

Operation Wallacea Science Report 2026

Krka National Park, Croatia



Krka River gorge © J Murray (2024)

This report has been compiled by Jenna Murray on behalf of all contributing scientists and the support team. The project is the result of the close collaboration between Operation Wallacea (herein 'OpWall') and BIOTA Group Ltd (herein 'Biota').

Published 15/09/2026 (version 1).



CONTENTS

1 ABBREVIATIONS & DEFINITIONS	5
2 THE 2026 TEAM.....	6
2.1 Operation Wallacea Croatia Project Management	6
2.2 Site's Lead Biota Scientist.....	6
2.3 Site's Lead OpWall Scientist.....	6
2.4 Survey team.....	7
2.5 LinkedIn group.....	7
3 INTRODUCTION & BACKGROUND	8
3.1 Aims and scope	8
3.2 Wider context for 2026.....	9
3.3 What is Operation Wallacea?	9
3.4 Research projects and planning	9
3.4.1 In progress.....	10
3.4.2 Longer-term (as dataset grows).....	10
4 FUTURE DIRECTIONS, POLICIE & GUIDANCE FOR 2027.....	10
4.1 Survey protocols and site selection	10
4.2 Permits	11
4.3 Photography, videography, social media.....	11
4.4 Biosecurity, Zoonosis & Environmental damage.....	12
4.4.1 Use of DEET	12

4.4.2	SARS CoV2 Protocols - IUCN.....	12
5	METHODS (2026).....	13
5.1	Survey and Sampling Design.....	13
5.1.1	Transect Surveys.....	14
5.1.2	Constant Effort Sites	14
5.2	Summary of 2026 surveys.....	15
6	RESULTS.....	16
6.1	Bats.....	16
6.1.1	Trapping at CES	16
6.1.2	Roost monitoring.....	16
6.2	Birds	17
6.2.1	Point counts.....	17
6.2.2	Mist netting at CES sites.....	17
6.3	Butterflies and other invertebrates	18
6.3.1	Butterfly Pollard Walks	18
6.4	Caves.....	19
6.5	Habitats	19
6.6	Herpetofauna	19
6.6.1	Encounter surveys (transects and opportunistic).....	19
6.7	Mammals	20
6.7.1	Mammal observations on transects.....	21
6.7.2	Mammal incidental observations	21
6.7.3	Mammal camera trapping.....	21
7	Additional Activities	23
7.1	Additional Lectures and Workshops	23
7.1.1	Second week RA lectures/workshops	23

7.1.2	Guest Lectures.....	23
7.1.3	Dissertation Lecture.....	24
7.1.4	Additional workshops.....	24
APPENDIX 1: Fauna Species Lists by Year.....		26
Bats.....		26
Birds		27
Butterflies		31
Herpetofauna.....		33
Mammals		34

1 ABBREVIATIONS & DEFINITIONS

IUCN* International Union for the Conservation of Nature; <https://www.iucn.org/>

OpWall Operation Wallacea, UK; <http://www.opwall.com/>

* For details on how the IUCN Red List categorisation works in relation to the categories listed below, please see <https://iucn-csq.org/red-list-categories/>.

- Extinct (**EX**)
- Extinct in the wild (**EW**)
- Critically endangered (**CR**)
- Endangered (**EN**)
- Vulnerable (**VU**)
- Near threatened (**NT**)
- Least concern (**LC**)
- Data deficient (**DD**)
- Not evaluated (**NE**)

2 THE 2026 TEAM

Sincere thanks go to everyone involved in the project including staff and volunteers from Biota and OpWall, without whom we could not continue to collect our long-term dataset to support ongoing efforts. The names of each person in the 2026 science and support teams are listed below. Equally, thank you to the school students and teachers, and research assistants who contributed time and energy towards the 2026 field season.

2.1 Operation Wallacea Croatia Project Management

Evie Courtenay (Camp Manager)

Operation Wallacea, Wallace House, Old Bolingbroke, Lincolnshire, PE23 4EX, UK

e: evie.courtenay@opwall.com

iN: https://www.linkedin.com/in/evie-courtenay-59a34a221?utm_source=share&utm_campaign=share_via&utm_content=profile&utm_medium=ios_app

Dr Thomas Edward Martin (Head of Research, Operation Wallacea)

Operation Wallacea, Wallace House, Old Bolingbroke, Lincolnshire, PE23 4EX, UK

e: tom.martin@opwall.ac.uk

2.2 Site's Lead Biota Scientist

Dušan Jelić PhD

Magic Forest Ltd, CEO / BIOTA Ltd, CEO / President, Croatian Institute for Biodiversity, Zagreb

e: jelic.dusan@gmail.com (alternative: jelic.dusan@biotagroup.org)

iN: <https://www.linkedin.com/in/du%C5%A1an-jeli%C4%87-5b11823a/>

RG: http://www.researchgate.net/profile/Dusan_Jelic

Orcid: orcid.org/0000-0003-2790-1522

2.3 Site's Lead OpWall Scientist

Jenna Murray

e: jenna.evelyn.murray98@gmail.com

iN: <http://www.linkedin.com/in/jennaevelynmurray>

ResearchGate: <https://www.researchgate.net/profile/Jenna-Murray-4>

Orcid: 0000-0002-1117-9144

2.4 Survey team

- **Bat Team:** Jessica Dangerfield, Lauren Gibson, David Marshall, Gabriele Stoppa, Kim Wallis and Tina Wiffen
- **Bird Mist Net Team:** Ben Bristow and Lua Koplin
- **Bird Point Count Team:** Craig Basford, Cat Byrne, Marcus Ashworth and Emilio Masotti-Black
- **Butterfly Team:** Aoife Cameron-Mitchell and Ananya Kastuar
- **Habitat Team:** Owen Coffey, Alice Merry and Kieran Swain
- **Herpetofauna Team:** Alfie Bailey and Jack Smith
- **Mammal Team:** Chloe Forrest, Molly Montague and Bastien Zanette
- **Volunteer Coordinator and Survey Support:** Molly Thomas

2.5 LinkedIn group

The science teams from this and previous years can be found on: <https://bit.ly/krka-linkedin>.

