
Foto © Urs Wiederkehr et al., 2006

Nischentrennung?

von Hufeisennasen, Langohren und Zwergen

Tagung Fledermausforschung in Österreich
20. Oktober 2012
BOKU Wien

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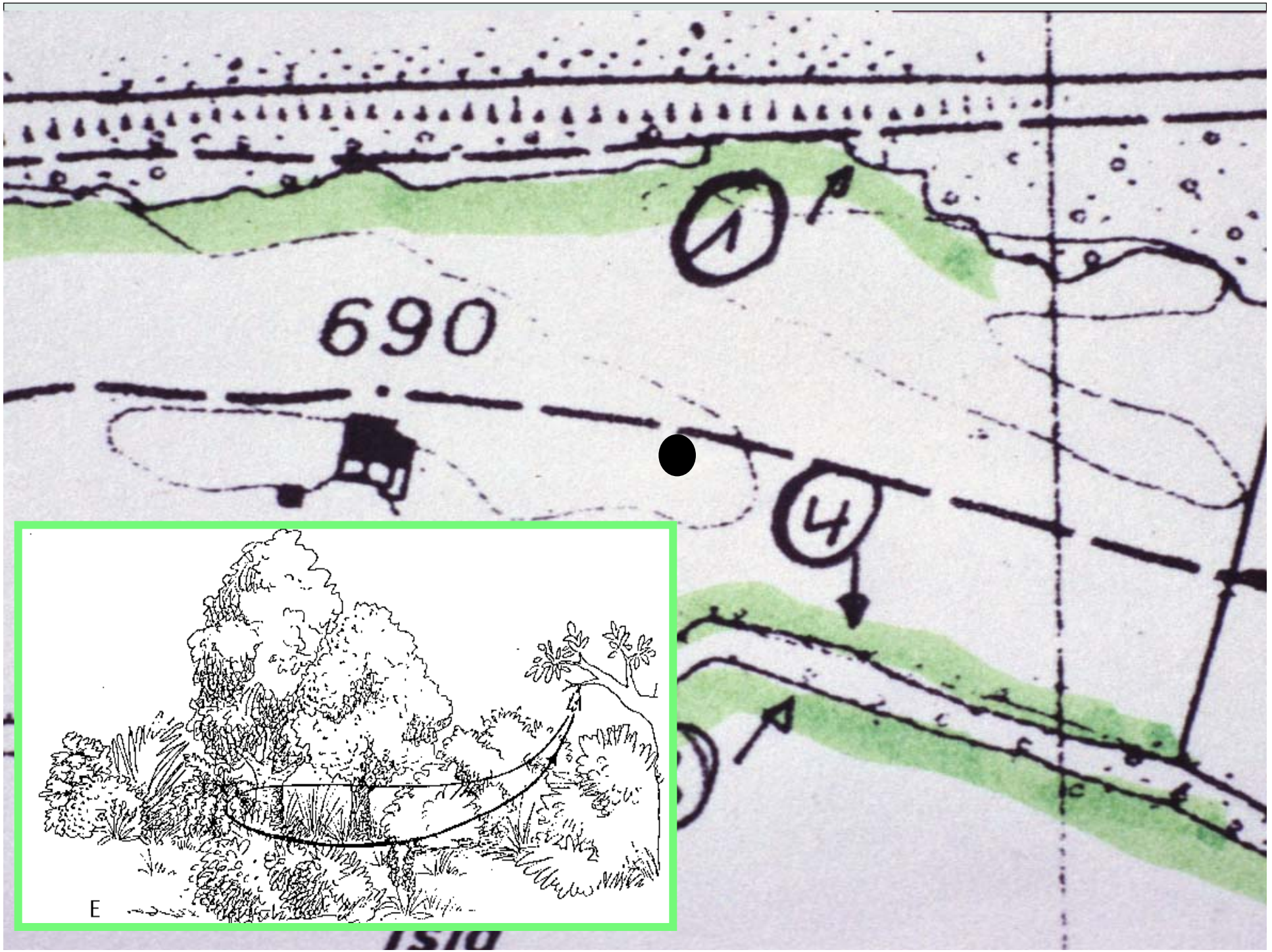
690
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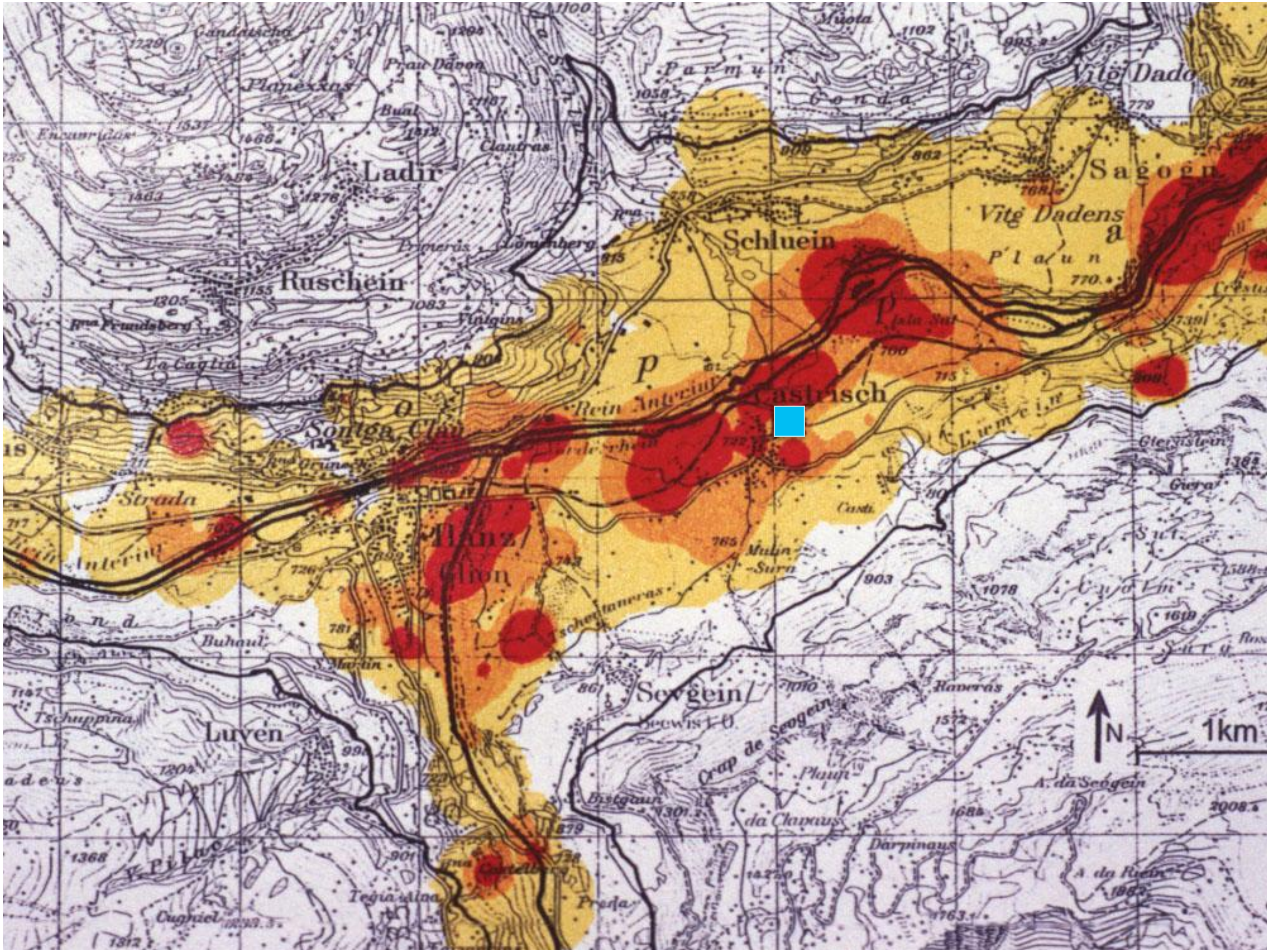

Ladir
Ruschein
Schluein
Castrisch
Sagogn
Vitg Dadens
Sevgein
Luven
Strada
N
1km

Nutzung der Lebensräume

	F1 *Vielfältige Flussbe-reiche*	F2 *Hecken-gebiete*	F3 *Struktur-reiches Kulturland*	F4 *Hang-wälder*	F5 *Vielfältige Laubwald-rand-gebiete*	F6 *Bäche*	F7 *Bachtobel*
Frühling	+ **	-**	-	=	+ **	+	-
Sommer	+	+	+	- **	+	+	+
Herbst	+	+	-	-	+	+	-
Frühling bis Herbst	+ **	-	-	- *	+ **	+	-

N = 25 Grosse Hufeisennasen (23 W, 2M)

F = Hauptfaktoren von 28 Habitatvariablen

* = (p<=0.05), ** = (p<=0.01).

