YEARLY PROJECT REPORT – No.1

2022

Dear olive farmers and stakeholders participating and interested in our project ECO-OLIVES!

We thank you very much for your kind collaboration and support this year! With this short report we want to give you an overview of what has been done in ECO-OLIVES in 2022 and what we have planned for the next year.

This report gives an insight into the first existing data of our project and are therefore to be considered as a rough trend. For the scientific analyses, we still need some repetitions of measurements and observations, as well as some more time in the laboratory for the taxonomic determination of the recorded species.

We are very happy to be able to report some insights and highlights already, despite the still ongoing project work. The major highlights of this year include:

- 53 bird species observed (incl. 19 pure insectivores and several partial insectivores).
- 25 recorded species of bats (out of 27 species in Italy - all insectivorous)
- Over 100.000 estimated individuals of arthropods (including more than 50 estimated species of spiders and more than 20 estimated species of ants).
- One newly observed spider species for Italy (!)
- Successful completion of harvesting and set-up of experiments
- New funding for biodiversity surveys and two PhD theses in ECO-OLIVES
- Planning and submission of extended projects (COMPASS) - focusing on pruning effects to promote ecosystem services and harvesting

TABLE OF CONTENTS




STUDY DESIGN AND AIMS OF ECO-OLIVES

In ECO-OLIVES, we link biodiversity data of birds, bats and arthropods (insects and spiders) to olive production data with a focus on functionally important species groups that provide ecosystem services such as biological pest control (z.B.: suppression of pest insects like olive fly and olive moth) as well as dis-services (z.B.: effects of olive fly and olive moth on olive yield quantity and quality). Specifically, we study the occurrence of different bird, bat and arthropod species in relation to local farm factors (z.B.: composition and condition of olive trees and local vegetation) and landscape factors (z.B: proximity to and amount of surrounding natural and urban habitats) over the year, also accounting for effects of seasons (z.B.: migration of species) to better understand:

- **The importance of local, landscape and seasonal factors for species conservation**
  (Why do certain species occur in some places and times and not in others?)
- **The multi-trophic interactions of species**
  (Which species promote or counteract the occurrence of other species?)
- **The effects of species on olive production**
  (How is the occurrence of species related to olive yield quantity and quality?)

Based on a statistically optimized study design that ensures high data power through the selected number and characteristics of farms, as well as through the biodiversity surveys and their replications, we aim to better understand the interactions of biodiversity, olive management and production. The recorded data and considerations of different management techniques will help us to better understand how biodiversity, management and production can be combined sustainably – which means how environmental, societal and economic considerations can be harmonized in the management of the olive growing landscape that depends on ecosystem services.

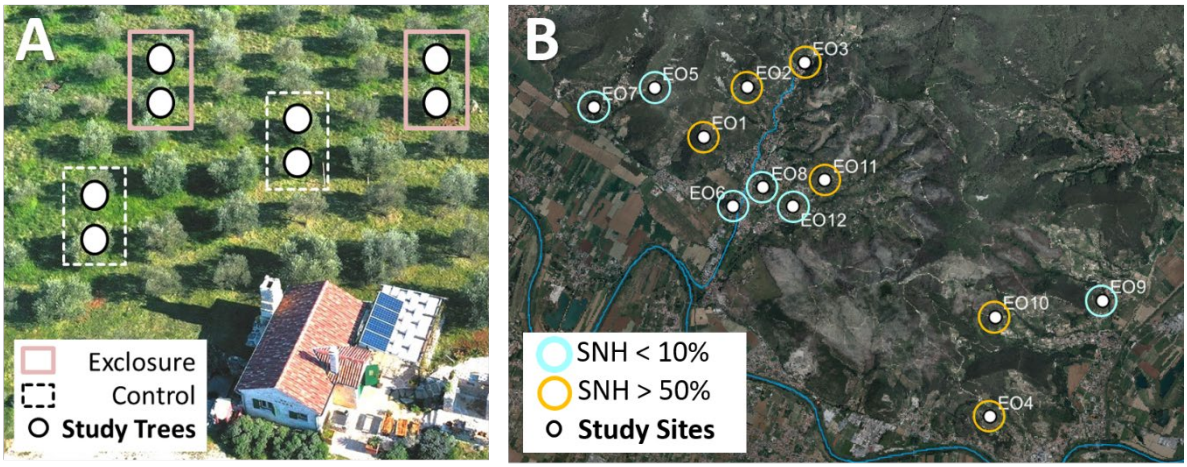


Figure 1: Study design of ECO-OLIVES. On a local scale (left; A), we compare 8 olive trees per farm – 4 of which are part of an experiment excluding birds and bats and 4 of which are used as controls to compare effects of birds and bats on multitrophic interactions between species and concurrent effects on olive production. On a landscape scale (right; B), we compare these effects on a total of 12 organic olive farms in the area of Monte Pisano – 6 of which are surrounded by a high amount of semi-natural habitat (>50% within 500m radius; orange circles) and 6 of which are surrounded by a low amount of semi-natural habitat (<10% within 500m radius; blue circles).

