

Understanding the composition, behaviour and sociality of bats during swarming: Case study of Campanhó (2014-2024)

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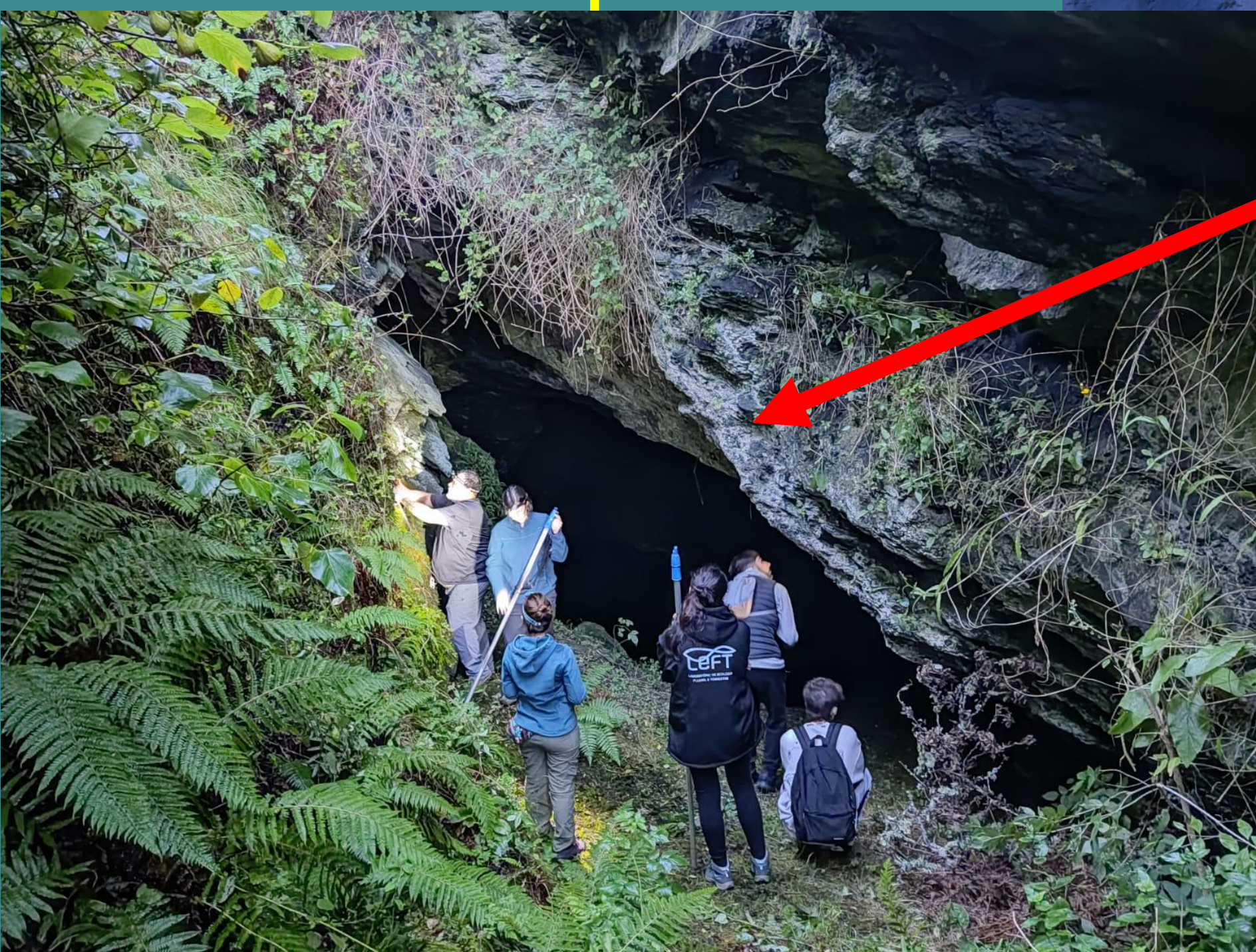
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Introduction

Bats swarm when several individuals of different species converge and aggregate in specific roosts during autumn. Swarming behaviour could serve multiple social purposes, one of which is mating. Bearing in mind that bats from multiple summering areas can mate, this swarming behaviour is thought to enhance gene flow. Swarming sites are characterised by a high abundance and richness of species, as well as a high percentage of active reproductive individuals.

