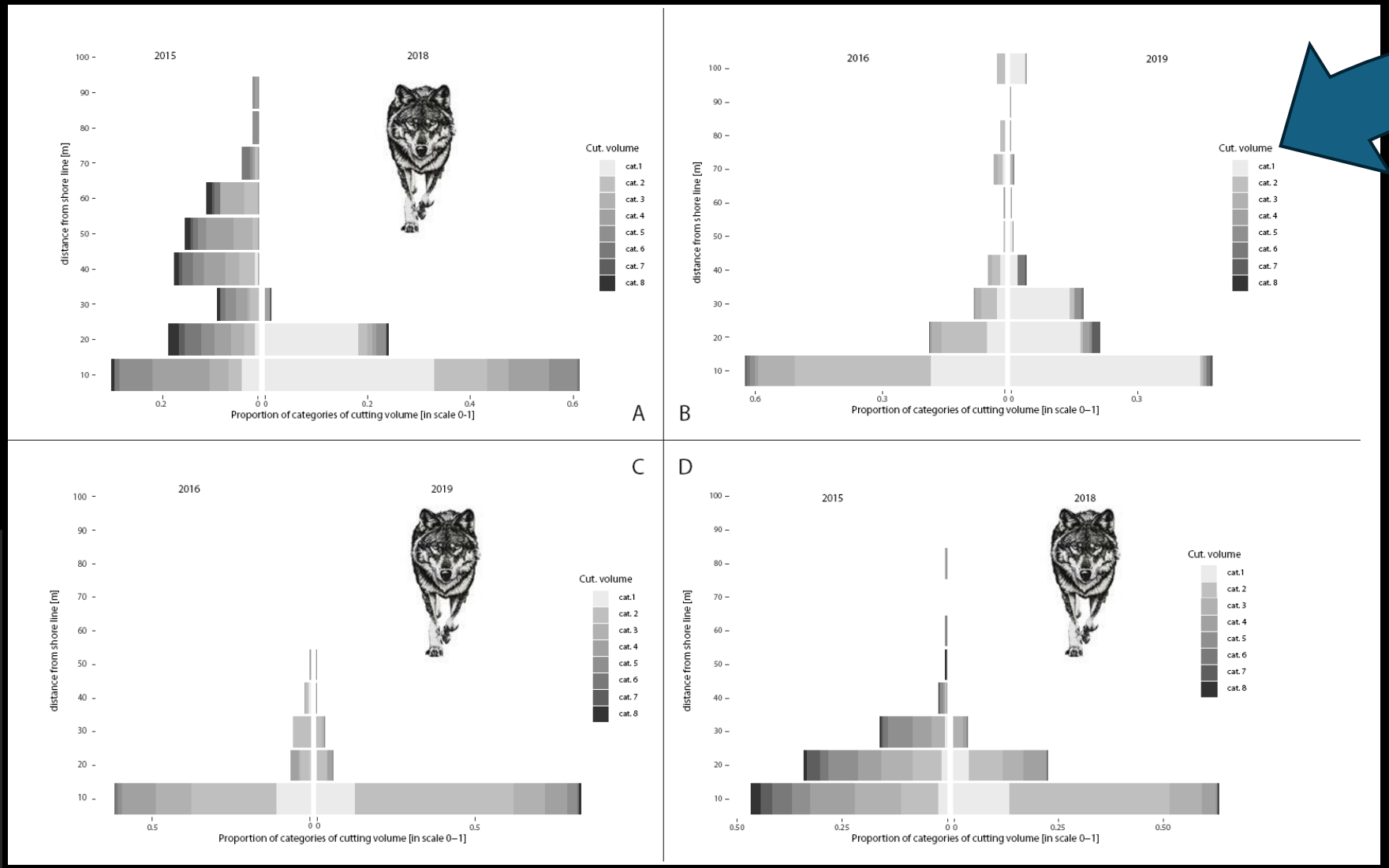


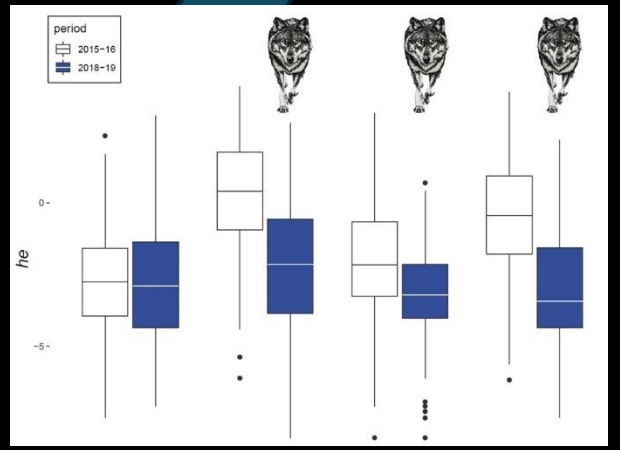
Surveyed 28 beaver families in four areas (one control area - without wolves)