BIODIVERSITY DATA RECORDED IN 2022

Birds, bats and arthropods have a high functional diversity which means they have a high variety of feeding guilds and habitats in which they occur, as well as a high mobility. Depending on the availability of local resources and the structure of the landscape, insect eating birds, bats and arthropods (like ants and spiders) are able to reduce the amount and impact of different insects (including many pest insects) and thereby contribute to the ecosystem service of natural pest control. To investigate these ecosystem services, we observed and recorded birds, bats and arthropods in all the project sites using these methods:

Birds: Visual and acoustic point counts
Bats: Acoustic ultrasound recording
Arthropods: canopy fogging and genetic analyses; pitfall traps in the ground; visual observations on trees; honey traps on olive tree branches (for ants)

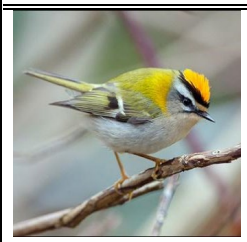
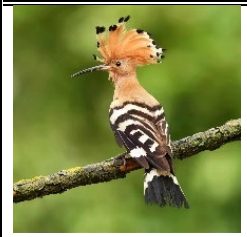
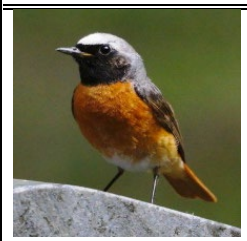
BIRDS

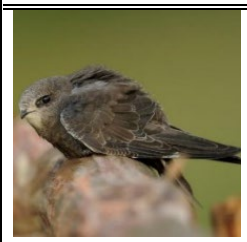
Birds are considered to be of high ecological and economic importance as consumers of pest insects, seed dispersers, pollinators and scavengers at several trophic levels and play a major role in the structure and function of ecosystems.

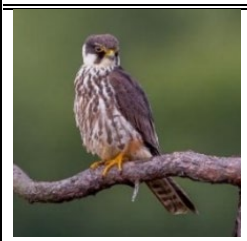
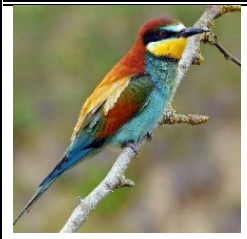
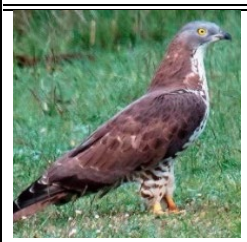
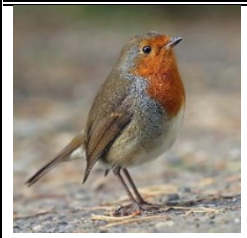
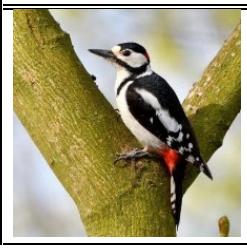
Worldwide, there are more than 10,000 different bird species. Although birds are incredibly diverse, mobile and adaptable, species numbers and associated ecosystem services are in steep decline. The main factor in this decline is the rapid expansion and intensification of agricultural landscapes. Across the EU, it is estimated that there are 300 million fewer farmland birds than there were 20 years ago - and the number is rising. In Italy, there are 572 different species of birds.

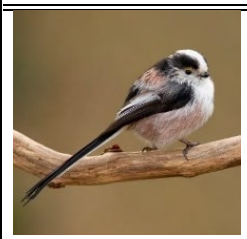
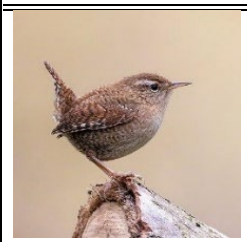
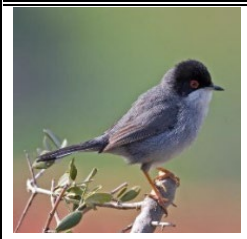
In 2022, we detected a surprisingly high number of 1881 birds out of 53 different species in the 12 olive farms of the project region. The majority of the species (34 out of 53) and also most abundant birds such as the Eurasian Blackcap, the European Robin and the European Starling (see Table 1 below), which feed predominantly and most of the year on insects and other invertebrates. But also, birds that are mainly granivorous, carnivorous or omnivorous often feed temporarily on insects, especially in the breeding season to feed their young. Thereby, most bird species may control pest insect populations that attack olive fruit. The ecological and economic importance of birds in agricultural landscapes illustrates the concern of bird conservation, especially in highly diverse Mediterranean regions. We found in total 8 species of conservation concern, five classified as “near threatened”, one classified as “vulnerable” and two classified as “endangered” by the IUCN Red List of Italy (see Table 1 for more information).

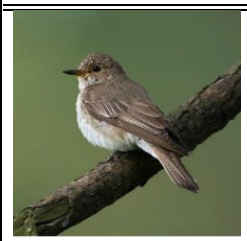
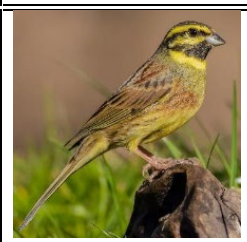
Table 1: List of bird species and numbers detected in 12 olive farms of the ECO-OLIVES project. Species are categorized in feeding guilds according to their main diet: mainly insectivorous, mainly granivorous, carnivorous and omnivorous. Bird species of conservation concern category (IUCN - Red List Italy) are highlighted and indicated with: NT (“near threatened”, green) VU (“vulnerable”, yellow) and EN (“endangered”, orange).