Mann-Withney-U-Test bei den Einzeltieren, Kombinationstests über die Saisons

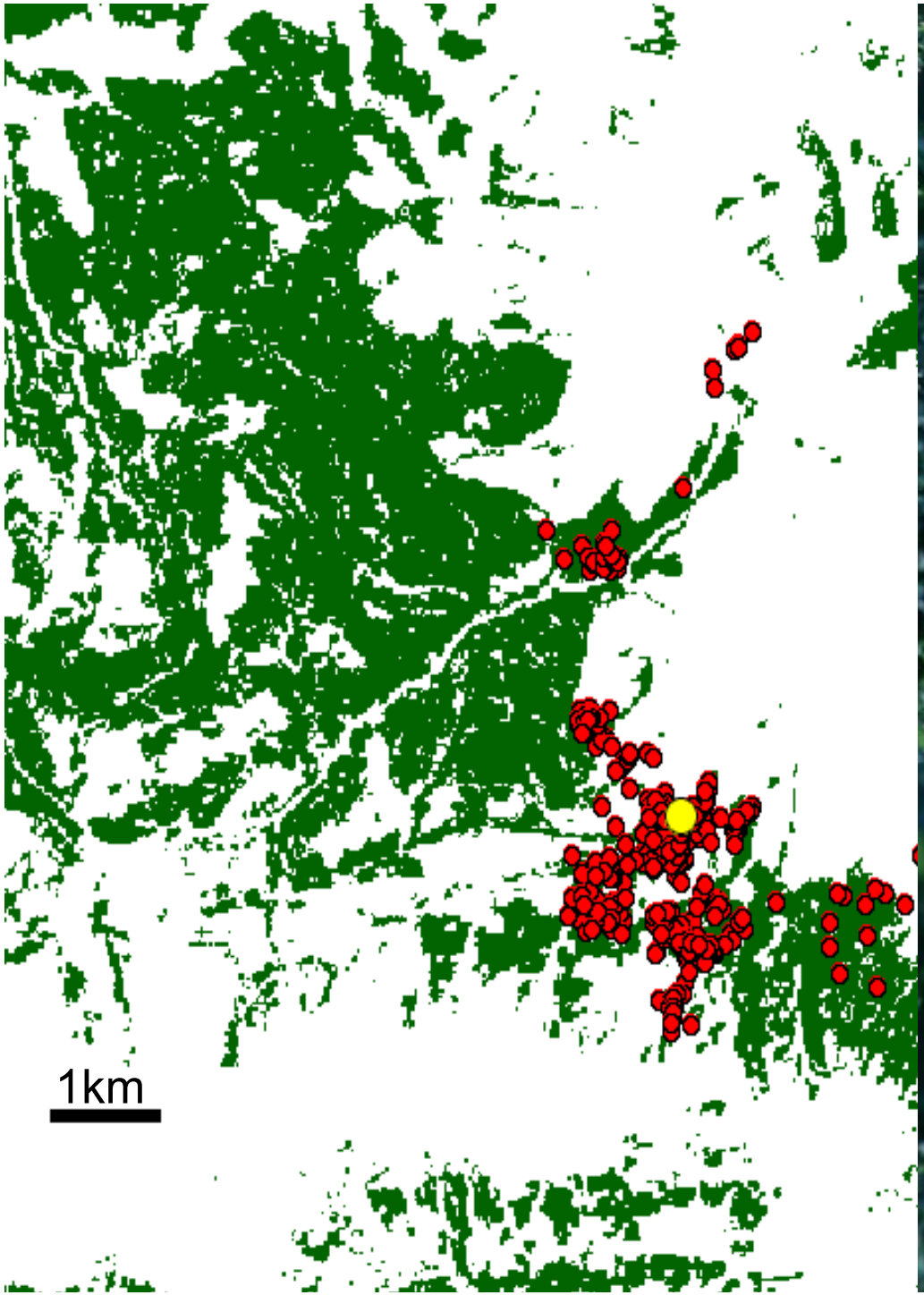
(Beck *et al*. 1994, BRN)

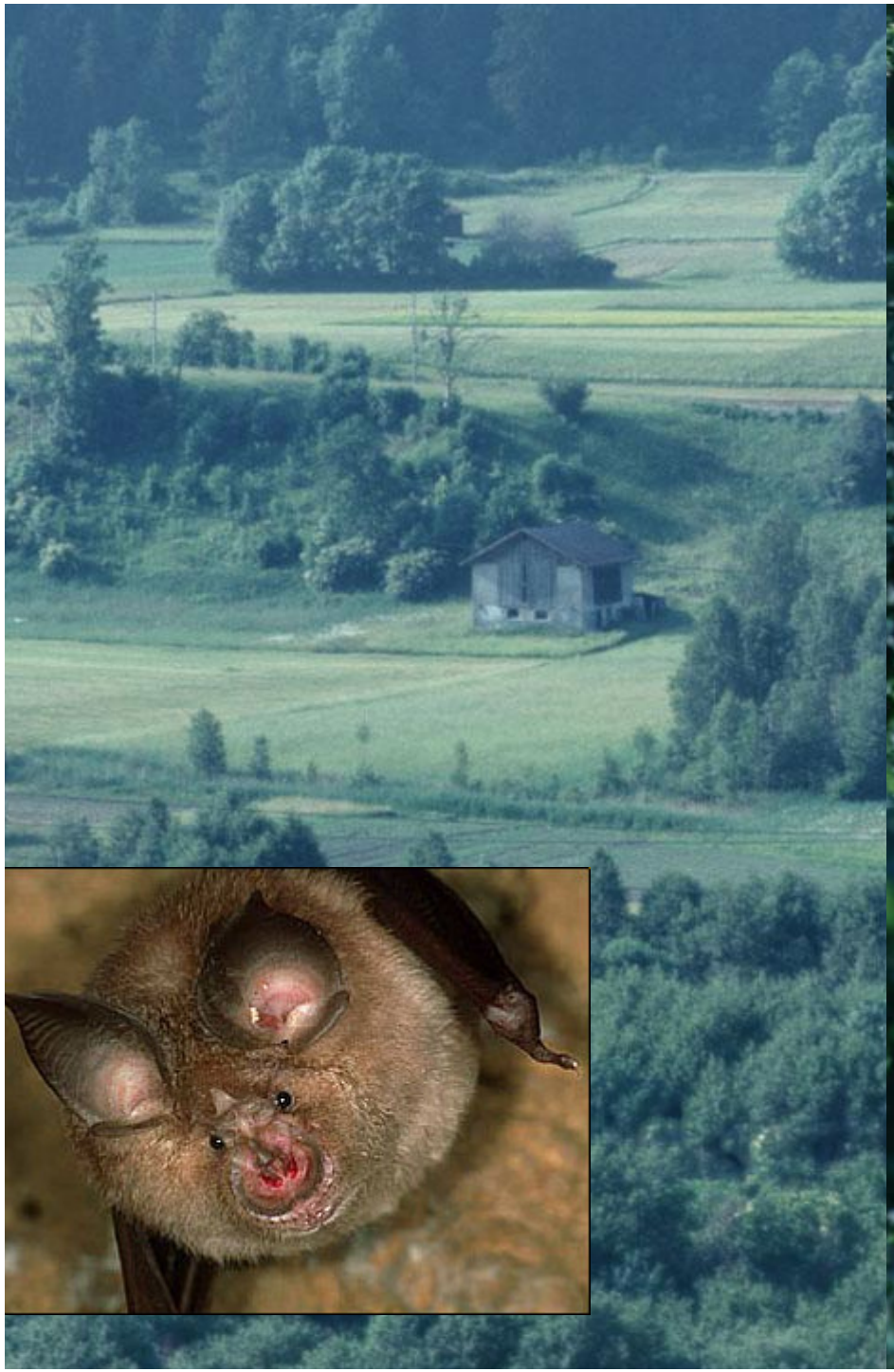
BCT, UK

Many suggestions:
Foraging over extensively used agricultural land (e.g. Yales 2003).
Foraging areas in highly structured pastures (Duelli et al. 1994)
pastoral landscapes (Kokurewicz 1987)