Study area

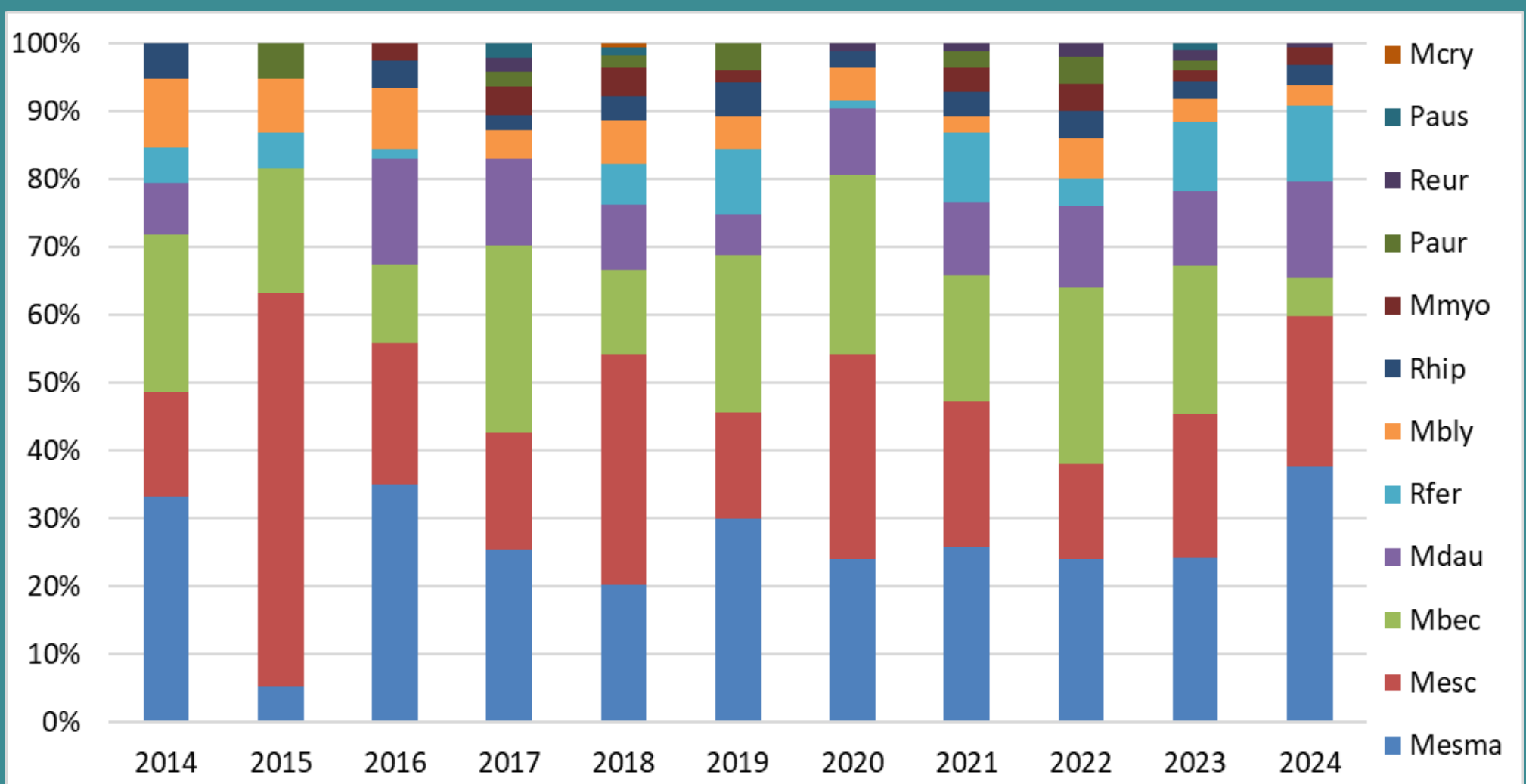
Campanhó swarming site is located at the north of Portugal, within the Natura 2000 Site of Community Importance (SCI) Alvão/Marão. This SIC is classified in the scope of the Natura 2000 network with the goal to achieve a favourable conservation status of Mediterranean habitats and species of community importance.