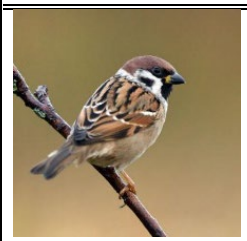
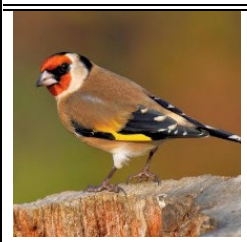
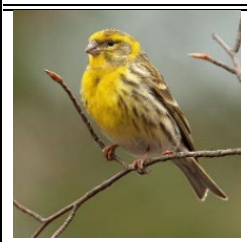
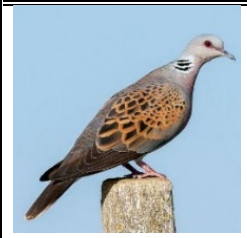
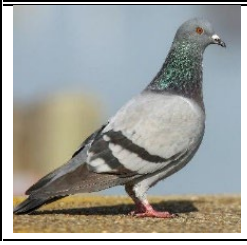
Diet	Species name (**English**, *Scientific*, Italian)	EO1	EO2	EO3	EO4	EO5	EO6	EO7	EO8	EO9	E10	E11	E12	TOTAL per species
Mainly insectivorous	 **Barn Swallow** *Hirundo rustica* Rondine			5	1		11	3	2	2			2	26
	 **Common Chiffchaff** *Phylloscopus collybita* Luì piccolo	1	4		2	1	2	6	1	1	1	3	1	23
	 **Common Cuckoo** *Cuculus canorus* Cuculo		2	1							2		1	6
	 **Common Firecrest** *Regulus ignicapilla* Fiorrancino	5	1	3		4	2	2	1	1	1	5		25
	 **Common Hoopoe** *Upupa epops* Upupa		1		2			1		3		1		8
	 **Common Nightingale** *Luscinia megarhynchos* Usignolo								4	4		1	6	15
	 **Common Redstart** *Phoenicurus phoenicurus* Codirosso comune	1	2	4	4		1	1		2	4	2		21

	**Common Stonechat** *Saxicola torquatus* Saltimpalo							3				2	5
	**Common Swift** *Apus apus* Rondone Coman				2			2		1	2			7
	**Dunnock** *Prunella modularis* Passera scopaiola		1		1					1	1		1	5
	**Eurasian Blackbird** *Turdus merula* Merlo	9	7	17	9	10	10	8	9	7	9	7	8	110
	**Eurasian Blackcap** *Sylvia atricapilla* Capinera	10	13	16	9	11	16	13	13	15	10	9	10	145
	**Eurasian Blue Tit** *Cyanistes caeruleus* Cinciarella	5	3	2		8	2	1	3	7	3	6	1	41
	**Eurasian Golden Oriole** *Oriolus oriolus* Rigogolo				1							2		3

	**Eurasian Green Woodpecker** *Picus viridis* Picchio verde	6	7	3	9	6	3	2	6	7	5	11	4	69
	**Eurasian Hobby** *Falco subbuteo* Lodolaio									1				1
	**Eurasian Wryneck** *Jynx torquilla* Torcicollo						1							1
	**European Bee-eater** *Merops apiaster* Gruccione				1									1
	**European Honey-buzzard** *Pernis apivorus* Falco pecchiaiolo		1											1
	**European Robin** *Erithacus rubecula* Pettirosso	10	12	18	9	24	12	7	10	17	15	10	10	154
	**European Starling** *Sturnus vulgaris* Storno		1	5			83	8	19	5		1	22	144
	**Great Spotted Woodpecker** *Dendrocopos major* Picchio rosso maggiore	1			1	1				3	1			7

	**Great Tit** *Parus major* Cinciallegra	12	7	13	8	7	9	14	7	11	9	12	5	114
	**Grey Wagtail** *Motacilla cinerea* Ballerina gialla								1					1
	**Long-tailed Tit** *Aegithalos caudatus* Codibugnolo			10	4	3	4	20		4	1			46
	**Northern House Martin** *Delichon urbicum* Balestruccio		50		23		12		4	3	3	1		96
	**Northern Wren** *Troglodytes troglodytes* Scricciolo		1	2	1	3				3				10
	**Red-backed Shrike** *Lanius collurio* Averla piccola	1										2		3
	**Red-billed Leiothrix** *Leiothrix lutea* Usignolo del Giappone	2	16	13	1	22	1		1	6	4			66
	**Sardinian Warbler** *Sylvia melanocephala* Occhiocotto	14	13		3	14	2	7	6	8	16	17	3	103