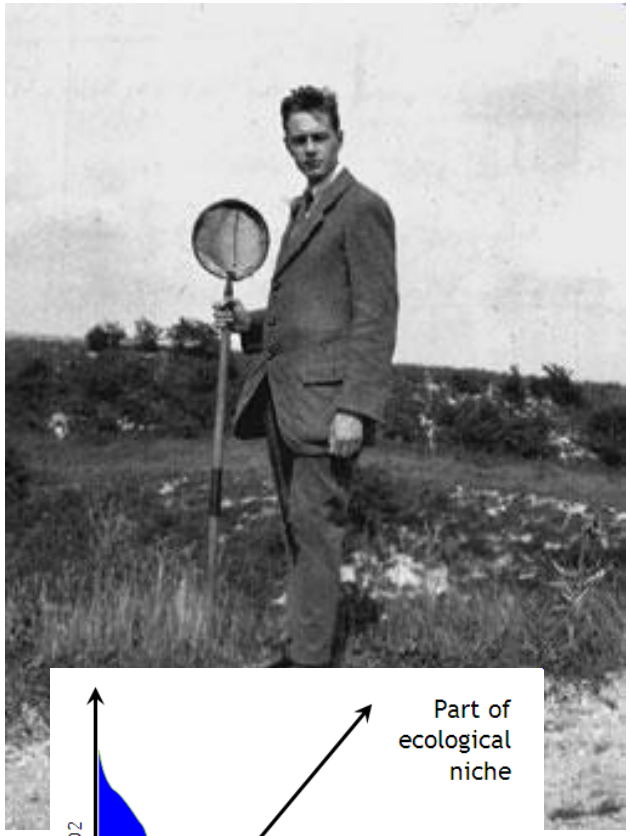
Red list of Switzerland:

R. hipposideros (Kleine Hufeisennase)	heckenreiche Landschaften, ruhige Dachstöcke


1km



Concept of the Ecological Niche



G.E. Hutchinson (1958):

the niche could be modeled as a space with many dimensions,

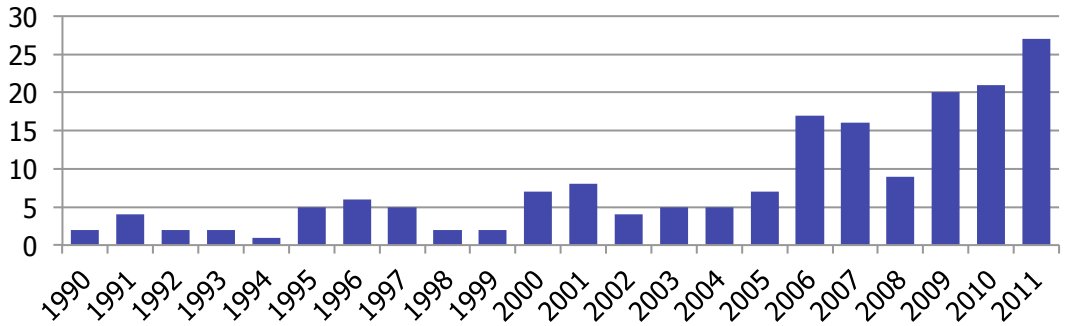
in which each dimension or axis represents the range of some environmental condition or resource that is required by the species.

Schoener (1974):

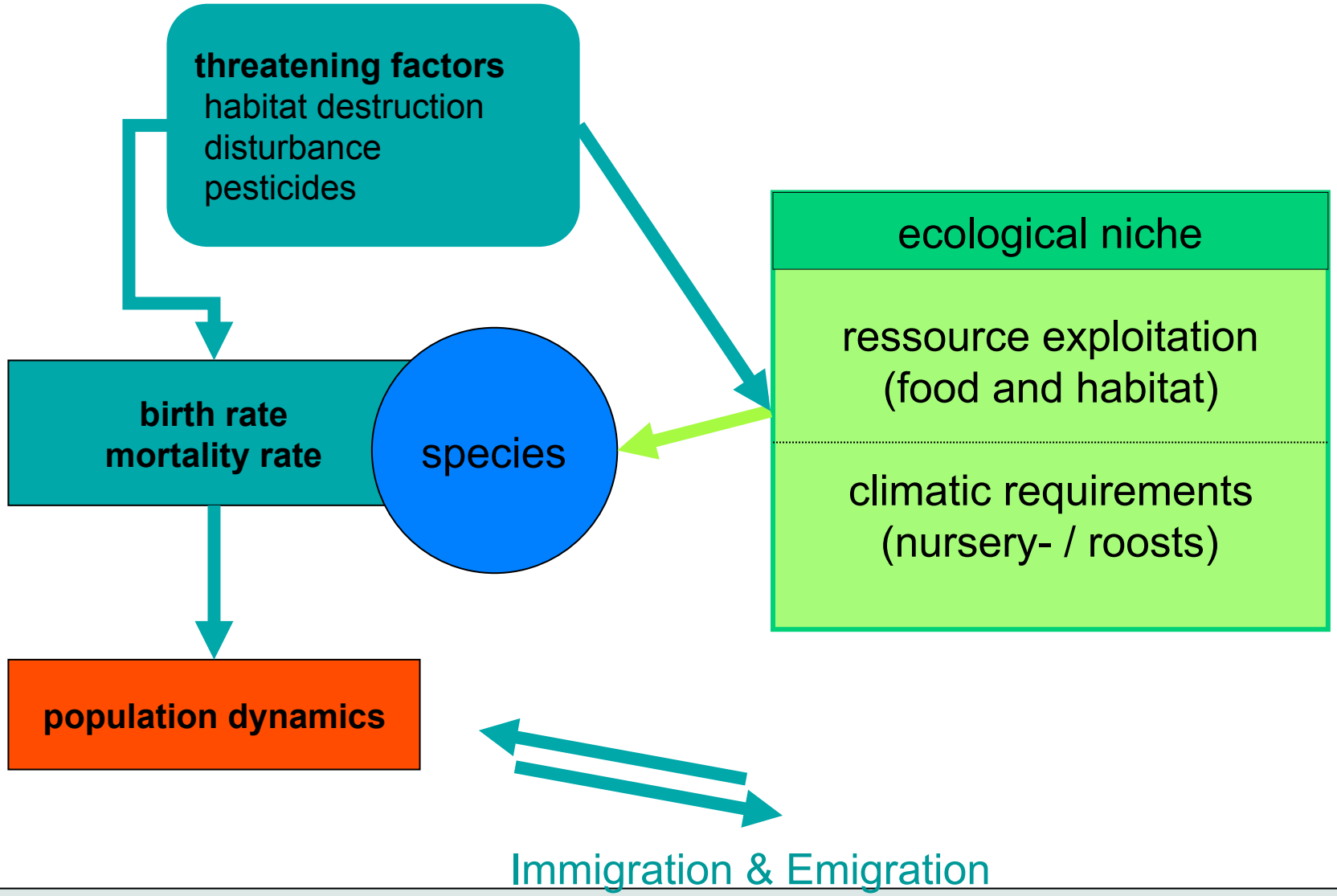
The major niche dimensions:

Diet, microhabitat (and temporal activity time)

 # publications [niche AND bat] / year



The role of the ecological niche



Resource partitioning in three cryptic sympatric bat species (*Plecotus spp.*)

cryptic species of special interest: PhD of Sohrab Ashrafi

Long-eared bats in the European Alps

Cryptic and new *P. macrobullaris*

Distribution of the species

Distribution of brown (*Plecotus auritus*), grey (*P. austriacus*) and Alpine (*P. macrobullaris*) long-eared bats