Results

2.e Beaver Foraging Patterns

Under predation risk - beavers reduced foraging distances and remodified volume of cut trees (following Central Place Foraging)



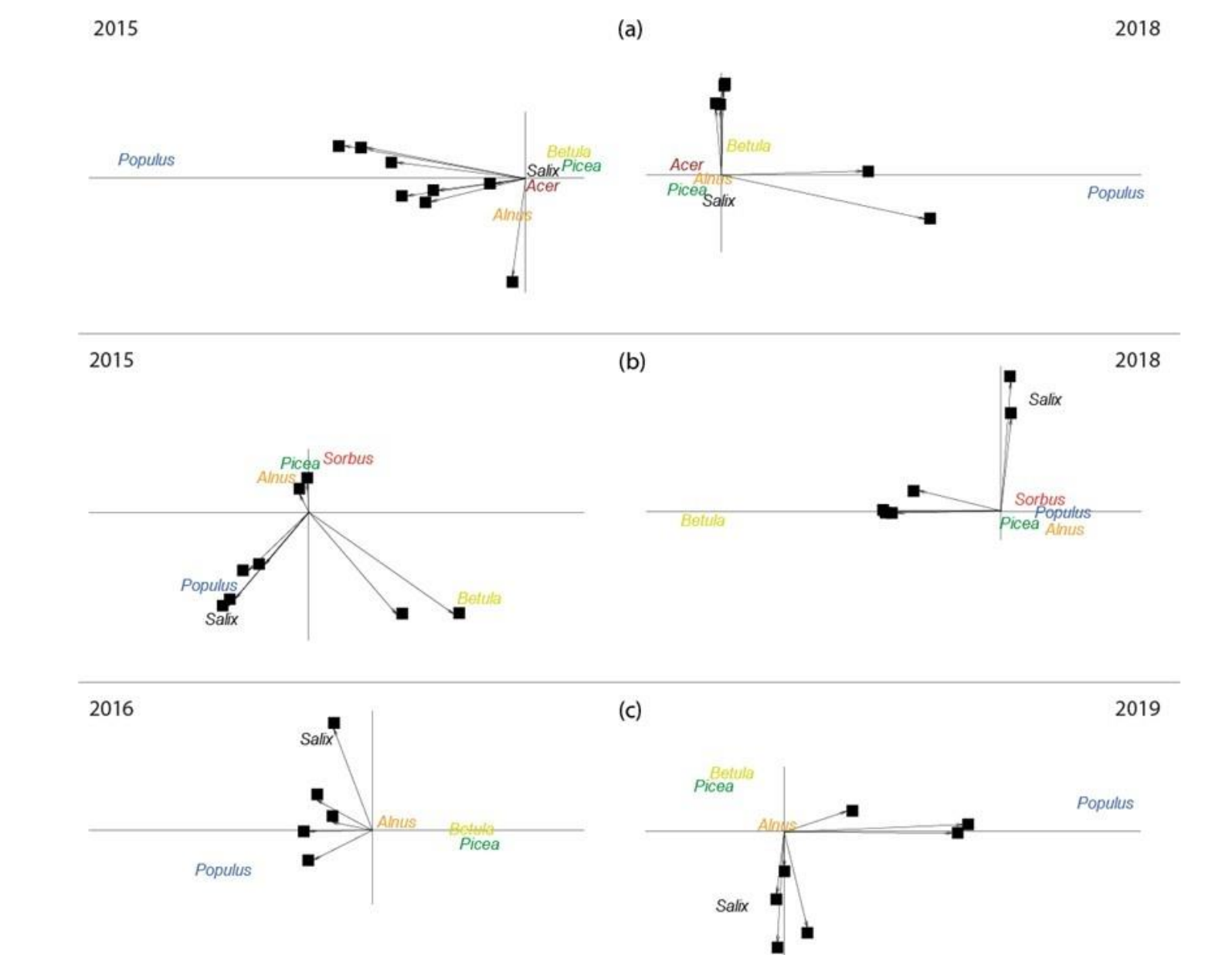


Surveyed 28 beaver families in four areas (one control area - without wolves)