		**Short-toed Treecreeper** *Certhia brachydactyla* Rampichino comune	2	3	5	6	3		3	4	5	1	1	1	34
		**Song Thrush** *Turdus philomelos* Tordo bottaccio	2		1		1	3			1	1	1	1	11
		**Spotted Flycatcher** *Muscicapa striata* Pigliamosche			1		2	1							4
		**White Wagtail** *Motacilla alba* Ballerina bianca			3			1	4	4	2			5	19
Mainly granivorous		**Cirl Bunting** *Emberiza cirlus* Zigolo nero		4	1				2				1		8
		**Common Chaffinch** *Fringilla coelebs* Fringuello	8	6		1	2	4		2	3	3	1	3	33
		**Common Woodpigeon** *Columba palumbus* Colombaccio		2	4	2	3	4	1	3		3	1		23
		**Common Pheasant** *Phasianus colchicus* Fagiano comune										1	2		3

	**Eurasian Collared-dove** *Streptopelia decaocto* Tortora dal collare	2				2	7	4	7	8		4	10	44
	**Eurasian Tree Sparrow** *Passer montanus* Passera mattugia								1				2	3
	**European Goldfinch** *Carduelis carduelis* Cardellino		1	1	1		3	2		2		3	5	18
	**European Greenfinch** *Chloris chloris* Verdone	1					4		2	2		5	7	21
	**European Serin** *Serinus serinus* Verzellino	2	3	4	7		11	5	1	4	1	4	6	48
	**European Turtle-dove** *Streptopelia turtur* Tortora selvatica		3			1	1	4			2		2	13
	**Italian Sparrow** *Passer italiae* Passera d'Italia		6	6	1		4	28	10	6		9	29	99
	**Rock Dove** *Columba livia* Piccione domestico	5		7	2		8	1	5	14		1	1	44

Carnivorous		**Common Kestrel** *Falco tinnunculus* Gheppio	2	1	1	1		1					1		7
		**Eurasian Buzzard** *Buteo buteo* Poiana		2											2
		**Little Owl** *Athene noctua* Civetta								1					1
Omnivorous		**Carrion Crow** *Corvus corone* Cornacchia grigia	7	6	4	5	1	2	5	9	17	1	5	3	65
		**Eurasian Jackdaw** *Corvus monedula* Taccola	3					14		9	3			3	32
		**Eurasian Jay** *Garrulus glandarius* Ghiandaia		4		2	6				1	3			16
		**Eurasian Magpie** *Pica pica* Gazza	6	6	7	8	1	2	6	8	8	5	11	8	76
Total per field			**117**	**189**	**157**	**127**	**136**	**241**	**160**	**156**	**188**	**108**	**140**	**162**	**1881**

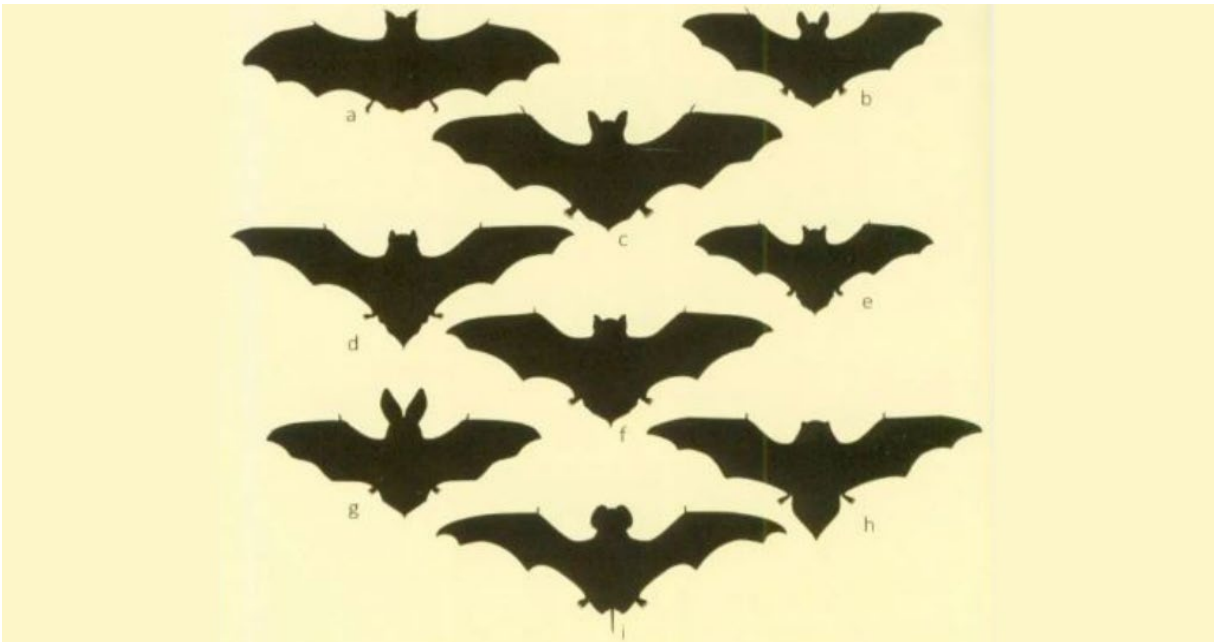
BATS

Bats are highly mobile and active foragers that provide crucial ecosystem services such as biological pest control, see dispersal, pollination and nutrient cycling. About one-third of the approximately 1,400 known bat species worldwide are listed as endangered or are understudied for classification. Due to their nocturnal activity, their contribution to ecosystem services such as biological pest control is often underestimated.