3 INTRODUCTION & BACKGROUND

3.1 Aims and scope

This report summarises the data gathered by staff and students from OpWall's science team based at the Krka National Park Research Station in Puljane, Croatia during the summer of 2026. The project is run with OpWall's in-country partner BIOTA Group Ltd. With systematic surveys of the area having started in 2019, 2026 marked the project's seventh active field season (with the 2020 season having been cancelled due to the global pandemic). The year 2021 did not include a full complement of staff and students during international COVID recovery. The approach to some taxa (e.g., *Chiroptera*) have been altered to better suit the region's terrain and landscape characteristics¹. The project is based on annual surveys across the habitats in and around the Krka National Park, Šibensko-Kninska, Croatia, which lies within the Krka I Okolni Plato Natura 2000 site (Figure 1). Surveys took place over eight weeks from early-June to early-August.

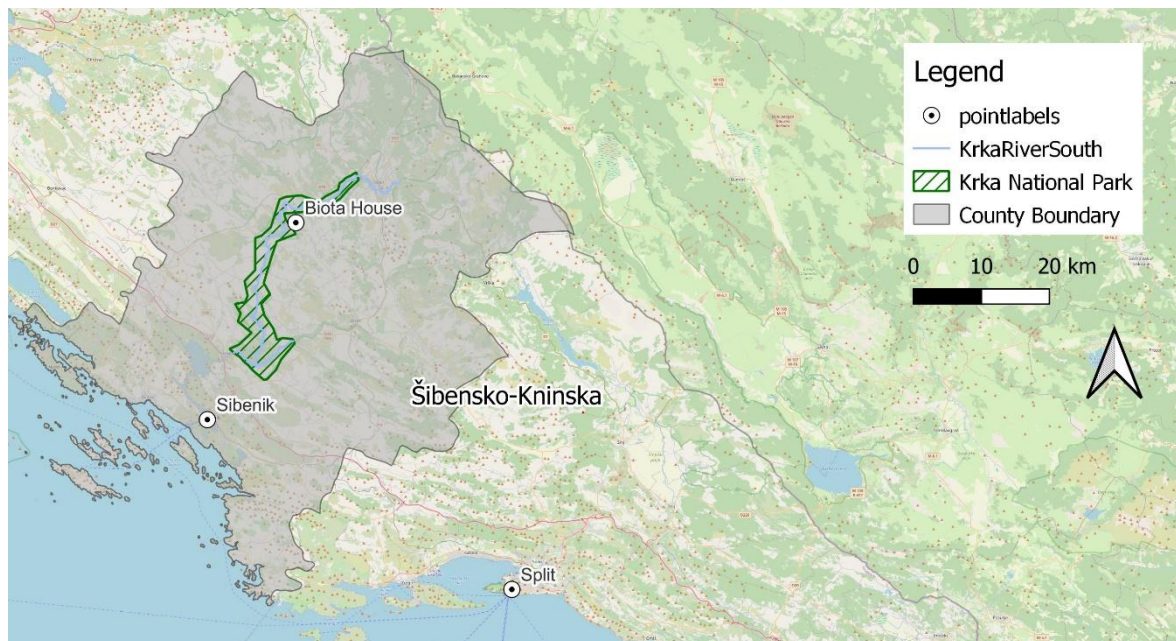


Figure 1: Map of Biota house location in Šibensko-Kninska, Croatia. Basemap © OpenStreetMap (2023)

Our ongoing aim is to monitor changes in the flora and fauna in the study area, with initial seasons providing baseline data and species assemblage assessments, and later seasons performing comparative analysis and monitoring changes in the populations of those taxa. By establishing and delivering a range of long-term monitoring schemes for habitats, herpetofauna, avifauna, mammals (including bats), and invertebrates, we have now laid the groundwork for future monitoring and

¹ Haelewaters, D., Hughes, M., Barão-Nóbrega, J.A.L., Slater, K., and Martin, T.E. (2024) Standard deviation: standardized bat monitoring techniques work better in some ecosystems. *PlosOne*

conservation, informing practical conservation actions both locally and regionally. We facilitate research in addition to the core monitoring, from dissertation projects to collaborations with universities from all over Europe, and it is our intention to expand and build upon this facility. This report gives an overview of the 2026 situation in terms of biodiversity and methods. Data from previous years are shown for comparison where appropriate.

3.2 Wider context for 2026

The aims of the 2026 season were to further refine methods and protocols for our study taxa, facilitate ongoing research projects and continue to collate data and produce publications as per the publication plan for Krka National Park.