Materials e Methods

The bats at the swarming site were captured using 2 nets (16x16mm, 70/2 Nylon: Ecotone, Poland) one 2.5 x 3m (in the entrance) and 2.5 x 9m (in the surrounding) mist-nets and a harp trap (Bat Conservation and Management, EUA) placed at the secondary entrance. The nets were opened one hour after sunset and kept open for 6 hours. Forearm length and body mass of each bat trapped were measured using a pair of digital callipers ($\pm 0.01\text{mm}$) and a digital scale ($\pm 0.01\text{g}$). Reproductive status was checked according to (Haarsma 2008). Two sampling periods were carried out in each year, the first in mid-September and the second in mid-October.

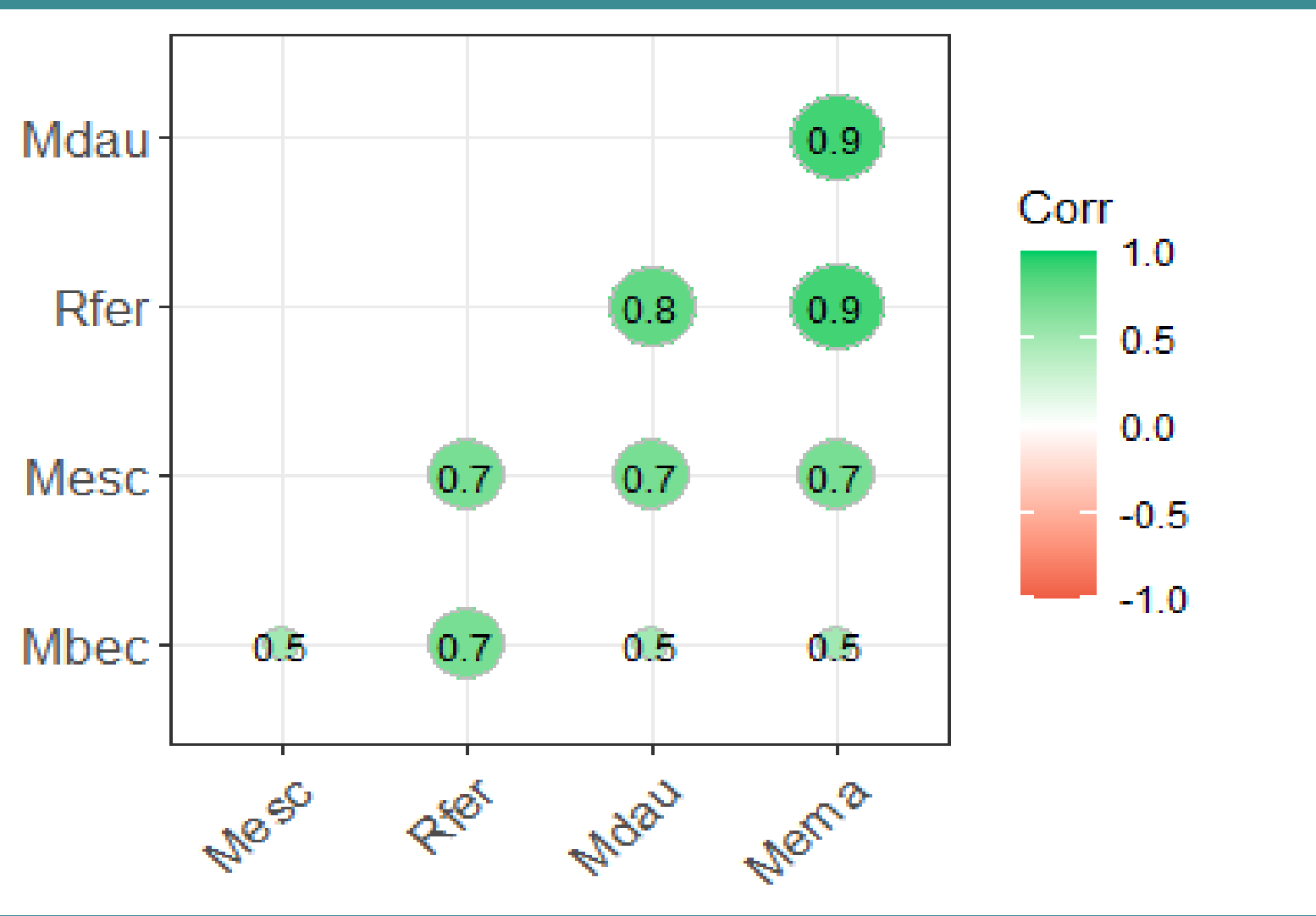
1.132 individuals processed of 12 different species