Bats eat bugs, which is not only helpful for reducing mosquitoes and other insects at bay for us humans, but also has economic importance. Scientific studies on the economic value of bats to agriculture estimated that bats provided natural pest-control services totaling $3.7 billion to $53 billion per year. This study did not even consider what the indirect costs of “replacing” bats with pesticides would be in terms of potential health and pollution threats from greater levels of toxins in the environment.

In Italy, there are 27 different bat species that are all "insectivorous", which means they feed on insects and potentially contribute to natural pest control also in agricultural habitats. However, agricultural expansion and intensification is also the main threat to bats and is causing a steady decline of species and individual numbers. In particular, the decline of suitable foraging habitats and roosts is posing a great threat to this species group and associated ecosystem services.

Figure 2: Flight silhouettes of different bat species groups occurring in the study area of ECO-OLIVES.



Flight silhouettes of (a) Ferro di cavallo (horseshoe bats), (B) Vespertilio di Bechstein (Bechsteins myotis), (C) Myotis (Mouse-eared bats), (D) Nottulla sp. (Noctule sp.), (E) Pipistrello (Pipistrelle sp.), (F) Serotino comune (Serotine bat), (G) Orecchione (long-eared bats), (H) miniottero comune (common bent-wing bat) and (J) molosso di Cestoni (European free-tailed bat); drawings by W. Lang; source by Dietz and Kiefer (2004). Note that these digrams gives an indication of shape not of scale.

In 2022, we recorded 27 bat species on the 12 farms of ECO-OLIVES – all of them being insectivore and thereby potentially contributing to biological pest control. By analyzing and comparing the available data at this point, we can expect that these 27 recordings represent at least 21 different bat species, which is a very positive and surprising result for us.

However, since we used these Auto-ID data for this preliminary report, for some species (marked with*) we can only confirm their occurrence after manual post validation. Since we can hardly see bats due to their nocturnal activity, we have measured their activity by their call signals to give you a picture of their activity on the 12 project sites (EO1-EO12). To quantify the units of measurement of bat activity we classified "bat passes", which are defined as a sequence of 5-second duration with a minimum of two recognizable echolocation pulses per species. The most common species in our survey areas was the Nathusius pipistrelle (Pipistrello di Nathusius), which might be a commonly found bat, but still very functional in providing pest control. In addition, we found 16 species of conservation concern: seven species are classified as "near threatened" (NT), five species as "vulnerable" (VU), three species as "endangered" (EN) and one species is classified as "critically endangered" (CR) by the IUCN Red List of Italy (see Table 2 for more information).

Table 2: List of bat species and numbers detected in 12 olive farms of the ECO-OLIVES project. Detections are based on automatic identification of bat species compared with other large data sets of bat sounds (processed in KaleidoscopePro software). Bat species of conservation concern category (IUCN - Red List Italy) are highlighted and indicated with: NT ("near threatened", green) VU ("vulnerable", yellow), EN ("endangered", orange) and CR ("critically endangered", red).

Species name (English, *Scientific,* Italian)	**EO1**	**EO2**	**EO3**	**EO4**	**EO5**	**EO6**	**EO7**	**EO8**	**EO9**	**E10**	**E11**	**E12**	**TOTAL per species**
Western barbastelle* EN *Barbarstella Barbastellus* Barbastello	1					2				5	1	3	12
Northern bat *Eptesicus nilssonii* Serotino di Nilsson			1	1		1		1	2	17	1		24
Common serotine NT *Eptesicus serotinus* Serotino Comune	2			2	1		1		3	2			11
Savi´s pipistrelle *Hypsugo savii* Pipistrello di Savi	62	32	78	42	96	94	48	44	33	9	22	253	813

Common bent-wing bat *Miniopterus schreibersii* Miniottero comune VU	1	2	3	5	3	12	19	8	2		1		56
Bechstein's bat* EN *Myotis bechsteinii* Vespertilio di Bechstein			1			1							2
Brandts myotis *Myotis brandtii* Vespertilio di Brandt			1	1		1	1					2	6
Dauberton's myotis *Myotis daubentonii* Vespertilio di Daubenton			1		2	1	6	2		5	2	1	20
Geoffroys myotis* NT *Myotis emarginatus* Vespertilio smarginato					1								0
Mouse-eared myotis* VU *Myotis myotis* Vespertilio maggiore											1		1
Natters myotis* VU *Myotis nattereri* Vespertilio di Natterer		1											1
Grater noctule bat CR *Nyctalus lasiopterus* Nottola gigante				1		1	1	1	1		12	7	24
Lesser noctule NT *Nyctalus leisleri* Nottola minore	4	1	6	2	5	7	6	2	2		3	4	42
Common noctule VU *Nyctalus noctula* Nottola comune		3	1	24	2	2	1	7	2	2	7	14	65
Kuhls pipistrelle *Pipistrellus kuhlii* Pipistrello albolimbato	29	23	28	78	196	15	66	55	47	75	78	518	1208