3.3 What is Operation Wallacea?²

Operation Wallacea (OpWall) is a conservation research organisation that is funded by, and relies on, teams of volunteers (school students, teachers, and university students) who join expeditions for the opportunity to work on real-world research programmes alongside academic researchers and expert surveyors. Most science programmes abroad that deliver research outcomes are funded on a short-term basis by grants with typically tightly restricted aims. Long-term projects covering large scales that can incorporate more than one ecosystem are rare. By adopting a volunteer-funded model, OpWall does not suffer from those restrictions and can draw upon researchers from a wide range of different disciplines and academic institutions and create long-term research projects. Importantly, this also provides extensive training and networking opportunities for the next generation of researchers. Those researchers and academics also separate OpWall from other volunteer organisations, allowing a truly research-orientated project.

3.4 Research projects and planning

Within the general infrastructure of the Biota-OpWall Krka Project, multiple distinct research projects are in progress and/or planning or awaiting additional years of data. Examples of these independent research projects are provided below. We invite the reader to get in touch regarding new project ideas that the Biota-OpWall Krka Project may be able to facilitate/host.

² Taken from <https://www.opwall.com/about-opwall/>

3.4.1 In progress

- Atlas Projects: Data collection and production of atlases and checklists for the NE KNP area for butterflies and birds. *Project lead: Dr Thomas Martin, OpWall*
- Hermann's tortoise: Various projects (dissertations, etc.) have focused on Hermann's tortoise (*Testudo hermanni*) over the past few years. These have included movement and morphometric data. These projects continue as this is a key flagship species for the park. *Project lead: Dušan Jelić, Biota Group Ltd.*
- Cat snakes: Long-term monitoring of cat snake (*Telescopus fallax*) populations in the park is an ongoing project and is carried out on an ad-hoc basis, with all encountered individuals being brought to the camp for morphometric measurements and individuation through ventral scale marking. *Project lead: Dušan Jelić, Biota Group Ltd.*

3.4.2 Longer-term (as dataset grows)

- Community ecology trends through time: This project will look at community ecology, incorporating traits and spatial analysis. *Project leads: Drs Joseph Bailey and Hannah White, Anglia Ruskin University, Cambridge, UK*

4 FUTURE DIRECTIONS, POLICIES & GUIDANCE FOR 2027

4.1 Survey protocols and site selection

Staff MUST:

- Ensure that survey protocols are read before surveys commence at the start of each field season and that any questions are discussed with science team prior to the start of fieldwork.
- Ensure that survey protocols are updated throughout the field season, but protocols for standardised surveys should NOT be changed without discussion and justification as data must be consistent year-on-year.
- Anything undertaken that deviates from the survey protocols MUST be clearly documented in Epi-Collect5 notes or in discussion with one of the science leaders.
- Any new transects or Constant Effort Sites (CES) MUST be recorded as new sites, and no existing sites should ever be over-written (e.g., if Site 4 is no longer suitable and a new site is established nearby, this would become Site 9, where 9 is the next available site number).

4.2 Permits

Permits are required for certain activities that involve the capture and handling of protected or notable species (bat trapping) or where invasive techniques (e.g., bird ringing or collection of entomological specimens) take place. These permits, when required, are held by Biota staff with OpWall scientists listed as appropriate. Where survey works are carried out under such a permit, this is made clear to the students and teachers, and particular emphasis is placed on the ethical and welfare considerations, level of training, and expertise.

4.3 Photography, videography, social media

We want to encourage everyone to fully engage with the science we are doing, including the use of media and social media. However, we need to abide by OpWall's strict social media policy, and this should be made clear to those leading and attending surveys during orientation. Survey leaders should ensure volunteers and teachers are aware of the potential dangers of sharing photographs or videos that may misrepresent what we are doing or how we are doing it. For example, a single photo or video clip of handling a snake, removing a bird from a net, or taking a DNA sample from a bat, can easily make it appear the animal is in distress, even though we abide by strict ethical standards, are fully licensed, minimise stress as much as possible, and always have the animal's wellbeing at the centre of what we do.

This should be clearly communicated, and activity leaders can and should tell people to stop filming or taking photos when they feel the need to and/or state that all photos/videos should be checked by the survey leader before being shared (including video edits). The same applies for experiences that may appear more dangerous than they are in a photo or video (e.g., cave visits).

If a school wants to make a video, we encourage this, but they should tell us that is what they are doing, get permission from survey leaders (i.e., explicitly confirm that the survey leader is happy to be filmed/photographed), and should share the transcript and footage with us before it is released to ensure it abides by OpWall's policies and so that we can feedback and correct factual errors and misrepresentations. As part of this, we should also discuss with teachers the importance of accurately communicating science and ethics, including but is not limited to, the type of language used, which should be factual and scientific.

4.4 Biosecurity, Zoonosis & Environmental damage

4.4.1 Use of DEET

All survey leaders need to remind students that DEET damages the environment, so if their insect repellent contains DEET, they must refrain from touching any animal, entering freshwater or wet vegetation, or spraying it in any environment. Students should also be advised (and reminded thereafter) NOT to spray DEET in indoor communal areas (which is essentially all indoor areas), especially near food, and in groups of people outdoors. It can especially have a negative impact on people with a respiratory condition, especially when combined with the dust and heat.

