



Wildlife in the Changing Andorran Pyrenees

Earthwatch 2023 Field Report

Bernat Claramunt i López
CREAF, edifici Ciències, UAB
08193 Bellaterra, Catalonia

PERIOD COVERED BY THIS REPORT: JANUARY TO DECEMBER 2023

Message from the PI

Dear Volunteers,

This has been our 8th year in Andorra, gathering data to discover the responses of some plants and animals both to climate change and human presence. For sure you have experienced the roughness of the terrain (this is a “Very Active” expedition!), but also its beauty and variety of landscapes. Our main goal during the expeditions is obviously gathering data that can help us answer to the many questions we have, and that working in the Pyrenees can help us answer to; but we also aim at making the expedition an unforgettable experience for you. Helping you be more aware of the dangers that sensitive environments (not only mountains, but mountains in our case) face due to global change; or letting you know a bit about a country, Andorra, that many people do not even know where it is; or just discovering the joy of hiking, are among other non-scientific objectives that we have put to ourselves. You will read in this report that the scientific objectives have been 100% accomplished (so, thanks!!), and we are sure that we are in the right direction. We hope the non-scientific objectives have also been accomplished. As with many Earthwatch projects, this project is very ambitious. The project is also logistically complicated, with many activities carried out each day, under a climate that forces us to be very flexible and to adapt our plans almost every day, and in a territory that some days is too steep for some of us (staff included!!). We want to thank you for your adaptability and for accepting the last-minute changes we have had to make sometimes.

In terms of our scientific objectives, this year has also been very successful. There have been no big incidents with the material (not many cameras stolen, for example, or most digital dendrometers working correctly), and we have been able to collect all planned data. After eight years of fieldwork, we are ready to start answering some of our mid-term questions, and we have good news on that. First, a Ph.D. thesis is starting on September 2023, which will be working with the data from the camera traps for 3-4 years; second, a postdoc will join our team in April 2024 and, for 3 years, she will be working with the data obtained with the dendrometers. The results from these two students, that will come from data that you have helped us gathering, will add up to the papers included in the PhD thesis presented this year, that was focused on the description of the insect communities to elevational gradients.

Finally, we are quite sure that most of you enjoyed the accommodation (despite having to have dinner a bit too late!). We are very grateful to Hotel Bringué for their collaboration, their willingness to make things work and easy for us, and for their flexibility with our diet requirements ;-). Also, for helping us deal with some COVID situations we have unfortunately had. In the same way that comments from the volunteers of previous years, your comments (both public and private) will help us improve the expeditions for the volunteers who will join us in 2024.

Thanks a lot again for making this adventure possible. Very best wishes from the Pyrenees staff. We hope we meet again.

Jana, Oriol, and Bernat

Summary

By the time this report is completed, we still do not have the data for this year, but after a preliminary look at the field data, there are some things that will for sure appear once we are able to analyze them in detail. One of them is that we are likely to see the effects of the extreme drought that the region has suffered this year on both tree growth and microbial activity. We suspect that the lack of available water will be translated into lower growth both at the high and the low elevations; similarly, it looks like that decomposition rates will be much lower than in previous years. All this seems to translate into lower carbon storage in the region in the case of the trees, whereas the effects of the drought on lower decomposition rates are difficult to predict now. On the other hand, we have been able to capture many more small mammals and birds than in previous years, and we expect that, after 8 years, we will be able to start seeing some kind of biological cycle in these two so important taxonomic groups. Finally, we were excited to spot a brown bear in one of our cameras. There are no resident bears in Andorra, but sometimes some individuals “visit” the country. Despite Andorra’s forest services already detecting the bear in close areas, we provided the Andorran government with information about its presence in a place where it had not been observed.