Nathusius pipistrelle NT *Pipistrellus nathusii* Pipistrello di Nathusius	15	13	112	12	524	367	172	236	171	26	33	1752	3433
Common pipistrelle *Pipistrellus pipistrellus* Pipistrello comune	3	4	4	7	4	1	8	26	3	42	1	92	195
Soprano pipistrelle *Pipistrellus pygmaeus* Pipistrello pigmeo	2		1	1	4	3	5			1		2	19
Brown long-eared bat NT *Plecotus auritus* Orecchione comune				2			1	2			1		12
Grey long-eared bat NT *Plecotus austriacus* Orecchione meridionale	2		2	1	7	2	3	3	6	2	5	2	35
Mediterranean horseshoe bat NT *Rhinolophus euryale* Ferro di cavallo euriale		1				3	2					1	7
Greater horseshoe bat *Rhinolophus ferrumequinum* VU Ferro di cavallo maggiore		5	9		4	8	46	4	6	2	6	38	128
Lesser horseshoe bat EN *Rhinolophus hipposideros* Ferro di cavallo minore	6	14	31	27	49	51	34	34	68	97	134	42	587
European free-tailed bat *Tadarida teniotis* Molosso di Cestoni	182	1	18	68	35	65	144	118	32	13	212	359	1247
Particoloured bat* *Vespertilio murinus* Serotino bicolore		1		3		1		1		2		1	9
TOTAL per field	**309**	**101**	**297**	**277**	**933**	**638**	**564**	**544**	**378**	**300**	**520**	**3091**	**7957**

ARTHROPODS

The overview of the arthropod species found in the 12 olive groves of ECO-OLIVES is not complete yet, due to the big amount of data collected in the field sessions (324 traps and 80 canopy fogged trees) and the consistent amount of time required for the identifications. In this preliminary report, we can share an overview from the canopy fogging experiment that was performed in May on all sites except EO7 and EO8. During the canopy fogging, 8 trees per farm were treated with natural pyrethrum (an organic gas that disappears from the environment in a few hours).

Table 3: Overview of arthropods divided into 9 groups. The numbers marked with a (*) are approximate values, estimated to accelerate the manual counting during the sorting of the samples.

Group name (**English**, Italian)	**EO1**	**EO2**	**EO3**	**EO4**	**EO5**	**EO6**	**EO9**	**E10**	**E11**	**E12**	**Total per group**
Larvae/ caterpillars Larve/bruchi	9	4	1	1	1	10	14	17	12	8	77
Coleoptera Coleotteri	125	100	98	158	144	100	174	178	150	144	1371
Spiders Ragni	19	48	10	39	18	91	88	90	58	148	609
Ants Formiche	790*	876*	224	5032*	2039*	40	193	655*	722*	2451*	13022*
Hymenoptera Altri imenotteri		18	5	16	9	35	17	12	18	17	147
Orthoptera Ortotteri	10	5	17	3	2	4	2	7	2	2	54
Heteroptera Eterotteri	15	6	18	31	25	173	219	32	97	157	773
Cicada Cicale e affini	26	93	18	232	23	74	58	14	236	109	883
Aphididae Afidi	35	23	8	15	15	138	5	29	46	28	342
Other / Altri artropodi	20	76	39	132	78	138	144	101	125	162	1015
Total per field	**1220**	**1249**	**438**	**5659**	**2354**	**803**	**914**	**1135**	**1466**	**3226**	**18293**

Phaeocedus vankeeri: a new spider species for Italy

While identifying the canopy fogging samples from our site EO11, we found a spider not reported in Italy. Its name is *Phaeocedus vankeeri*, and it belongs to the Gnaphosidae family, a huge spider family that includes 169 species from 31 genera just in Italy. The specimen we found is an adult male of 4.5mm of body length (the length in spiders is measured excluding the legs), and the analysis of the pedipalps allowed us to be sure about the species. In fact, the most reliable morphological characters in spiders are the genitalia, only present in adults: female genitalia are covered with a particular structure called epigyne, while the copulatory organs in males are the pedipalps, the second pair of appendices, modified for the mating. Pedipalps and epigynes work as a key-lock mechanism, and they have a different shape in each species.

Phaeocedus vankeeri was described only in 2019, and it is officially known for Greece, France, and Corse: considering its Mediterranean distribution and its recent description, the presence of this species in Italy is not very surprising, but still of great value. In the precedent records, this spider was found on the ground in phrygana, while our specimen was found in the canopy of an olive tree: other findings, both on the trees or on the ground, could help to better understand the almost unknown ecology of this species.

Being spiders still understudied and very few biodiversity samplings in our study area being done, we hope to find more rare species in our project and contribute to a better understanding conservation and management of biodiversity and associated ecosystem services.