4.4.2 SARS CoV2 Protocols - IUCN

All bat handling surveys will be undertaken in accordance with protocols outlined by IUCN as compiled by their Bat Specialist Working Group, comprising the latest guidelines for Field Hygiene for Researchers ([*IUCN SSC BSG GUIDELINES FOR FIELD HYGIENE 2024*](#)).

These protocols outline measures (biosecurity and best practice) to reduce the likelihood of transmission of SARS-CoV viruses between bats and researchers. Protocols comprise the following, which will be adopted by project science staff and assistants going forward:

- All bat handlers to be fully vaccinated against both rabies (EBLV) and SARS-COV-2 with the most up-to-date vaccines.
- Pre-survey check for symptoms of infectious disease (e.g., fever, sore throat, sneezing, coughing, congestion). No one with such symptoms will attend the survey.
- Use of PPE (masks and gloves) by handlers and anyone within 2m of bats (e.g., field assistants/students assisting with data will wear face masks if this applies).
- All tools and equipment will be disinfected prior to survey and between bats where appropriate
- No blowing on bats (use lens-cleaner / blowing tool instead).
- Bats to be kept in clean, individual bags. Bags to be cleaned between use.
- No eating, drinking, etc., in proximity to bats.

When students observe staff wearing masks and gloves, inevitably this results in a discussion regarding not only Covid-19 but also European Bat Lyssavirus (EBLV – Rabies). This should be seen as an opportunity to dispel fear and reinforce our responsibility as OpWall scientists to always consider the welfare of individual animals and their populations, and to emphasise that this is of the highest priority to OpWall. Cave work (for bats or otherwise) will abide by the IUCN guidelines for cavers: [*map recommendations cavers v2 dec 2021*](#).

5 METHODS (2026)

5.1 Survey and Sampling Design

There are six transects, which were established in 2019 (Figure 2), and sampling points along each transect are the key locations for many of the surveys. Transects are of variable length and shape and correspond to the principal habitat types occurring in KNP. In 2023, as GPS signal is not reliable on all transects (particularly T4 and T5), 100m markers (Figure 3) were placed along the length of each transect to assist the science team in record accuracy.



Figure 2: Location of transects in relation to Biota house and Krka River gorge

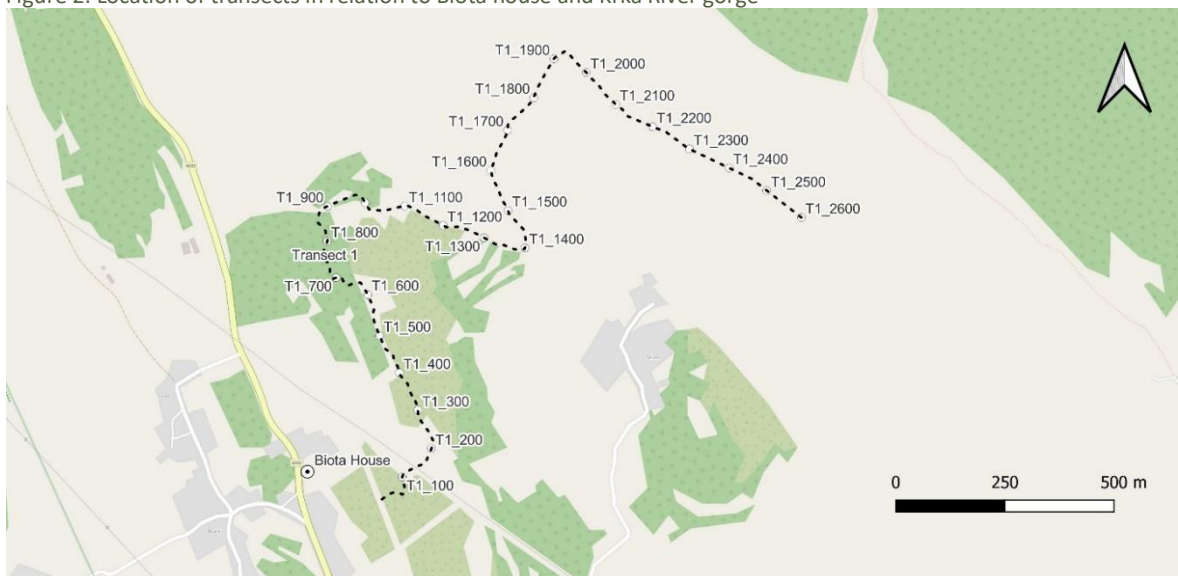


Figure 3: Example of 100m markers (in this case, on Transect 1)

5.1.1 *Transect Surveys*

Surveys for herpetofauna, butterflies and mammals take place along the transects. Surveys for habitats and bird point counts occur at specific sites evenly distributed along the transects. The survey rota was designed in such a way that the transects subject to survey on any given day have not been disturbed by another group prior to the survey. Surveys for each taxonomic group also take place at times aimed at optimising survey success (e.g., herpetofauna transects take place early in the mornings when the target species are likely to be basking and butterfly surveys occurring comparatively later when the temperature has increased and butterflies start to emerge).

5.1.2 *Constant Effort Sites*

For certain survey types (namely, mist netting for bats and birds), surveys do not take place along standard transects but are sited in areas known to support the target species groups (or in the case of caves, habitats). Ideally, CES will be visited year on year, subject to a standard minimum survey effort, with a view to monitor species richness and abundance over time.

5.2 Summary of 2026 surveys

Table 1: Summary of surveys. See survey protocols for specific times. ‘Evening’ refers to dusk and first hour or so of darkness; ‘night’ goes beyond approximately 22:30.