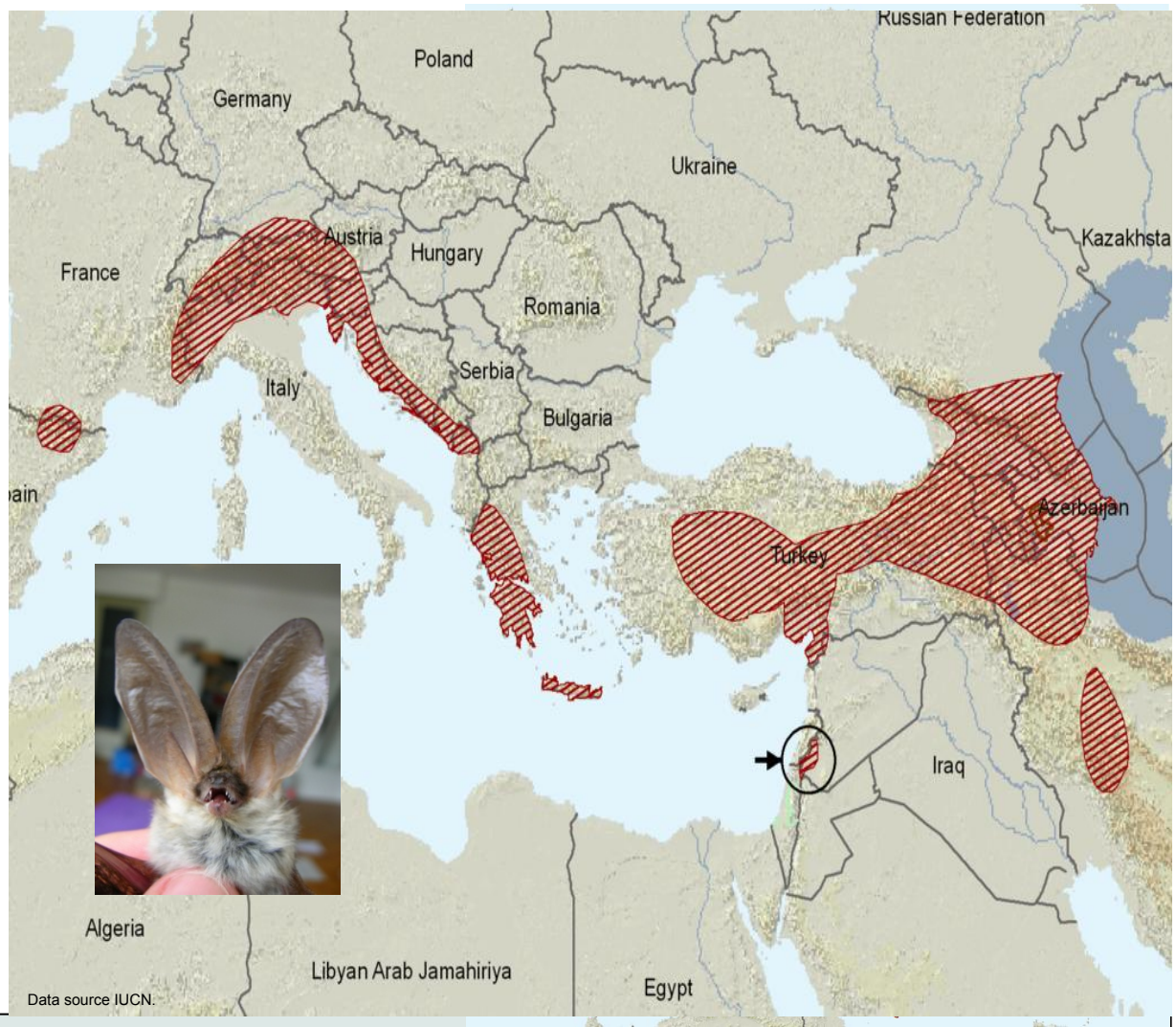


Table of Content

I. Identification of cryptic *Plecotus* bat species

II. Resource exploitation: diet

III. Resource exploitation: foraging habitat

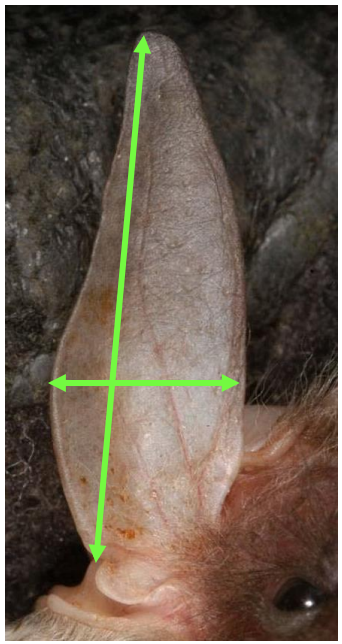
major dimensions of niche

Methods

Samples and measurements

- 220 ivdividuals from 29 sites
- 8 external measurements, sex, triangular pad
- Molecular species identification

FA: forearm	EARL: Ear lenght
TH: Thumb lenght	EARW: Ear width
TIB: Tibia lenght	TRAGL: Tragus lenght
HF: Hind foot lenght	TRAGW: Tragus width

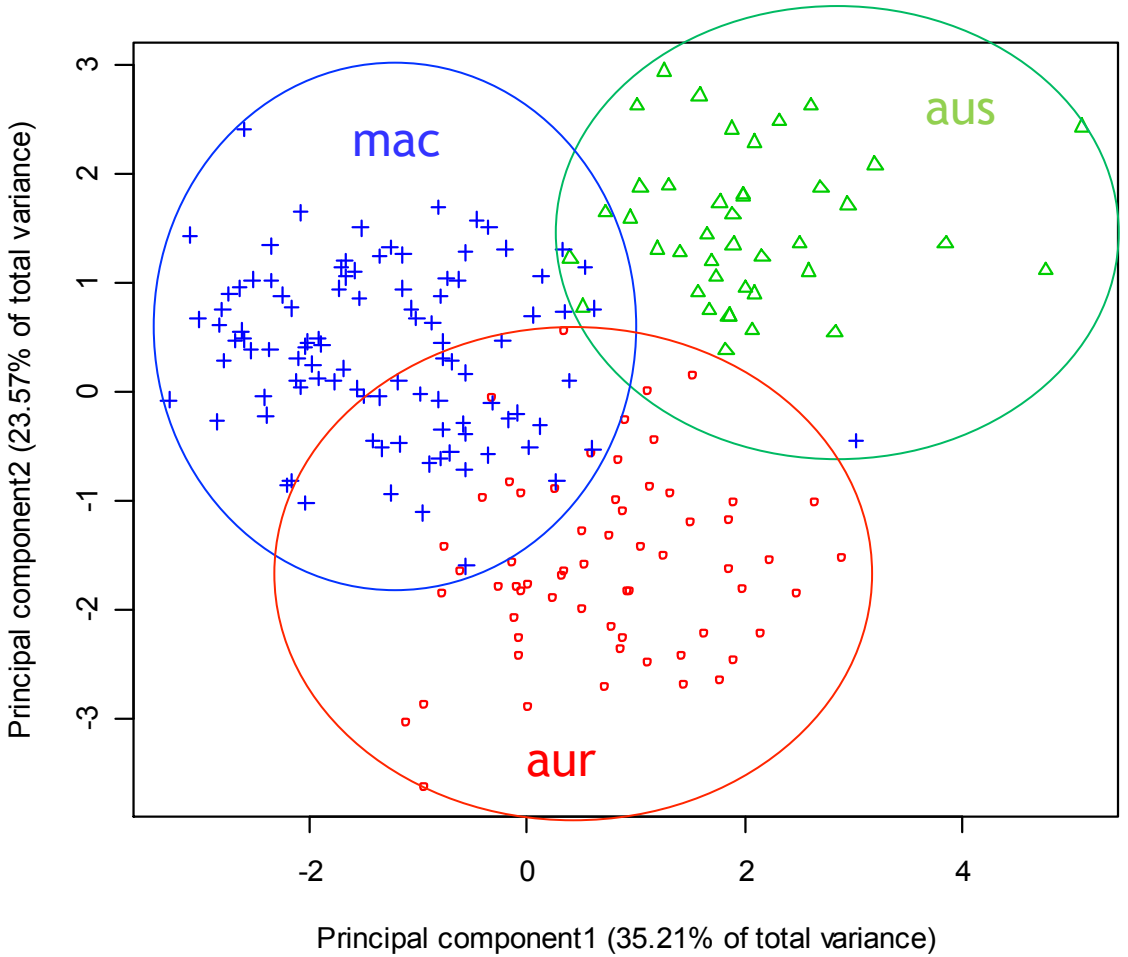


Results

Principal component : analysis

correlation matrix of untransformed data from the eight variables

No reliable Reliable identification was not achieved using single external character.