Results

2.e Beaver Foraging Patterns

Under predation risk beavers newly follow more energetically rich trees

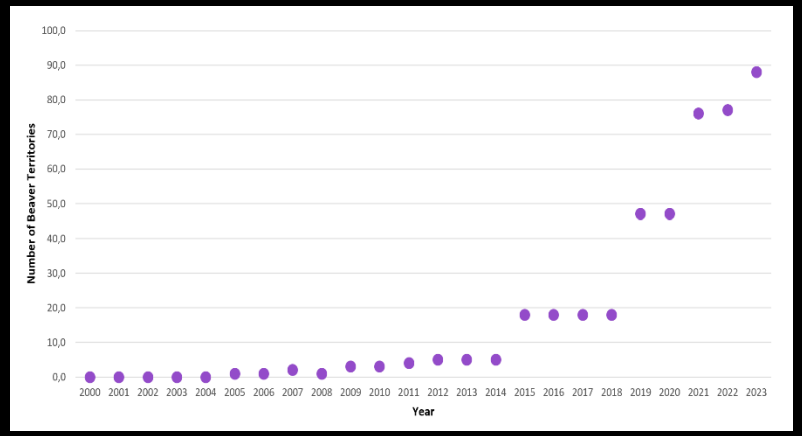


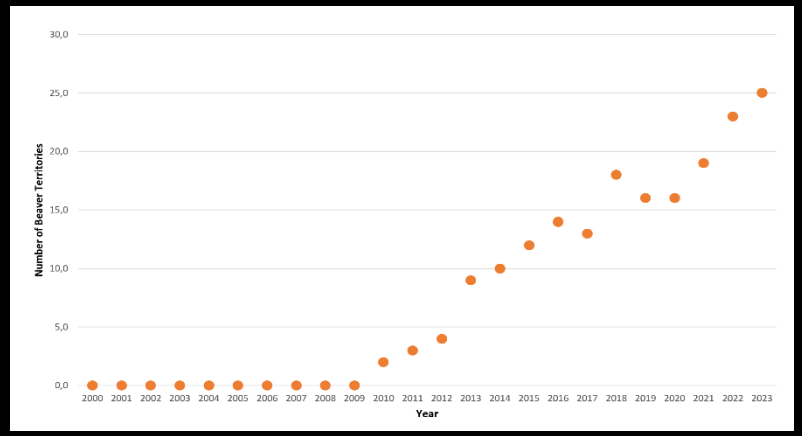
Surveyed 28 beaver families in four areas (one control area - without wolves)