Taxon	Transects: Route	Transects: Intervals	Constant effort sites	Opportunistic
Avifauna		Bird point counts (morning)	Mist netting (morning)	Biodiversity surveys at opportunistic sites once surveys completed (morning)
Bats			Mist netting (evening/night)	Roost monitoring at abandoned buildings
Caves			Daily bioblitz surveys (afternoon)	
Habitats		Vegetation structure and cover (afternoon).		Vegetation structure and cover at bird mist net sites and opportunistic sites once surveys completed (afternoon).
Herps	Visual encounter surveys – all herptiles (early morning).			Cat snakes (evening) Herptile lab sessions (measurements, marking etc; daytime) Visual encounter surveys at opportunistic sites once transect replicates complete (morning).
Inverts	Pollard walks butterflies (morning).			Moth trapping (ad hoc, evening)
Mammals	Surveys – tracks and scat (morning)	Camera trapping (constant)		Opportunistic camera trapping Sherman trapping around camp (ad hoc)

6 RESULTS

N.B. See **Appendix 1** for all species lists by year.

6.1 Bats

Bat surveys take the form of either mist netting at constant effort sites, and roost monitoring which includes infra-red monitoring and occasional hand-netting.

6.1.1 *Trapping at CES*

CES surveys took place at Bilušića buk, Brljan-Manojlovac (BM) Trail, Knin Mine, Pravoslavni Manastir Krka (the Monastery) and Jezero Brljan Dam. Additional, opportunistic surveys occurred at Kistanje pond, Seline, Orlić pond the Tunnel and Oklaj pond. 40 surveys were completed across these sites with a total of 220 bats comprising of 22 species. For the third season most species-rich site was the Monastery again (10 species).

This year Knin mine had the highest abundance of bats with an average of 8.2 bats per survey, a change from Miljacka hydroelectric plant last year. However, this season we were unable to survey that site so it is unclear whether this would have been the same had this site been revisited. The most abundant species caught was once again the long-fingered bat (*Myotis capaccinii*) with 93 captures.

Three new species were recorded this season, the Brandt's bat (*Myotis brandtii*), grey long-eared bat (*Plecotus austriacus*), and brown long-eared bat (*Plecotus auritus*). As only single individuals of each season were caught should they be found again in future seasons many photos, measurements and DNA samples will be taken to confirm the species.

One interesting site this year was the tunnel. Previously this sight has produced a few interesting species but low numbers, making it a site not often visited throughout the season. However, this year 5 new species were recorded to the site and there was an increase in abundance as well. It is hypothesised this could have been due to surveying the site later in the season, thus changing the species composition there. Additionally, last season, the new site Orlić pond was very successful, however, after the first survey done there this season the pond had completely dried up making it an inviable site to continue for the season.

6.1.2 *Roost monitoring*

The Bechstein's bat (*Myotis bechsteinii*) maternity roost in the attic of the Biota House had returned for the sixth year (Figure 4) and roosts of greater horseshoe bat were once again observed in the abandoned school in Puljane.

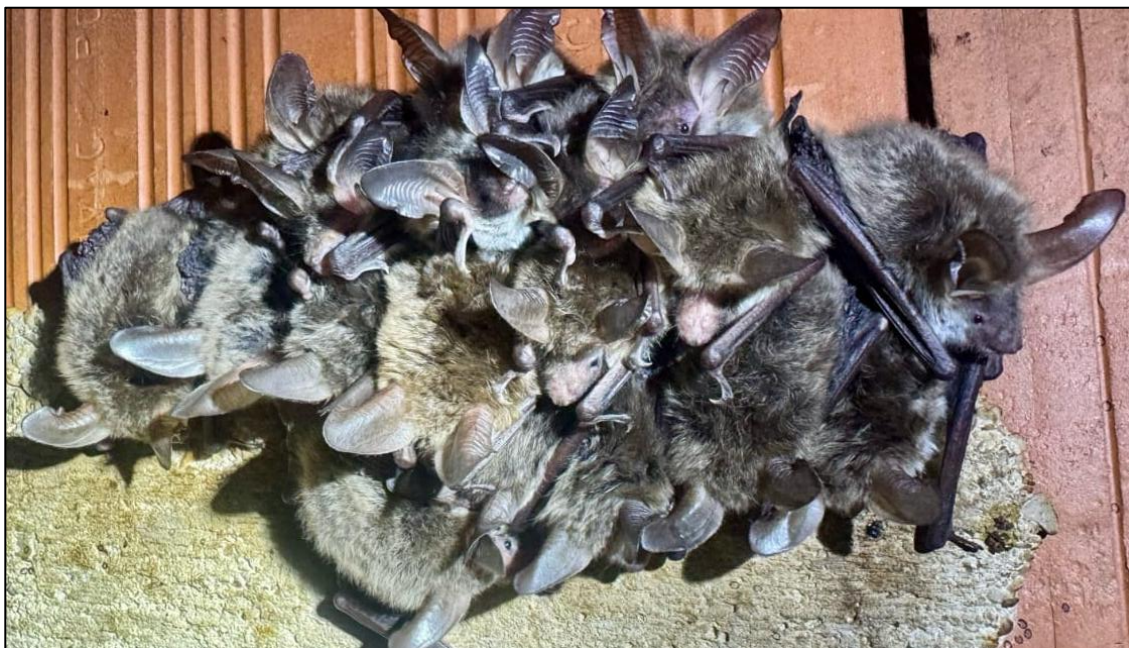


Figure 4: Bechstein's bat found roosting in BIOTA house attic © Jess Dangerfield 2026

6.2 Birds

Surveys of avifauna comprise of point counts and mist netting. Bird community composition, biodiversity and abundances were surveyed using point count transect surveys and mist netting at standardised Constant Effort Sites (CES). Where birds were captured in the hand morphometric and demographic data were collected.