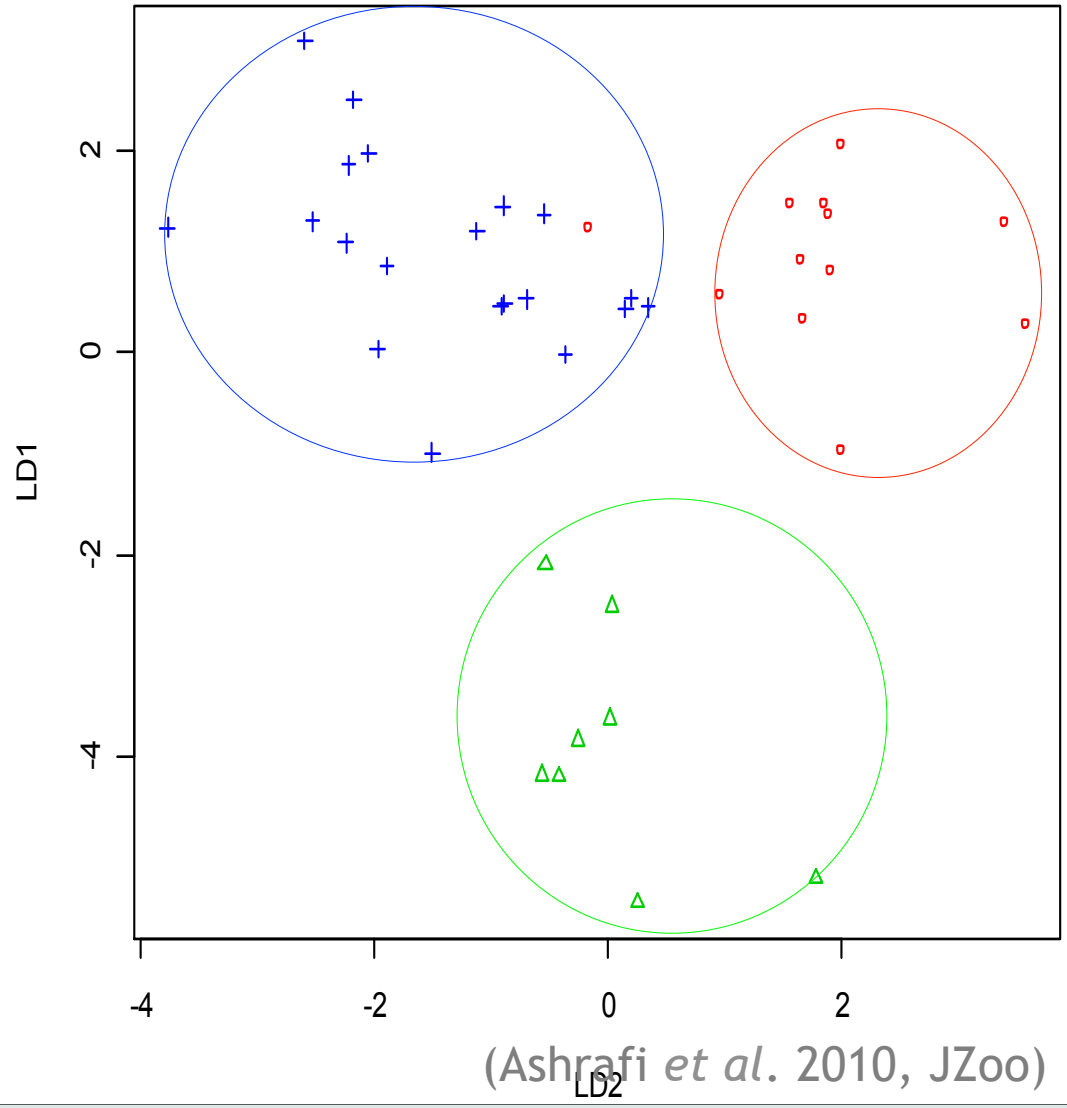


(Ashrafi *et al*. 2010, JZoo)

Results

DA:

A scatter plot of the scores of Linear discriminant factor 1 (LD1) and factor 2 (LD2) on validating data.



(Ashrafi *et al*. 2010, JZoo)

--> Classification equations:

If: S1>S2, S3 => *P. mac*

If: S2>S1, S3 => *P. aur*

If: S3>S1, S2 => *P. aus*

Conclusions

- The 3 *Plecotus* species are extremely similar: hard to distinguish
- sympatric distribution over large areas: 2 species (P.aur, P.mac)

According to Niche Theory

and the Principle of Competitive Exclusion
(Hardin 1960: total competitors cannot coexist)