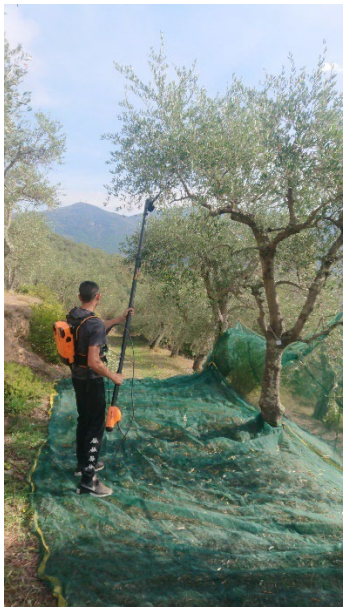
Figure 3: To give you an idea of the appearance of *Phaeocedus vankeeri*, we have added a photo quickly taken under the stereomicroscope:

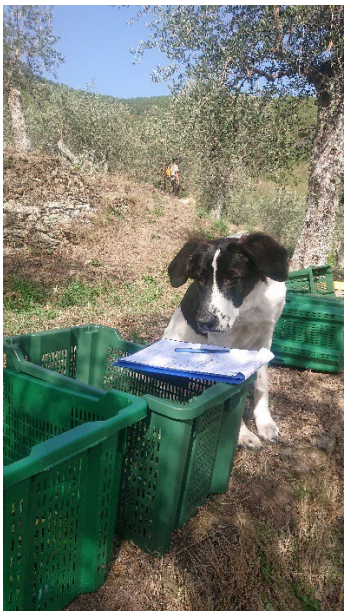
HARVEST DATA

From October to November 2022, we collected harvest data for each of the 96 olive trees in ECO-OLIVES. In addition to the total weight of olives harvested per tree, we also determined the respective proportion of "healthy" and "infested" olives per tree. In addition, the degree of ripeness of the olives, the variety of each tree and the length and width measurements of ten randomly selected olives were determined (a total of 1920 measurements). Together with the data on olive oil content and the farm and tree records from 2023 (which we do not yet have in full), we will be able to produce a detailed report in 2023 and also understand whether and how the absences of birds and bats (generated by the exclusion experiments) affect arthropod diversity, multitrophic interactions and harvest.

Table 4: Overview of harvest data on the 12 project sites of ECO-OLIVES.

Farm ID	Mean g/tree	Min. g/tree	Max. g/tree	Mean % "healthy"	Mean % "infested"
EO1	2083	830	4470	26	74
EO2	2821	0	11340	75	21
EO3	768	180	1360	74	26
EO4	244	25	505	45	25
EO5	1333	30	3245	78	22
EO6	9744	784	16270	92	9
EO7	3458	45	6295	77	23
EO8	4375	570	8290	92	8
EO9	3315	1505	5225	23	78
EO10	3631	1470	6360	66	34
EO11	5148	1805	9700	23	77
EO12	6658	1515	19570	83	17





INFOS ABOUT PILOT-SURVEYS & COMPASS

We thank all farmers participating in ECO-OLIVES very much for the feedback and support we received on the pilot-survey and implementation of our co-project COMPASS, which were distributed and discussed in December 2022. Below, you will find the cover page of our pilot survey, which will complement our farm data and be very helpful in the development of the international survey which we will start by spring 2023. Also, we attach the summary of COMPASS that has been shared with you.

QUESTIONNAIRE INTRODUCTION

"How can we sustainably link biodiversity, ecosystem services and productivity in olive cultivation?"

To capture the diversity of perspectives on our project content and goals, and to promote a better understanding of related challenges and opportunities, we are designing a questionnaire in close collaboration with our project network. In December 2022, we distributed a pilot version of this survey that will be used to develop the final version, which will be distributed internationally in 2023.

Perspectives and experiences from olive cultivation and management are essential for translating scientific evidence into land use practice. In this regard, we highly appreciate to have been able to learn from you during this year and our conversation in December! The information from the survey will flow into the ongoing analyses of data as well as into the development of the App-prototype to facilitate sustainable olive management and the international surveys on the interlinkages between biodiversity, agriculture and sustainability. Amongst others, you shared your visions on this mission with us and identified the following challenges (left, red colours) and opportunities (right, green colours) linked to it:

INFOS ABOUT COMPASS

The positive effects of traditional agricultural practices, such as systematic tree pruning, on biodiversity and ecosystem services have already been demonstrated in a wide variety of land-use contexts. However, targeted implementation of such practices is difficult due to various local and landscape factors. COMPASS will optimize traditional farm management methods by identifying the effects of systematic tree pruning on biodiversity, ecosystem services, productivity and sustainability of olive groves in different local and landscape contexts.

In November 2022, we submitted a pre-proposal to the EU funding programme BIODIVERSA+ for the open call 'Improving transnational monitoring of biodiversity and ecosystem change for science and society'. COMPASS will collaborate with partners of key projects and initiatives on sustainable olive production from Italy, Spain, Greece and Portugal (among others, FRAMEwork and OLIVARES VIVOS partners). The decision on the pre-proposal will be taken in April 2023.

In order to implement the COMPASS project, we intend to start applying systematic pruning techniques to olive trees within the network of farms of the ECO-OLIVES project in Monte Pisano. In addition to the 8 trees studied in ECO-OLIVES (4 control trees and 4 experimental secluded trees compared to each other to identify the effects of birds, bats, ants and spiders on biodiversity, olive tree pests and productivity), we would like to add a pruning approach to another 8 trees per farm (4 pruned in February and 4 pruned in April) in order to create a more complete and synergic dataset that will allow us to investigate the effects of pruning on the effects already studied in ECO-OLIVES. We thank all project partners for supporting this project and look forward to getting in touch with you by early January 2023!