6.2.1 Point counts

This year there was total of 1,083 records of 64 species, an increase from the 54 species recorded in 2025. The most recorded species was again the common blackbird (*Turdus merula*) (174 records). Interestingly, T1 had the greatest species richness (37 species) and the greatest abundance (339 individuals), whilst T4 had the lowest species richness (20 species) and T2 the lowest abundance (83 individuals), the same as the previous year.

Four new species have been recorded this year comprising of the Eurasian crag martin (*Ptyonoprogne rupestris*), short-toed treecreeper (*Certhia brachydactyla*), Spanish sparrow (*Passer hispaniolensis*), and the tree sparrow (*Passer montanus*).

6.2.2 Mist netting at CES sites

CES sites surveyed this season include the start of T1 behind the house (S1), Paraci a local village (S3), forest area close to T6 (S6), the dam (S4), and a pond at the end of T1 (S8). During the mist netting surveys, 342 individuals were caught comprising of 26 species, increasing from the 23

species recorded in 2025. The most abundant species caught was the common blackbird (*Turdus merula*) with 117 individuals recorded. Overall, S8 had the greatest species richness (15 species) and abundance (87 individuals). Whereas S1 and S6 had the lowest species richness (9 species) and S6 the lowest abundance (49 individuals), which is interesting as S6 had the highest of both in 2025. However, despite having the lowest abundance and species richness, one new species was caught, the pied flycatcher (*Ficedula hypoleuca*) at S6. Additionally, the common reed warbler (*Acrocephalus scirpaceus*) and great spotted woodpecker (*Dendrocopos major*) and linnet (*Linaria cannabina*) were caught at S4, 6 and 8 respectively, which have not been caught since 2019 (Figure 5).



Figure 5: (Left to right) Pied flycatcher © L Koplin 2026, common reed warbler © J Murray 2026, linnet © B Bristow 2026

6.3 Butterflies and other invertebrates

6.3.1 Butterfly Pollard Walks

Butterfly surveys were conducted using an adapted Pollard walk (Pollard, 1977), following on from the first year of Operation Wallacea researching in Krka National Park in 2019 (see survey protocol).

A total of 1,978 individuals across 48 species were recorded this season, a large decrease from 3,467 across 58 species from 2025, which could possibly be due to heatwaves experienced earlier in the season this year. As was observed last year the most recorded species was again the great banded grayling (*Brintesia circe*) with 404 records. Like last year T3 had the greatest species richness again (34 species) and T2 the lowest (12 species). Whereas this year T1 had the greatest abundance (589 individuals) differing from T1 last year. However, T2 again had the lowest (38 individuals).

Three new species were recorded this season, black hairstreak (*Satyrium pruni*) caught on T2, Cretan small heath (*Coenonympha thyrsis*) and olive skipper (*Pyrgus serratalae*). Additionally, an Eastern wood white (*Leptidea duponcheli*) and a marbled fritillary (*Brenthis daphne*) were caught on T6 and T3 respectively, species which have not been recorded since 2019.

6.4 Caves

Surveys were conducted with students each day to Jazinka cave, located near the start of T4. Surveys were conducted on the two cave cricket species common cave cricket (*Troglophilus cavicola*) and spider cave cricket (*Dolichopoda araneiformis*), doing population counts of both. Additionally, any incidental sightings of other species were recorded including common toad (*Bufo bufo*), edible dormouse (*Glis glis*) and an unknown horseshoe bat (*Rhinolophidae sp.*).

Two opportunistic surveys were conducted by the staff in Milijacka II (MII) and Milijacka IV (MIV), led by the BIOTA team. Cave diving was conducted by Dusan Jelic where one olm (*Proteus anguinus*) was recorded in MII; likely the same individual recorded the previous year; and three individuals recorded in MIV.

6.5 Habitats

This season, habitat data was successfully collected from every site along the transects. Data collected includes data such as tree species, understory density, presence of burning on trees, grass height, and canopy openness allowing for a continuous monitoring of the habitat along transects allowing for comparison against taxon data to determine species distributions based on habitat selection. This year once transect sites had been completed additional surveys were also conducted on bird mist netting sites 1, 3, 4 and 6, plus an additional opportunistic at the monastery.

6.6 Herpetofauna

Herpetological surveys are conducted through either transect or opportunistic surveys (the latter comprising all encounters with herpetofauna made outside of designated transects). All surveys this year were conducted using visual encounter methodology, with the capture of focal species.

6.6.1 Encounter surveys (transects and opportunistic)

A total of 291 individuals were recorded across 26 species through a combination of transects and opportunistic surveys. This is the most herpetofauna species caught in a single season since surveys began in the area, marking a successful year. Only 62 individuals of 14 species were recorded on transect, increasing the number from 37 individuals caught in 2025. There were 263 individuals across 24 species caught through opportunistic surveys and incidental records, again marking a large increase from 198 individuals recorded in 2025. Again, these figures continue to display the importance of opportunistic herpetological surveys being conducted allowing for surveys of sites of interest.