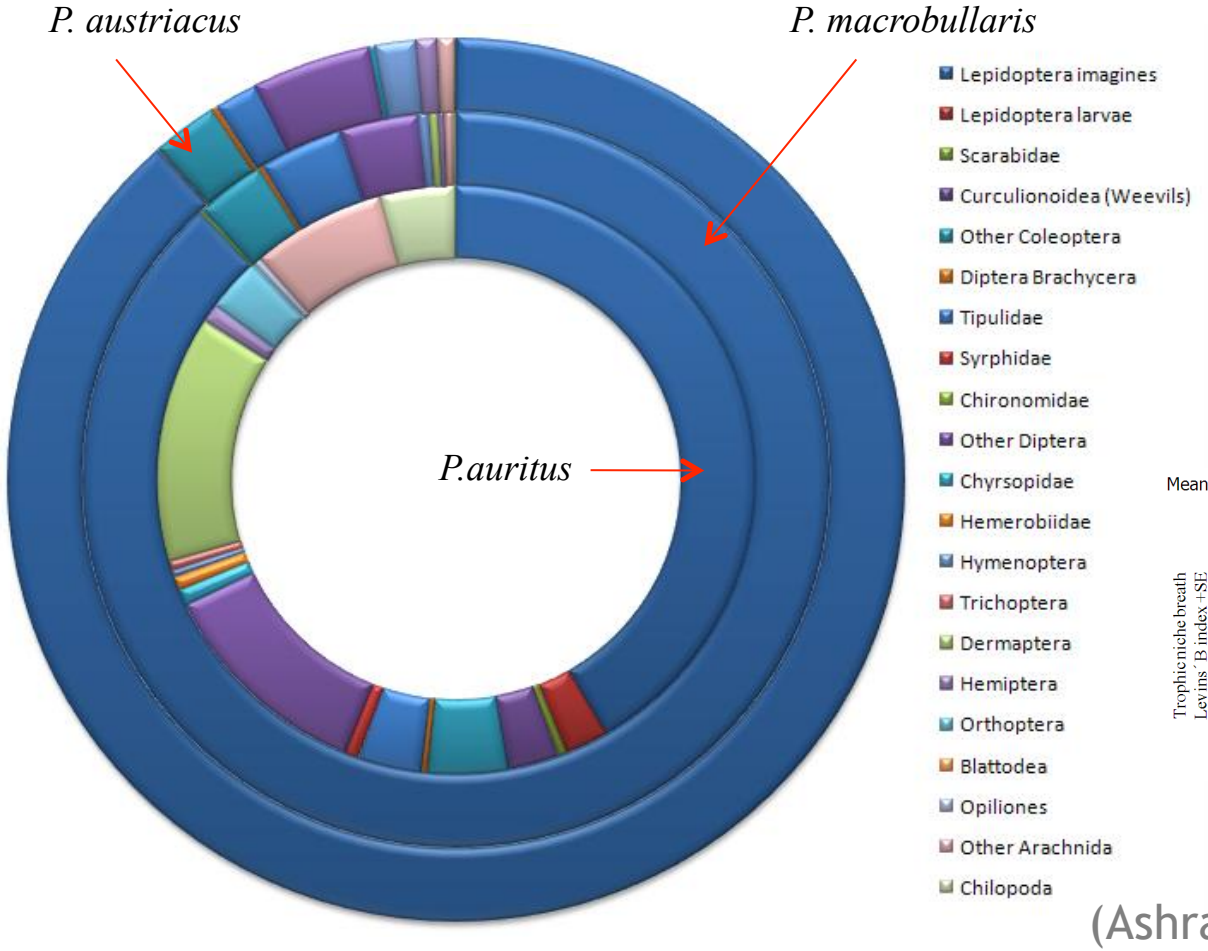
we expect Ressource Partitioning

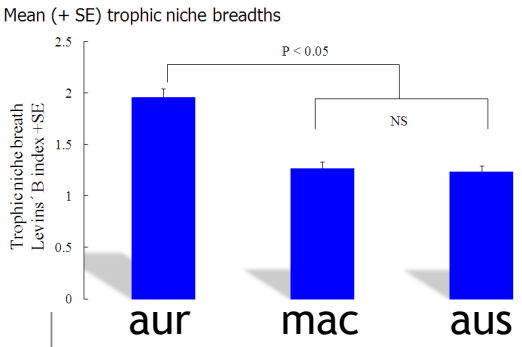
We tested this prediction for the main niche dimensions:

diet and foraging habitat

Results: diet composition

- 21 orders and families of arthropods identified
- 41%, 87% and 88% Paur, Pmac, Paus: Lepidoptera!
- 28% of diurnal and flightless taxa: gleaning in *P. auritus*



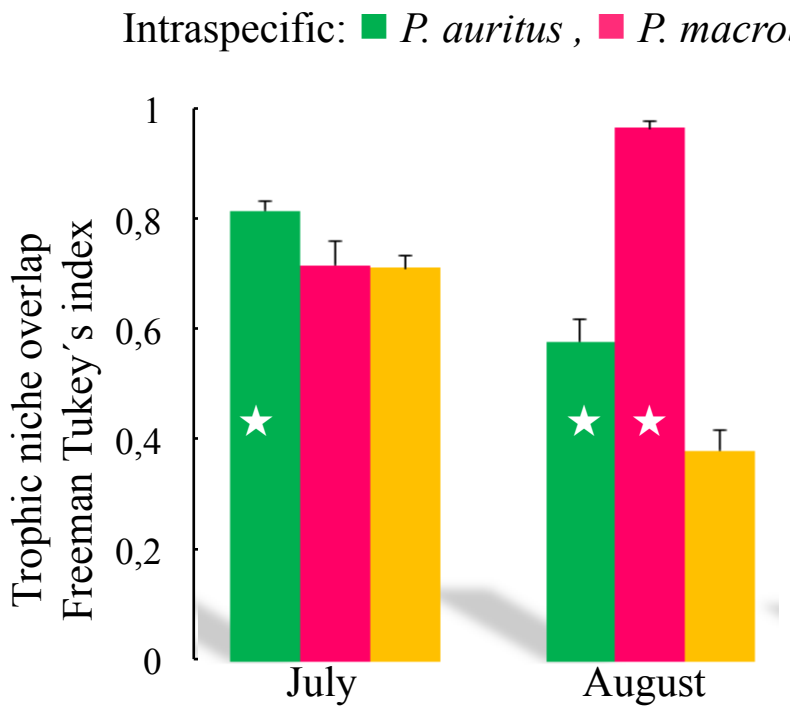


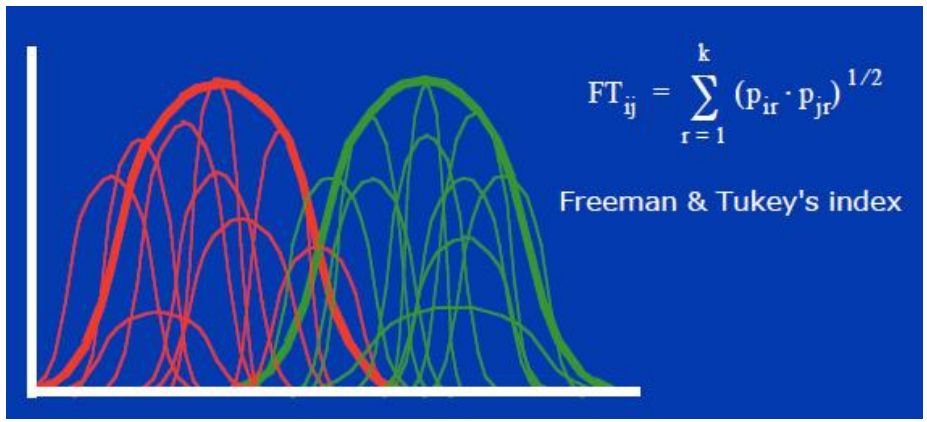
(Ashrafi *et al*. 2011, EurJWilRes)

Both, model and principle carry the same implications:

The lower the interspecific overlap in resource utilization – in comparison to the intraspecific overlap – the higher the probability of a stable coexistence (Arlettaz et al. JAniEco 1997).

Test in the sole sympatric colony: niche overlap





(Ashrafi *et al.* 2011, EurJWilRes)

Explore the habitat axis: radiotracking bats

> Eight female individuals of the three species (N=24) from June to September

> Radio tags (0.44 and 0.45 gr) attached between the scapulae.

> Applying triangulation technique (White & Garrott 1990, Bontadina *et al.* 2002)

> Recording radiotracking data by observer teams in five minutes intervals. Three categories of accuracy were estimated (50, 100 and 250m).

Result

P. auritus

> Ranked variables based on their relative importance using standardized coeficients

(Ashrafi *et al*. in review, AniCon)

Result

P. austriacus

> Ranked variables based on their relative importance using standardized coeficients

Result

P. macrobullaris

> Ranked variables based on their relative importance using standardized coeficients

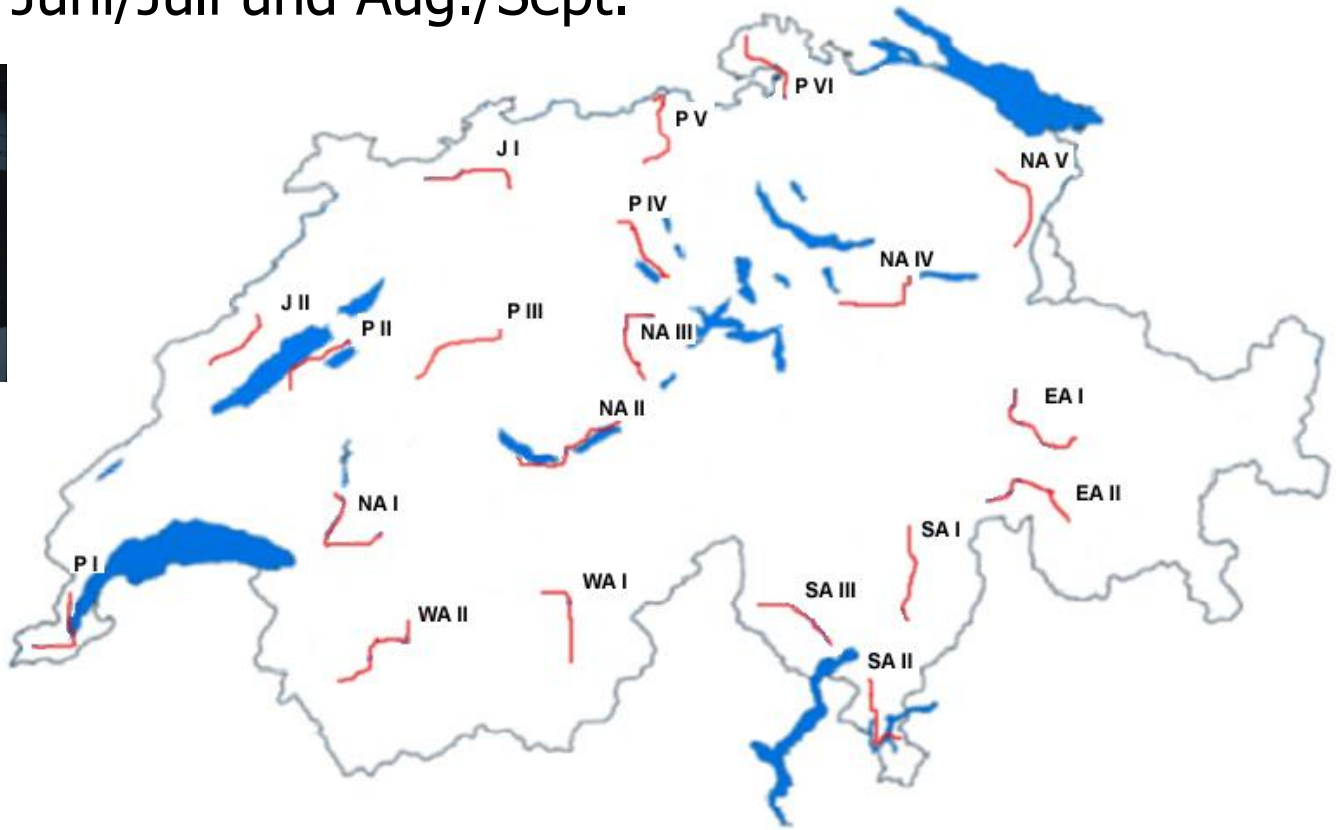
- Different habitat preferences in three species reflect strong evidence for resource partitioning
- Vegetation heterogenity is important for *P. auritus* and *P. macrobullaris* in horizontal and vertical dimension respectively