Goals, Objectives, and Results

Small Mammals

After COVID we were able to double the number of plots to study the small mammals community. Since we started, we have captured a total of 1165 individuals of 10 different species: Yellow-necked mouse (*Apodemus flavicollis*), Wood mouse (*Apodemus sylvaticus*), European snow vole (*Chionomys nivalis*), Garden dormouse (*Elyomys quercinus*), Edible dormouse (*Glis glis*), Field vole (*Microtus agrestis*), Common vole (*Microtus arvalis*), Bank vole (*Myodes glareolus*), common shrew (*Sorex araneus*) and Eurasian pygmy shrew (*Sorex minutus*). A surprising fact is that, despite the important drought that we have had in 2023, which could have negatively affected resource (seeds and insects) availability, the number of captured individuals (283) seemed not to be much affected (e.g. 301 in 2022 and 141 in 2021, 283 in 2020).

Bird Banding

Since 2017, we have been capturing and marking birds with the bird banding technique, one of the oldest and most important techniques used for studying and identifying individual birds. We have used mist nests to capture birds in several sites for the last years (2017-2023). In total, we have captured 1131 individuals (434 females, 614 males and 311 unidentified sex) belonging to 31 different species. Five of these 31 species were captured more than forty times: Citril finch (*Carduelis citrinella*), Crested tit (*Lophophanes cristatus*), Coal tit (*Parus ater*), Dunnock (*Prunella modularis*) and Goldcrest (*Regulus regulus*).

Nest Boxes

We have a total of 168 nest boxes installed at the 12 high-elevation sites (108 nest boxes) and at the six low-elevation sites (60 nest boxes). These nest boxes have been surveyed since 2016, in May, June, and July. Since the start we have counted 436 nest boxes occupations of three bird species: Crested tit *Lophophanes cristatus*, Great tit *Parus major* and Coal tit *Parus ater*. Some chicks were too young, or we had doubts with eggs identification, so they could not be identified at species level.

Soil Decomposition

After the COVID break in which we could not carry out the tea-bag experiment, we are finally able to continue our long-term experiment in relation to soil microbial activity. This year there were no big issues, and we could find most of the tea bags. This was also the first year in which we dig out tea bags that were buried last September to have some idea of soil activity during winter, that we expect that will increase over the next years. We will have to wait some years to see a pattern, but winter data will add good value to this experiment.

Tree Growth

We have not been able to analyze tree growth at our high and low-elevation sites yet, but we expect a decrease in growth in both sites due to the extreme drought we suffered. This may be especially relevant at the low elevation sites, where tree competition is higher, and so water availability is lower.

Camera Traps

As it happens each year, some cameras were stolen, mostly before the September expeditions, and others stopped working. However, this activity has worked very well in 2023 ("surviving" cameras without big issues). We are still checking and organizing the pictures taken by the 60 cameras during the entirety of 2023 and are organizing a huge database of more than 40,000 observations that will allow answering to some of our questions soon (most of them related to geographical differences, rather than differences due to climate change—it's still too soon.) Till now, the species we have are the ones we expected (roe deer, chamois, wild boar, red fox, marmot, cow, horse, some martens, and birds), but in July we had a big surprise: a brown bear was spotted in one of our high elevation sites. Even though the presence of that bear in Andorra was already reported by the forest services, our image helped the Andorran Government complement the information they had on the sites that this bear had visited. There are occasional visits of brown bears in Andorra, but by now, there is no resident population in the country.

Coleoptera Biodiversity

In 2023 Jamie Bookwalter (volunteers from other years may remember her) did the defense of her PhD on the diversity of coleoptera in Andorran mountains. The defense was a success, and her work resulted in three papers published in scientific journals.

Project Impacts

Increasing Scientific Knowledge

TOTAL CITIZEN SCIENCE RESEARCH HOURS (MOS 1.1):

- Number of hours per day that volunteers spend collecting data: 5–6
- Number of hours per day that volunteers are being trained to collect data: 1–2
- Number of hours per day that volunteers spend entering data: 1
- Transportation time from accommodation to the field: 10–20 minutes per day

PEER-REVIEWED PUBLICATIONS (MOS 1.2):