This season all transects had at least one record, compared to last year where T2 did not record anything. However, only one individual was recorded here, meaning T2 had the lowest species richness and abundance again. T1, 5, and 6 all had the great species richness with 5 species, and T3 the highest abundance with 11 individuals.

This season, more Hermann's tortoises (*Testudo hermanni*) were processed (morphological measurements taken), marked and released than the 2024 and 2025 season combined, with a total of 66 tortoises, 10 of which were recaptures, thus contributing a great deal of data to the ongoing Hermann's tortoise monitoring project.

Although, the season brought many successes, one interesting trend was the decline in snake records. Numbers fell from 98 in 2024 to 73 in 2025, followed by a significant decrease to only 37 individuals this year. The most notable decrease was in cat snakes (*Telescopus fallax*), dropping from 46 individuals in 2024 to only 2 individuals this year. Other species showing substantial decreases included the grass snake (from 17 to 4), the dice snake (12 to 5) and the nose-horned viper (17 to 9).

However, despite these low numbers a rare occurrence of an Eastern Montpellier snake (*Malpolon insignitus*) being caught in the hand did occur on T1. Most records of this species have been from dead individuals, which although do provide good data, catching and processing a live individual was a highlight for the season (Figure 6). Most interestingly, two dead Aesculapian snakes (*Zamenis longissimus*) were found in the area, a species that has not been recorded since 2019.



Figure 6: Eastern Montpellier snake © A Bailey 2026

6.7 Mammals

Mammal surveys include recording sightings and evidence of species along transects and incidentals off transect. Additionally, camera traps were deployed both on and off transect to record species presence and behaviour.

6.7.1 Mammal observations on transects

A total of 419 mammal records were observed across 15 species, with 149 records of 8 species occurring on transect. For the third season 8 species were observed on T1, making it the most species rich. T2 once again had the lowest with only 2 species recorded, a decrease from the 5 recorded in 2025. However, this year T6 had the highest number of records with 47, differing from T1 last year which only had 23. T2 was once again the lowest with only 2 records. Beech marten (*Martes martes*) was the most frequently recorded species (81 records), 73 of which were scat records, this being a large increase from only 31 records last year. In 2025 wild boar (*Sus scrofa*) was the most frequently recorded species however there was a decrease in records this year, going from 35 to 16 observations, possibly indicating a decrease in their activity on transects.

6.7.2 Mammal incidental observations

270 records across 15 species were recorded off transect, making up almost two thirds of all mammal records this season. As usual, species that were only recorded from incidental records and not on transect were wood mouse (*Apodemus sylvaticus*), western broad-toothed field mouse (*Apodemus epimelas*), white-toothed pygmy shrew (*Suncus etruscus*), unsurprisingly due to their small nature we only records direct visual encounters which often occur around the house at night. Other larger mammals only recorded through incidental records were golden jackal (*Canis aureus*), least weasel (*Mustela nivalis*), edible dormouse (*Glis glis*) and red squirrel (*Sciurus vulgaris*). Although most of these species are occasionally seen on the transect camera traps, it is difficult to record evidence of their presence, the former due to the difficulty in differentiating scat and tracks from domestic dog and the latter three species because of the lack of tracks and scat found due to their smaller size.

Interestingly, this year no tracks, scat or audio was recorded for the grey wolf (*Canis lupus*) this season. Often records are rare for this species due to their elusive nature and large range however until now evidence in small numbers has been found every season, except 2022. It is possible that they did not pass through the survey area this season as no howling was heard, but it is also possible that if they did pass through, they left no evidence where we would find it.

6.7.3 Mammal camera trapping

Analysis of camera trap footage is still being conducted; therefore, results cannot yet be delivered. However, some highlights include amazing footage of a golden jackal during the day, previously footage has been at night or where the individual is hard to see. Additionally, the first record of allogrooming from this site which occurred between two red foxes (*Vulpes vulpes*) (Figure 7).



Figure 7: (Left to right) Golden jackal on T6, two red foxes allogrooming.

7 ADDITIONAL ACTIVITIES

7.1 Additional Lectures and Workshops

In addition to the core taxon lecture series which run every day (Bats, birds, herps, mammals and inverts), we provided a range of supplementary lectures and workshops. A selection of these were provided to RAs in their second week on site as a replacement to the core lectures they had their first week. Others were used to fill gaps in the schedule or if people need a survey alternative.

7.1.1 *Second week RA lectures/workshops*

- Independent research: At the start of their second week, each RA selected a Croatian species to spend the week researching. This could be either a literature review about the species, or a mini research project conducted over the week. At the end of the week each RA presented their findings to the staff and other participants.
- QGIS: Practical lecture demonstrating how to create a QGIS map displaying the camera traps from 2024 and displaying their degree of success in mammal detection in different ways.
- Epicollect: Practical workshop showing RAs how to create an Epicollect form for data collection. RAs were then split into groups and given a research question, based on real previous or ongoing research conducted in Krka, and asked to create their own Epicollect form. Each group then inputted dummy data for each other and gave feedback.
- Careers workshop: Each staff member detailed their academic and work history. This allowed students to learn of vastly different potential careers paths they can pursue, be it degrees or primarily through work experience. It also gave them the opportunity to ask questions about working in the conservation field.