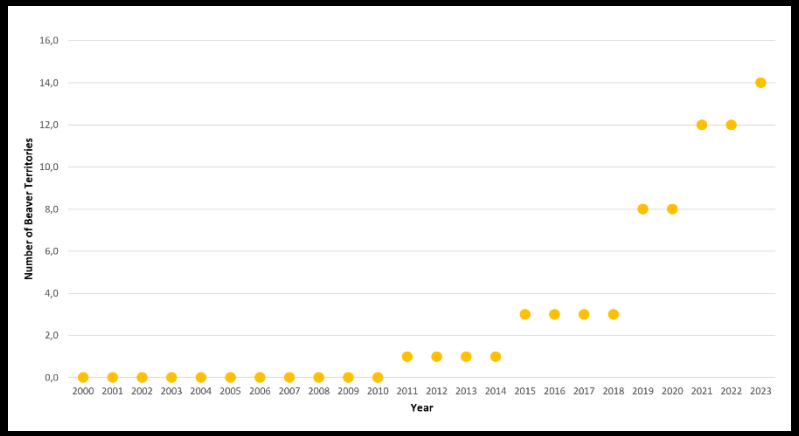
Results

2.f Beaver Demography

As a result –Beaver demography in different watersheds



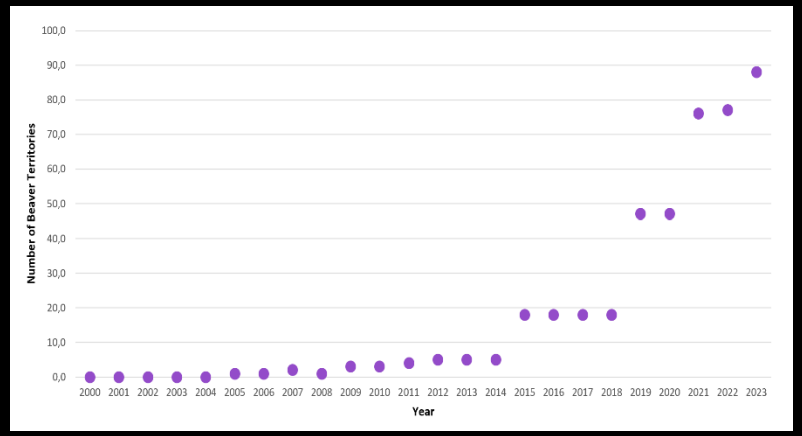


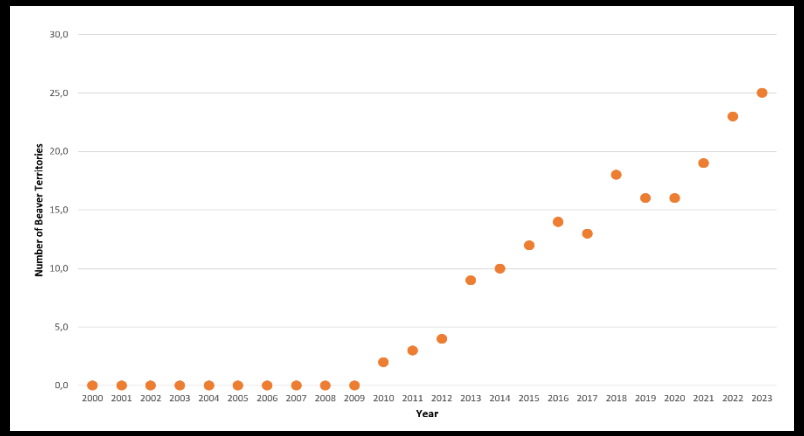


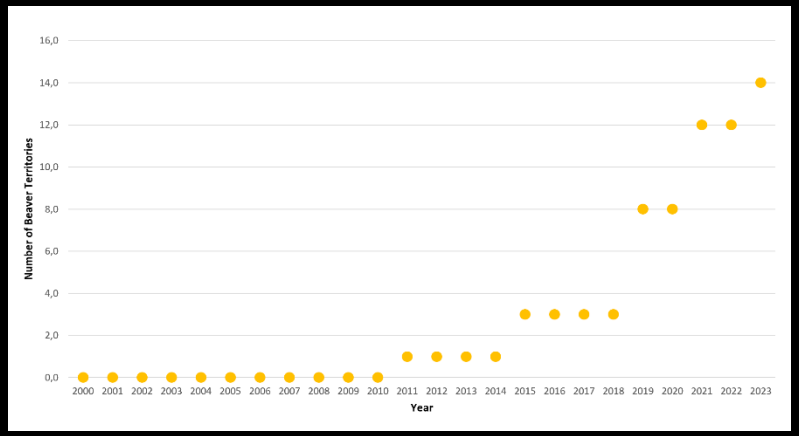
Results

2.f Beaver Demography

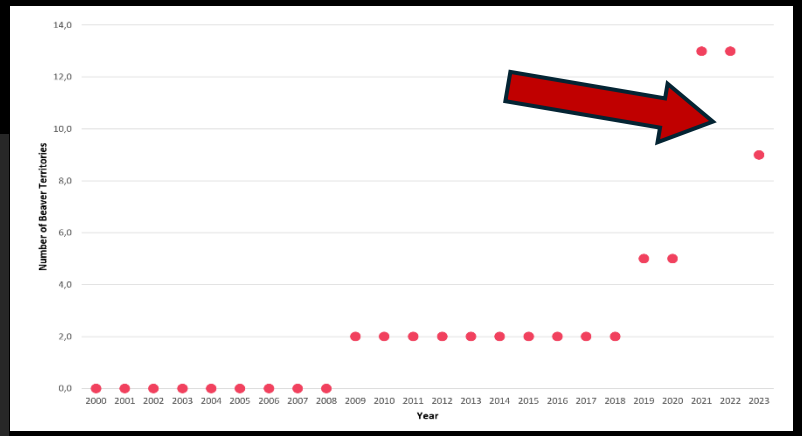
As a result –Beaver demography in different watersheds