- *Understanding the Coleoptera community at the tree line using taxonomic and functional guild approaches* Claramunt López, B., Bookwalter, J. D., Caballero López, B. & Molowny-Horas, R., Nov 2023, In: Agricultural and Forest Entomology. 25, 4, p. 669-680 12 p.
- *Fecal matters: implementing classical Coleoptera species lists with metabarcoding data from passerine bird feces.* Bookwalter, J., Mohamed Niyas, A., Caballero, B., Villari, C. & Claramunt Lopez, B., Aug 2023, In: Journal of Insect Conservation. 27, 4, p. 557-569 13 p.
- *DNA metabarcoding Passerine bird feces at tree line uncovers little intra- and inter-species dietary overlap.* Bookwalter, J., Mohamed Niyas, A., Caballero, B., Villari, C., Marco, J., Burgas, A., Ferrandiz Rovira, M. & Claramunt Lopez, B., 4 Jul 2023, In: Community Ecology. 24, 2, p. 147-157 11 p.
- *Name Over Function? Understanding Coleoptera community at the tree line using taxonomic and functional guild approaches* Bookwalter, J., Caballero, B., Molowny-Horas, R. & Claramunt Lopez, B., 2023, In Agricultural and Forest Entomology.

Outreach and Mentoring

GRADUATE STUDENTS (MOS 2.1)

Student Name	Graduate Degree	Project Title	Anticipated Year of Completion
Jamie Bookwalter	Ph.D. thesis	Functional groups dynamics of saproxylic insects at the tree line	Finished 2023
Rodrigo Ayala	Ph.D. thesis	Effects of climate change and land use on the community of large mammals in mountain regions	2026/2027
Experanza Iranzo	Post-doctoral grant	Coexistence in the mountain: wild herbivores facing anthropic pressure and climate change	2027

Partnerships (MoS 3.1)

Student Name	Graduate Degree	Project Title
Andorra Turisme / Institut d'Estudis Andorrans (CENMA)	Cultural support	2016–present
Ordino Municipality	Permits and logistics	2016–present
Meteorological Service of the Andorran Government	Data	2016–present
Natural History Museum of Barcelona	Academic support	2017–2023

¹. Support type options: funding, data, logistics, permits, technical support, collaboration, academic support, cultural support, other (define)

Please provide details connecting your contributions to policies/plans to the implementation of those policies/plans as relevant.

Some of our data was shared with the Natural Park. Such data was added to the data that they collect

Ecosystem services (MoS 5.3)

Indicate which ecosystem service categories you are directly studying in your Earthwatch research and provide further details in the box below as needed.

PROVISIONING SERVICES

- ☐ Fisheries (Fresh & Marine)
- ☐ Energy (Fuelwood/hydropower)
- ☐ Livestock grazing
- ☐ Material extraction (e.g. resin, grass)
- ☐ Timber
- ☐ Water supply
- ☐ Other food (crops, wild foods, spices)
- ☒ Preserving/maintaining Biodiversity

REGULATING & SUPPORT SERVICES

- ☐ Carbon sequestration/storage/"blue"
- ☐ Coastal protection
- ☐ Erosion control
- ☐ Flood regulation/protection
- ☐ Pest and disease control
- ☐ Pollination
- ☐ Seed dispersal
- ☐ Water purification/quality
- ☐ Nutrient cycling

CULTURAL SERVICES

- ☐ Cultural/historical values
- ☐ Health (mental & physical)
- ☒ Research & knowledge
- ☐ Recreational
- ☐ Spiritual/aesthetic values
- ☐ Pharmaceuticals

OTHER SERVICES

- ☐ Employment/Livelihoods

Details as needed:

The project is basically and most directly focused on biodiversity, but we indirectly address:

- **"Livestock and grazing"**: From our camera traps we are monitoring the population dynamics of livestock (but we do not measure its grazing impact)
- **"Carbon sequestration"**: Measuring tree growth is a proxy of net carbon sequestration, and our Teabag experiment is also an indicator of microbial activity, related to the carbon cycle (but not directly related to carbon sequestration)

Acknowledgments

We first want to thank the volunteers and Earthwatch for making this project possible. But we also wish to thank Hotel Bringué for making our food and accommodations comfortable for all of us and the Ordino municipality for their collaboration in some logistics.