Zwergfledermaus und Mückenfledermaus

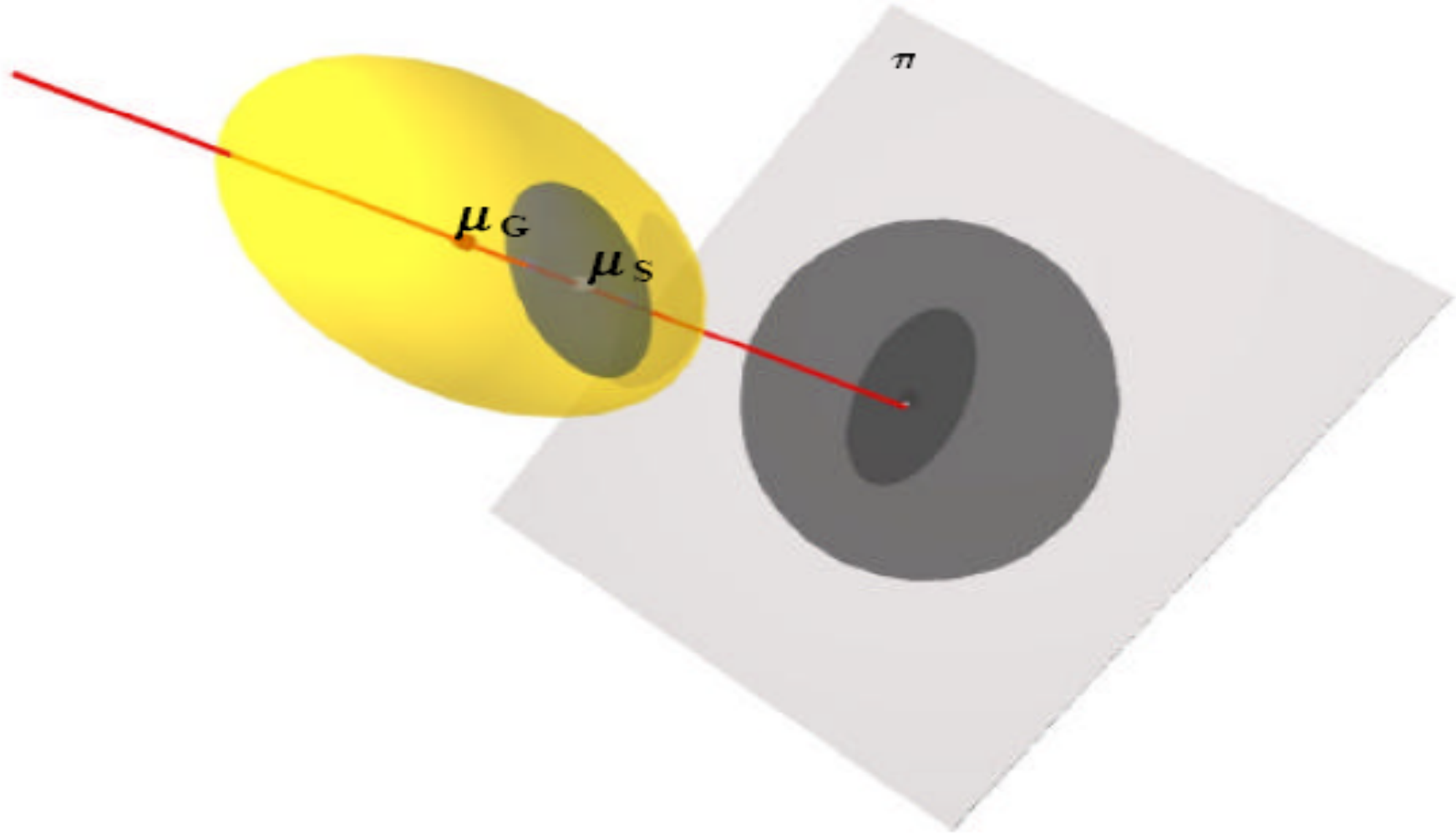
Foto: Wolf-Dieter Burkhard

Vorgehensweise

- Masterarbeit von Thomas Sattler
- Untersuchungsgebiet: Schweiz < 1500m
- Aufnahme von Fledermausrufen auf 20 Transekten à 40 km
- 2 Durchgänge: Juni/Juli und Aug./Sept.



ENFA: Ecological Niche Factor Analysis



(ENFA, Hirzel et al., Ecology 2002)

ENFA: Habitatsanalyse

Ecogeographical variables	*P. pygmaeus*	*P. pipistrellus*
Altitude	**- - -**	**- -**
Latitude (to the South)	**++++**	**++++**
Bush frequency	**+++**	**+++**
Proximity to forest edge	**++**	**0**
Open forest frequency	**+**	**++**
Hedgerow frequency	**+++**	**+++**
Riparian forest frequency	**+**	**++**
Riparian vegetation frequency	**+**	**+++**
Proximity to wide rivers > 12m	**++++**	**++++**
Lake border frequency	**++**	**++**
Grass frequency	**0**	**++**
Meadow frequency	**- -**	**-**
Pasture frequency	**- - - -**	**- -**
Highway frequency	**+**	**+**
Single building frequency	**+++**	**++**
Town frequency	**+++**	**0**
Village frequency	**+**	**++++**