- ✓ *Myotis emarginatus* (n=303)
- ✓ *Myotis escaleraei* (n=271)
- ✓ *Myotis bechsteinii* (n=201)
- ✓ *Myotis daubentonii* (n=120)
- ✓ *Rhinolophus ferrumequinum* (n=83)
- ✓ *Myotis blythii* (n=55)
- ✓ *Rhinolophus hipposideros* (n=37)
- ✓ *Myotis myotis* (n=28)
- ✓ *Plecotus auritus* (n=19)
- ✓ *Rhinolophus euryale* (n=9)
- ✓ *Plecotus austriacus* (n=5)
- ✓ *Myotis crypticus* (n=1)

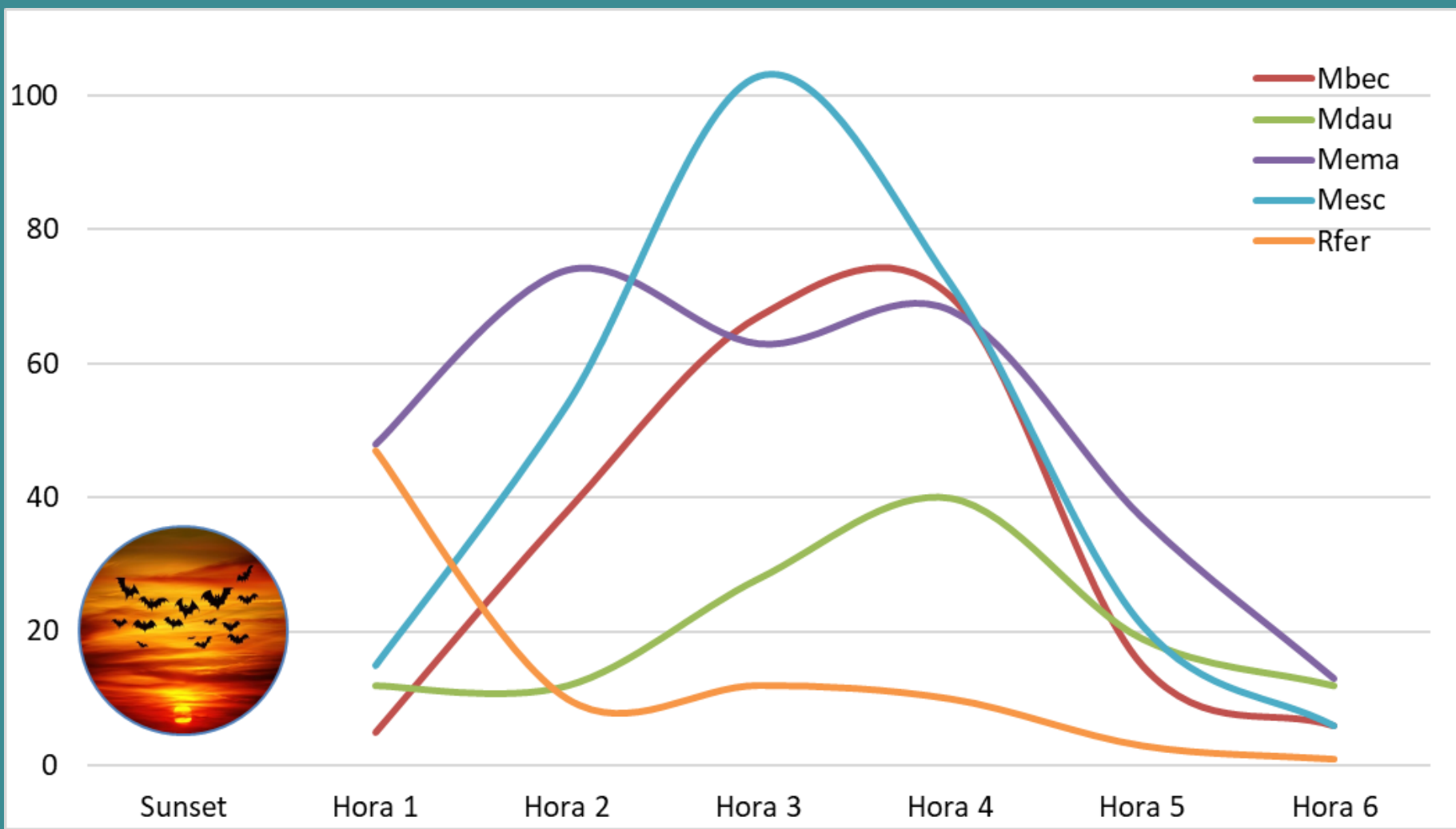
Results

Top five



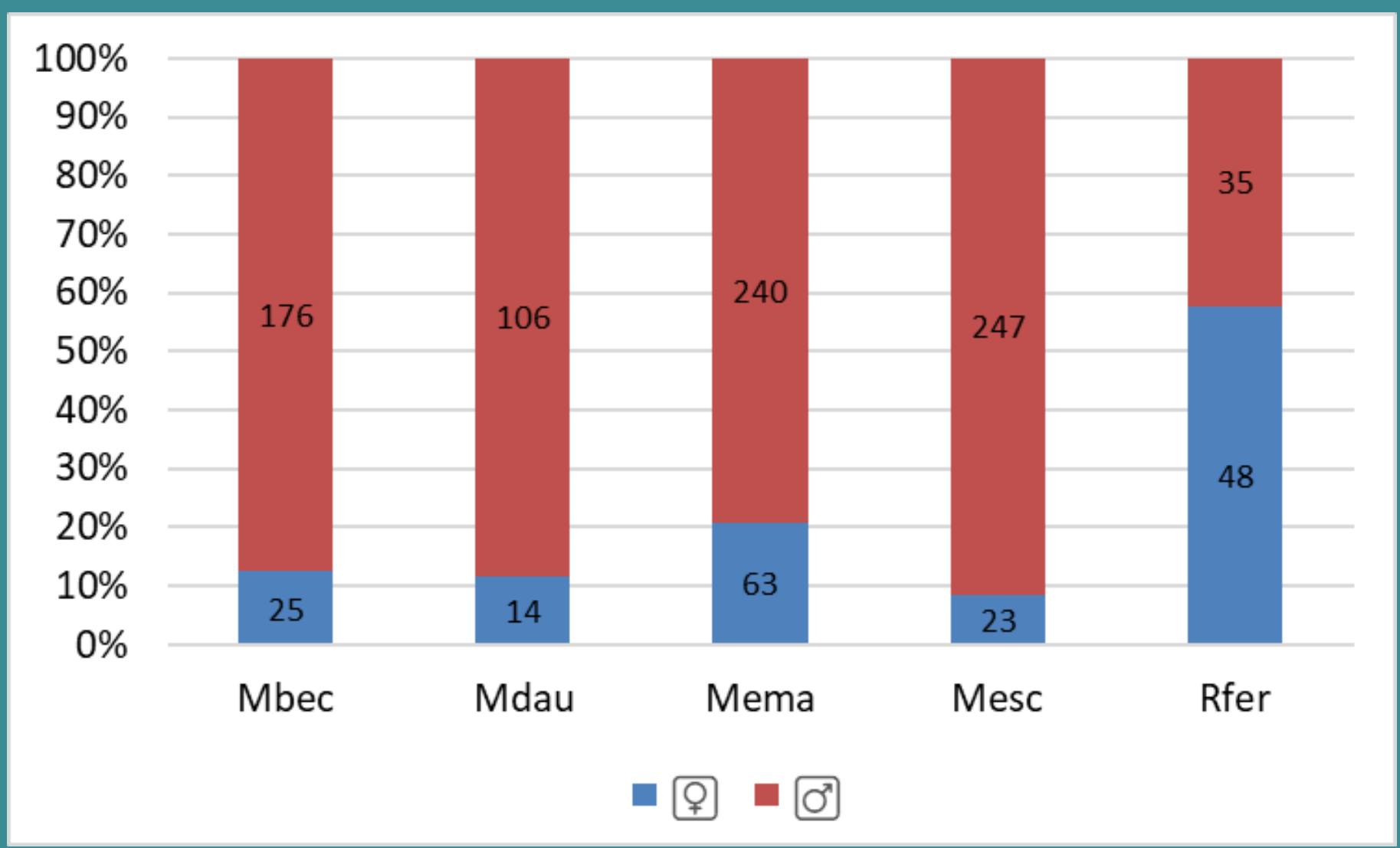
The 5 most captured species (Mema, Mesc, Mbec, Mdau, Rfer) representing more than 85% of the total bats caught, with a highly significant and positive correlation ($\rho > 0.9$) between them.