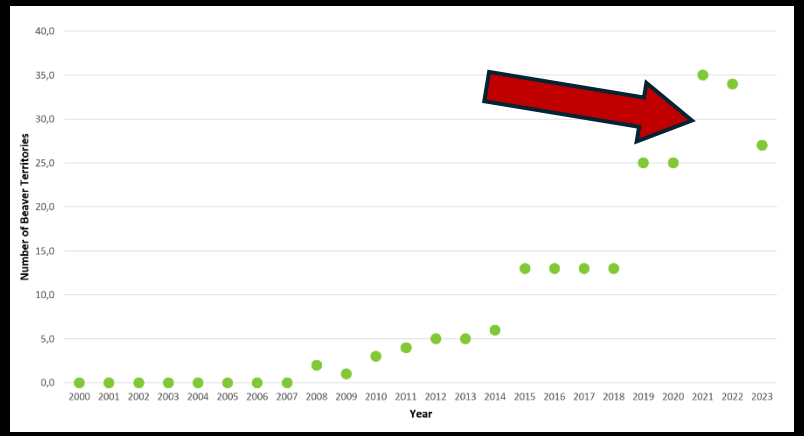


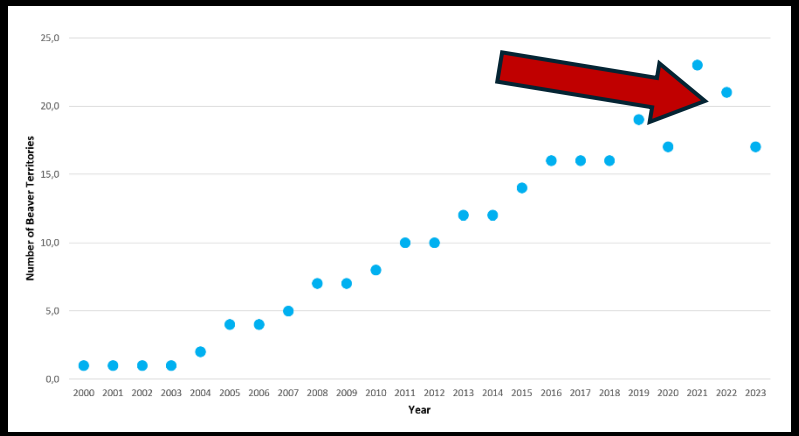




…in watersheds with wolves …







… has declined

Results

Conclusions

1. Beavers are an easily accessible local food source for wolves
2. Beavers play a substantial role in the wolves' diet
3. Beaver territoriality and activity patterns are driven by predation risk
4. Beavers have changed their foraging patterns.

Thus, beaver demographics have already been affected by wolf predation

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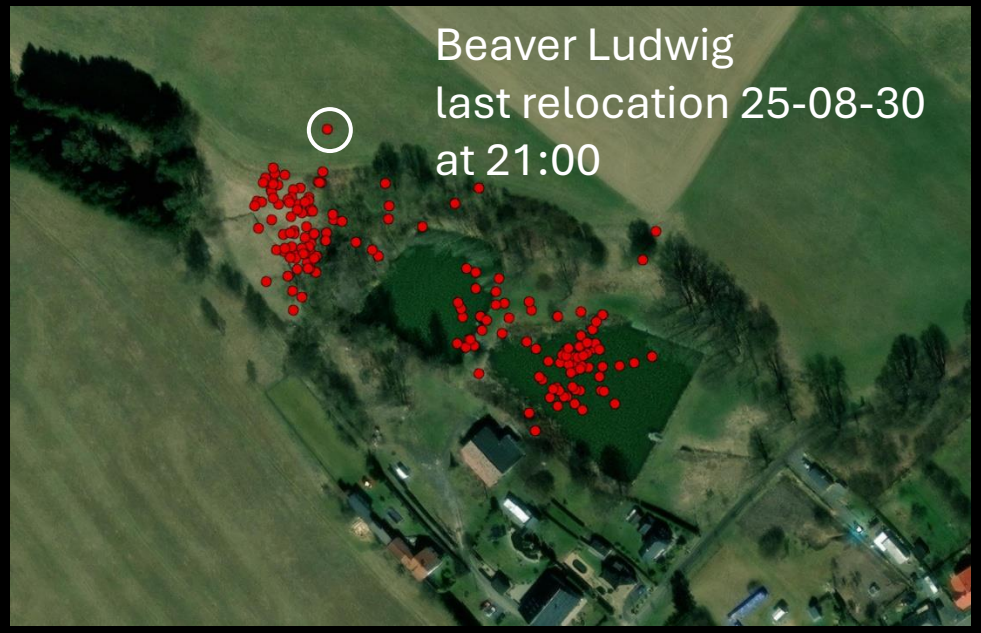