Beide Arten bevorzugen/ meiden zumeist dieselben Variabeln

In rot die wichtigsten Variabeln

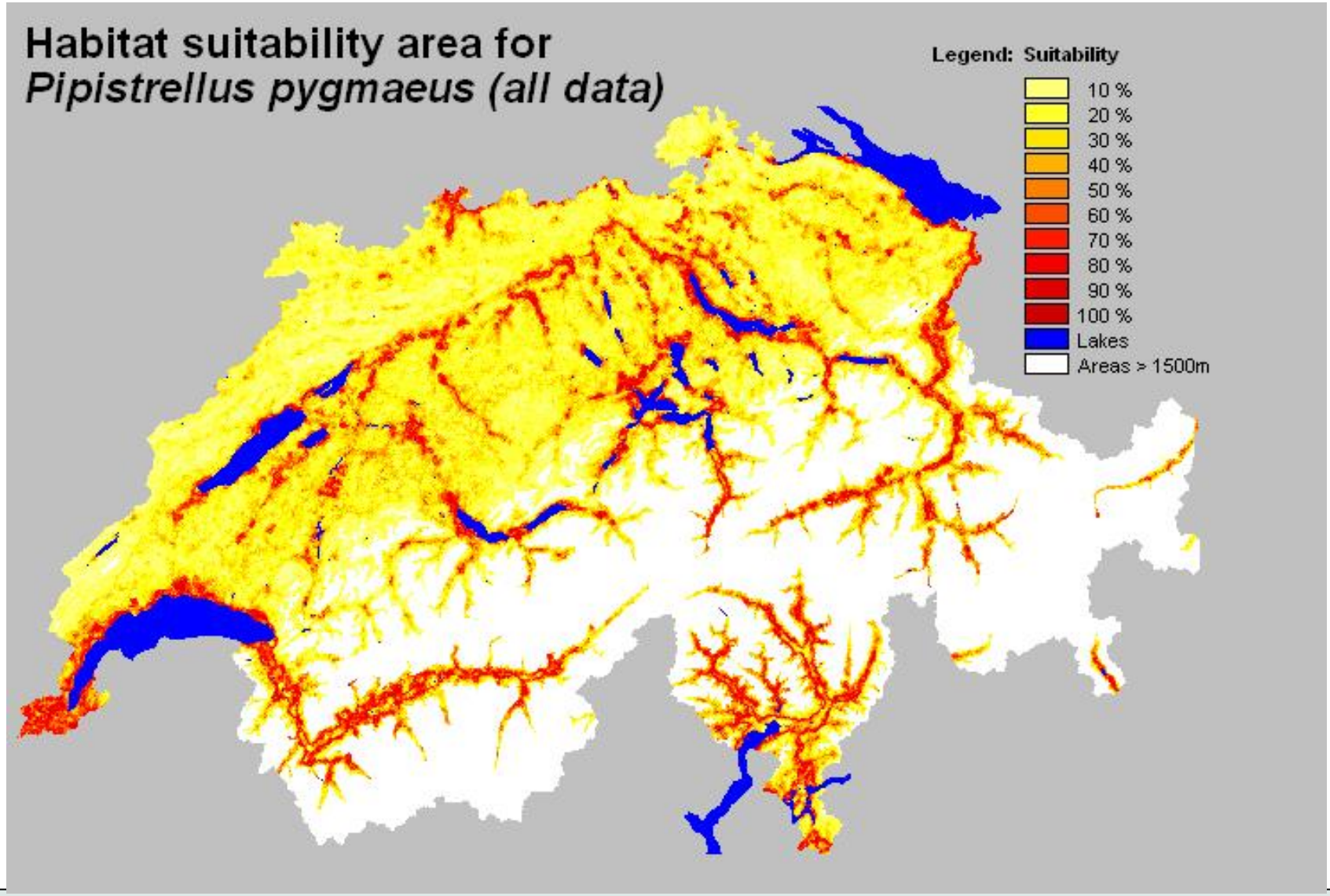
ENFA: Habitatsanalyse

Ecogeographical variables	*P. pygmaeus*	*P. pipistrellus*
Altitude	- - -	- -
Latitude (to the South)	++++	++++
Bush frequency	+++	+++
Proximity to forest edge	++	0
Open forest frequency	+	++
Hedgerow frequency	+++	+++
Riparian forest frequency	+	++
Riparian vegetation frequency	+	+++
Proximity to wide rivers > 12m	++++	++++
Lake border frequency	++	++
Grass frequency	0	++
Meadow frequency	- -	-
Pasture frequency	- - - -	- -
Highway frequency	+	+
Single building frequency	+++	++
Town frequency	+++	0
Village frequency	+	++++

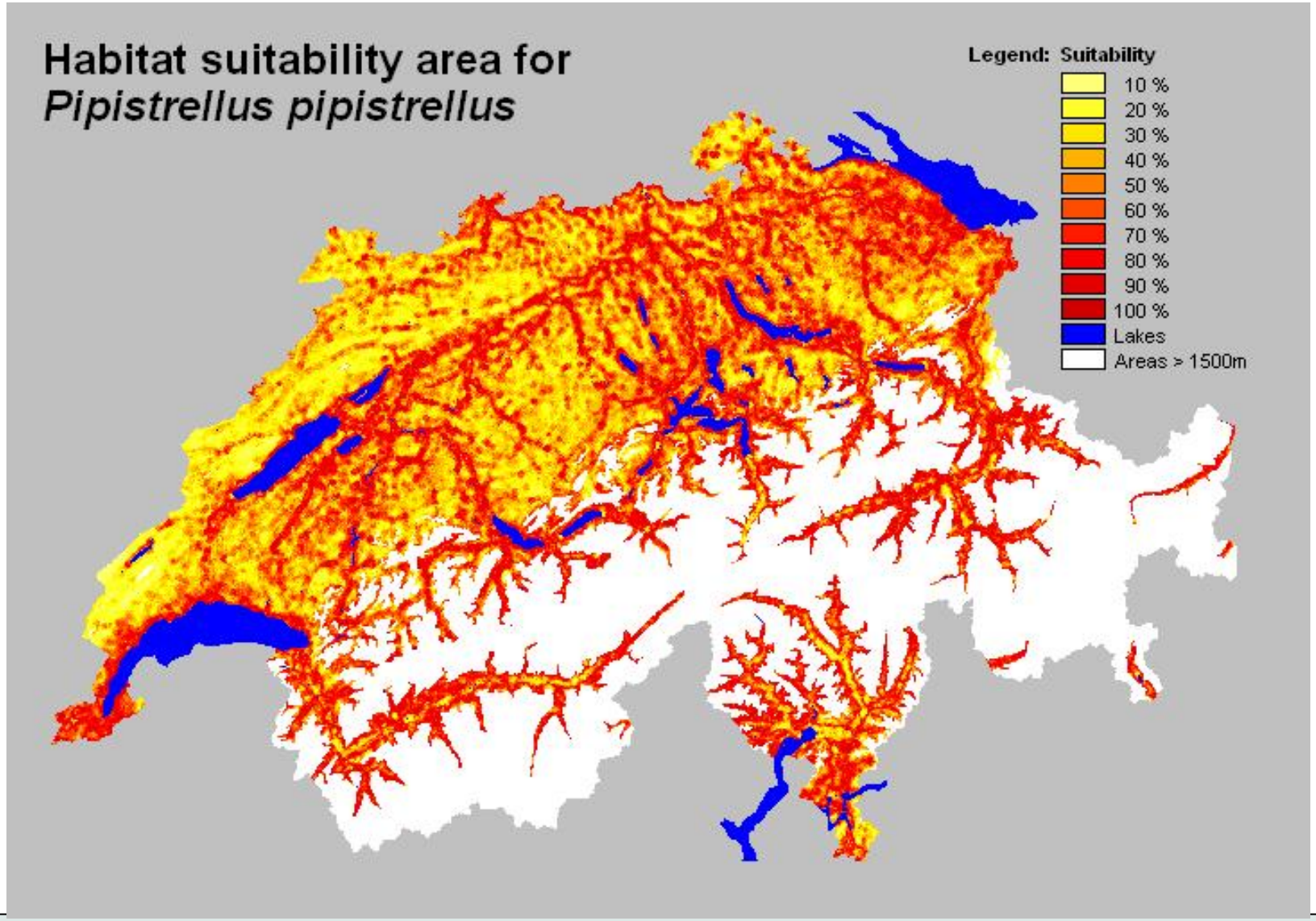
Nur 2 Variabeln zeigen grössere Unter-schiede:

P. pygmaeus bevorzugt Städte, während *P.pipistrellus* Dörfer bevorzugt

Potentielle Verbreitungskarte Mückenfledermaus



Potentielle Verbreitungskarte Zwergfledermaus



Take home message / Mitbringsel

- Ähnliches Aussehen heisst nicht ähnliche Ansprüche:
  Beispiel der Jagdgebiete Grosser und Kleiner Hufeisennasen

- Auch ähnliche oder kryptische Arten brauchen Abweichungen in der ökologischen Nische, wenn sie sympatrisch vorkommen

- Ökologische Nische hat Auswirkungen auf Landschaftsebene: Verbreitung

Auswirkungen für den Fledermausschutz

- Auch ähnliche oder kryptische Arten brauchen Abweichungen in der ökologischen Nische, wenn sie sympatrisch vorkommen: nur wo?
  Artengruppen nicht generalisieren
  Forschungsresultate nutzten für spezifische Schutzmassnahmen

- Alle 3 Langohrarten sind spezialisiert auf Falter, aber das Braune Langohr ist viel plastischer durch gleaning Jagdverhalten
  Plastizität des Verhaltens hat Auswirkungen auf Schutz Status

- Es ist wichtig, die wissenschaftlichen Ergebnisse zu publizieren, so dass andernorts zugänglich / nutzbar sind !