Swarming activity



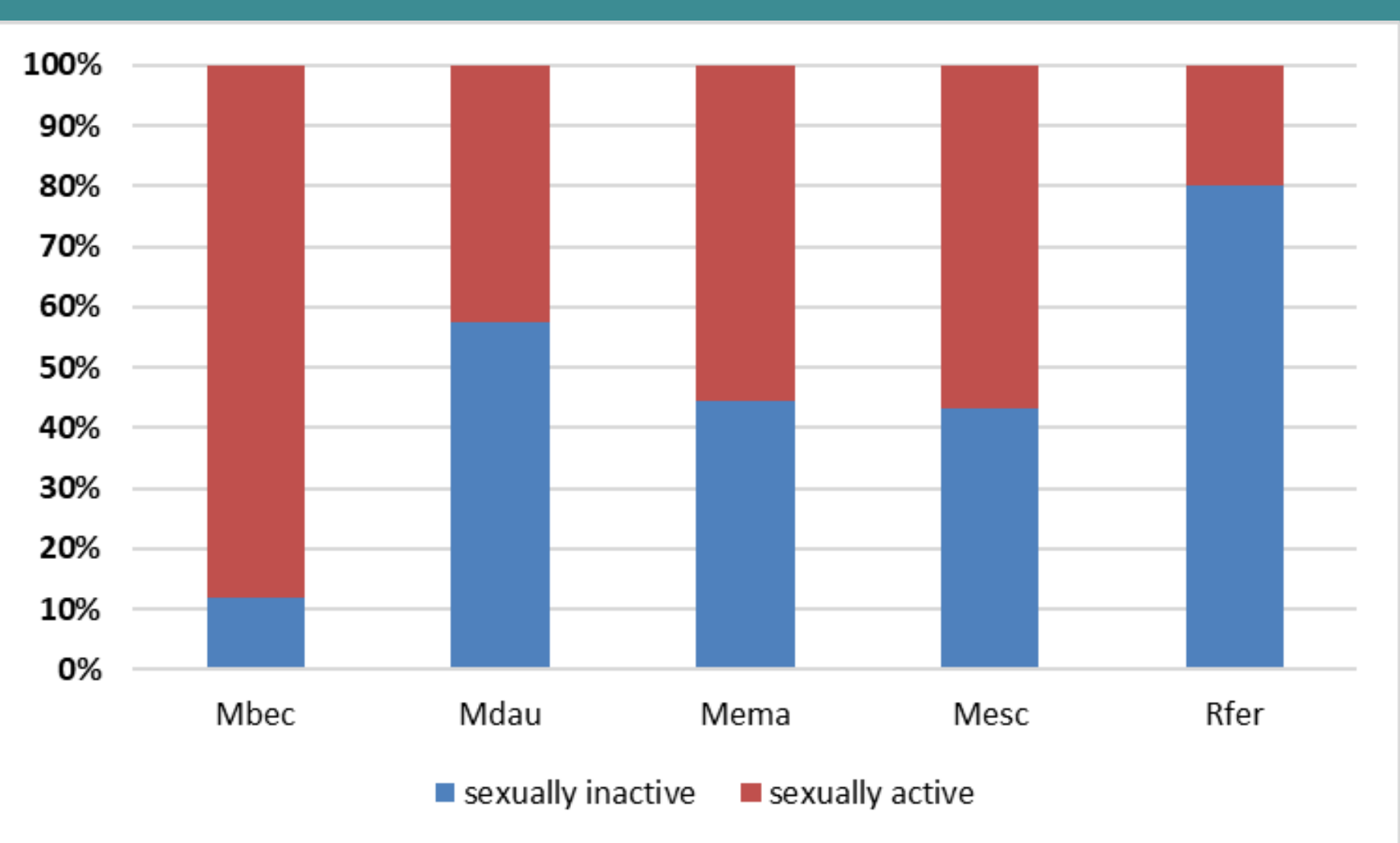
Regarding the arrival of bats at the swarming site, the peak of captures (arrival proxy) is reached during the 2nd and 4th hours of the sessions. Except for the Rfer, most captures take place before the 2nd hour, probably because it doesn't use the roost for swarming, but as autumnal roost.

Sex ratio



For the species belonging to the genus *Myotis*, there seems to be a sex bias towards males (with less than the >18% of females caught. This doesn't happen with *R. ferrumequinum*, where sex ratio is more balanced (>50% of females).

“Checking balls”



The majority of *Myotis* sp. males caught showed signs of being sexually active.

Myotis bechsteinii ringing project



In 2023 a ringing project for *Myotis bechsteinii* was started. The preliminary results show a low inter and intra-annual recapture rate, which may indicate the existence of a considerable population in the region.

Conclusions

Understanding the composition, behaviour and sociality of bats during swarming may provide important links to understand the status of the regional population and be an informative proxy for the bat's conservation assessment. Thus, the continuation of this type of long-term monitoring is of great importance, as it will allow us to follow the evolution and analyse the patterns of the bat population, in order to quickly discriminate possible changes in normal patterns. Is important to emphasize the value to protect the swarming site and distinguishing the presented species that use the roost for swarming and those that use only for roosting. Additionally, this is a good method for monitoring rare species or with high conservation value.

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