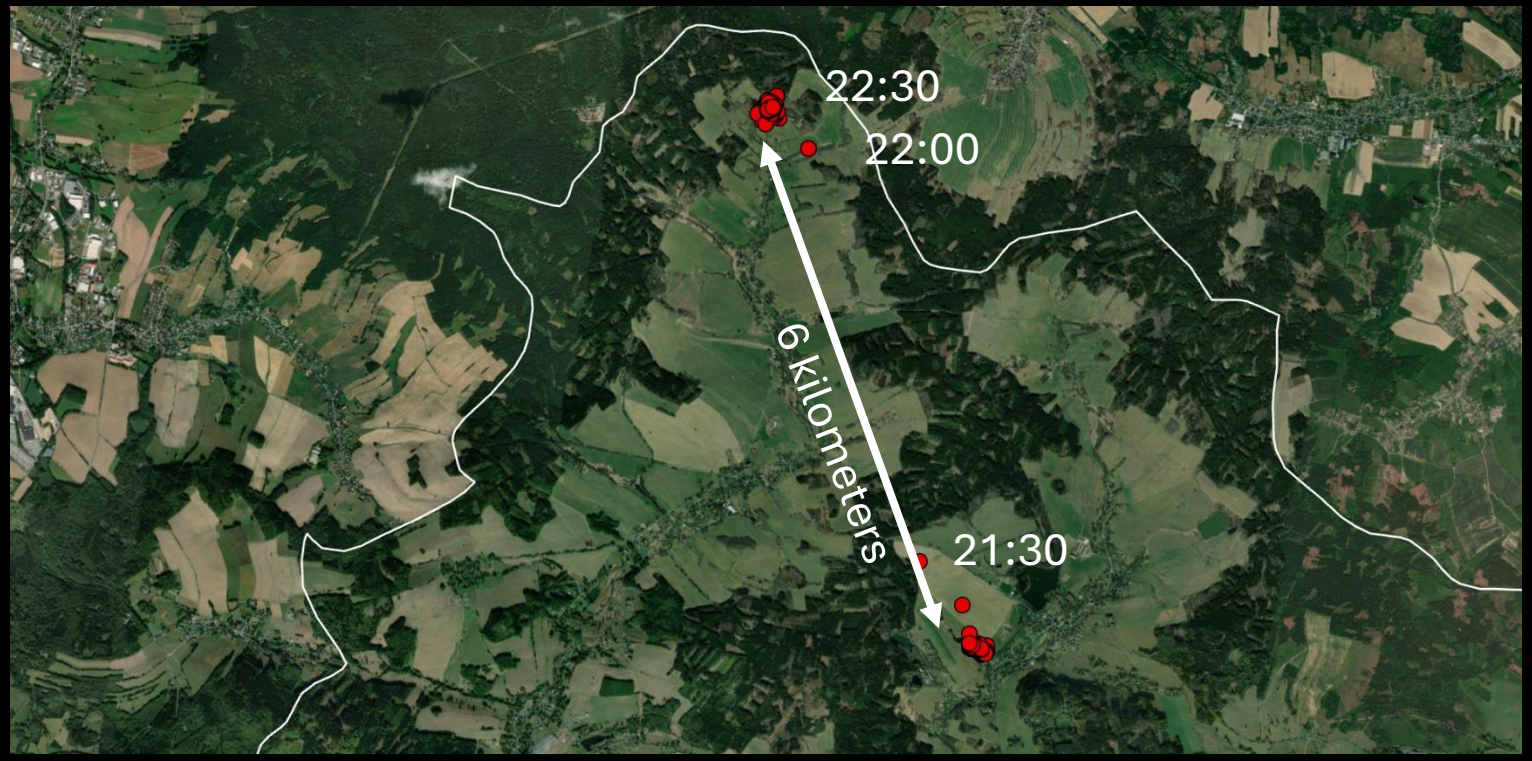

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