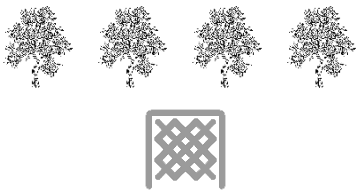
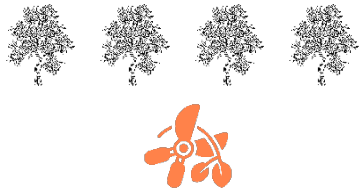
Control Trees	Exclosure Experiments	
		**ECO-OLIVES** (2022-2023)
 **Pruning in February**	 **Pruning in April**	**COMPASS** (2023-2024)

Figure 5: Overview of potential synergies between ECO-OLIVES and COMPASS when comparing controls, experiments and two different pruning approaches. Trees pruned within COMPASS will also be analyzed with regard to biodiversity (visual and non-invasive approaches only) and yield (per tree). The combination of ECO-OLIVES and COMPASS data will not only lead to more complete and reliable data sets, but also to a more comprehensive understanding of how to integrate olive productivity, biodiversity and ecosystem services into sustainable management approaches.

PLANS FOR 2023

In March 2023, we will start the next field season of biodiversity and olive tree surveys. The spring surveys will run from March to June/July (depending on the temperatures) and the autumn surveys from September to October/November (until the nd of harvest).

In addition to recording birds, bats and arthropods, we will also conduct a detailed assessment of each project farm and the included olive trees (e.g., local vegetation and tree size data), as well as a detailed landscape mapping and measurements of soil composition and impacts of local microclimate.

Further, we aim to develop an App-prototype based on available biodiversity-production data and your feedback from the conducted interviews in 2022 in order to support considerations targeted at more biodiversity-friendly and sustainable olive production.

On 15th April 2023, we will organize a mutual exchange event in Calci. During this event, we will not only demonstrate some pactical insights into our project such as the biodiversity assessment methods and tree pruning approach, but also provide some first insights from the data analyses. Further and foremost, this event should be an opportunity to exchange with all project participants and partners, to get to know each other and discuss ideas around the project and sustainable olive management. We will send out a reminder and more detailed invitation with information about the event location in March 2023, but we hope that you can save this date already in your calendars:

ACKNOWLEDGEMENTS

We sincerely thank all project partners for their support of ECO-OLIVES! First and foremost, we thank the owners and managers of the twelve olive groves in our project, as well as our partners at the University of Sant Anna, especially Camilla Moonen, for their tireless support in all phases of the project. Special thanks also go to Christiano Tozzini and Fabio Taccini for their active support in setting up the exclusion experiments.

We are very grateful to our partners at the Universities of Sant Anna, Florence, Vienna, Würzburg and Berlin, and to our international scientific-practical network for their support at all levels - from ant identification to large-scale genetic analyses in an always friendly, constructive and inspiring exchange.

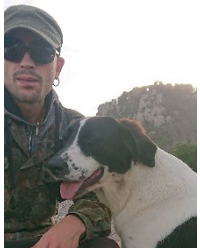
INFOS ABOUT OUR TEAM & CONTACTS

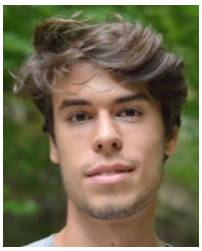
The ECO-OLIVES team has grown quickly this year - and often surpassed itself! Thanks to a great team spirit and great motivation of everyone involved, we were not only able to accomplish everything we set out to do, but also to react to complications and acquire further funding and projects… Because this team is also "eCOOLives" :)

We are especially glad to announce that beyond the successful field season in 2022, we were able to raise three additional fundings for ECO-OLIVES in 2022: one for the PhD thesis of Rym Nouioua on bats, one for the PhD thesis of Tara Hanf-Dressler on birds, and one for excellent bird and bat recording equipment from Wildlife Acoustics! Rym and Tara will start their PhD work in 2023.

We are looking forward to staying in touch with you and to many more exciting findings on the interactions of biodiversity and olive groves in Monte Pisano.







Bea *Virginia* *Tommaso* *Rym* *Andrea* *Tara* *Luca*

CONTACTS

If you have any questions, please do not hesitate to contact us

Lead of ECO-OLIVES and COMPASS:
Dr. Bea Maas
Email: bea.maas@univie.ac.at
Mobile/WhatsApp: +43 650 4200 494

Co-lead of COMPASS and pruning expert/contact:
Tommaso Nardi
Email: ilpendolino1993@gmail.com
Mobile /WhatsApp: +39 348 419 3298

Local communication/coordination contact:
Virginia Bagnoni
Email: Virginia.Bagnoni@santannapisa.it
Mobile /WhatsApp: +39 340 679 783

The whole team of ECO-OLIVES is wishing you wonderful holidays and is looking forward to starting the next field season in March 2023!