7.1.2 *Guest Lectures*

We continued to deliver weekly guest lectures. Staff members produced talks on areas of research they had conducted or a topic of interest. This allowed students to gain insight into practical applications of research all over the world in the conservation field.

Lectures this year included: Environmental listening, gall wasps, impacts of fire on birds in California, forensic entomology, venomous snakes around the world, eusociality, wildlife crime, illegal poaching of birds and peat bogs in the UK.

7.1.3 *Dissertation Lecture*

This year we had one dissertation student studying the butterflies and three studying the Hermann's tortoise. On their last week of data collection, the students put together a presentation for the staff and participants about their projects. Specifically detailing the justification for the research, methods, preliminary findings and their next steps.

7.1.4 *Additional workshops*

- Debate workshop: Groups of students are given conservation topics of debate and split into 'for' and 'against'. Groups are given 15 minutes to research their topic and compile an argument, before nominating a spokesperson to debate their point for 3 minutes, after which the opposing team has 1 minute to respond. Roles were then reversed. Examples of topics covered include ecotourism is beneficial to the environment, wolves should be reintroduced into Scotland, extinct species should be brought back and flagship species take away funding from less charismatic species.
- Senses in Nature: Participants are split into pairs, and one member of each pair secretly collects something from the garden. The other member is guided through each of the senses in a particular order (touch, smell, sound, sight) allowing them to gradually determine what their partner had chosen, giving them a deeper understanding of nature. This is repeated with the roles swapping within the pair.
- Invertebrate BioBlitz: Students were separated into teams and given nets and pots to capture and identify as many invertebrates as they could in the allotted time gaining points on how specific they could get their identifications (i.e. to family, genus or species level) and how many different orders of invertebrates they could find.
- Mammal tracks, scat and calls quiz: A quiz containing sound images from previous scats and tracks as well as clips of different native animal calls, which participants must work through as a group to identify.
- Sherman Trapping: Preparing and placing Shermans traps around camp in the evening and collecting in the morning with the intention of capturing different small mammal species for analysis in camp.
- Habitat workshop: This year the habitat team also ran an optional workshop at basecamp at 12pm. This was offered to each group that had been out with the bird mist netting team. This was because after returning around 9am the groups would not have an activity until their 2pm lecture, but remained optional in case anyone was too tired. The workshop consisted of

working through different tree clippings and identifying their species and the 'Habitat Bingo' where participants had a bingo sheet of plant species to find around the garden.

- Moth Trapping: A UV light box was placed overnight in the basement and after surveys had all returned an optional workshop was run allowing participants to species ID moths.
- Opportunistic Mist Netting: Typically, once a week, mist nets were set up behind the house both in the morning and evening. Participants could come and watch the processing on the back benches. Many interesting species were caught this way including European nightjars (*Caprimulgus europaeus*), golden oriole (*Oriolus oriolus*) and scops owl (*Otus scops*).
- Mammal Bone ID: Throughout the season, multiple bones were collected. Large mammal bones were often collected in the local area or on transect which were identified using ID guidebooks. Additionally, a large collection of small mammal bones was extracted from wildcat and grey wolf scat, allowing us to identify what species they predate on in the area.
- Snake ID: Teaching participants how to identify snake species from snake sheds.
- Guess Hoot!: An activity where participants wear a headband denoting a specific local species, testing their knowledge by asking yes or no questions to determine what species they are.
- Blog Writing: Workshop on creating blogs about their time in Croatia, which could be included in the Opwall blogs webpage.



Figure 8: (Left to right, top to bottom) Senses in Nature, Habitat Workshop, Mammal Bone ID, Snake ID © G Mendes 2026

APPENDIX 1: FAUNA SPECIES LISTS BY YEAR

Species lists below include records to species or species aggregate level. Those records of animals identified to family or genus level only have been omitted for the purpose of species listing.

Bats

Table 2: Bat species recorded (all methods) in KNP by OpWall/Biota staff, by year (2018-2026)

Species	2018	2019	2021	2022	2023	2024	2025	2026	Total
Balkan long-eared bat					2	3	8		13
Bechstein's bat	1		17	4	11	6	8	1	48
Blasius's horseshoe bat				1			20	1	22
Brandt's bat								1	1
Brown Long-eared bat								1	1
Common pipistrelle					3	1			4
Daubenton's bat		9		2				5	16
David's Myotis	4			1	2	1	48	2	58
Geoffroy's bat			3	8	12	7	88	4	122
Greater horseshoe bat	5		5	12	4	6	28	19	79
Greater mouse-eared bat	2			4	3	1	2	9	21
Grey long-eared bat								2	2
Kuhl's pipistrelle	16		19	9	2	3	20	4	72
Leisler's bat	1								1
Lesser horseshoe bat	2		8	10	5	8	22	1	56
Lesser mouse-eared bat	3		1		2		5	8	19
Long-fingered bat	2	17	3	60	31	82	210	93	498
Mediterranean horseshoe bat	1		3	5	1	6	21	39	76
Natterer's bat	4	1	8	6		3	7	5	34
Noctule bat	9			21	5		5	3	43
Savi's pipistrelle	1		2		1		10	3	17
Schreiber's bent-winged bat			1	2	1	1	1	7	13
Serotine bat	2		3	6		1		3	15
Soprano pipistrelle	2			1	1		25	2	31
Steppe whiskered bat						2			2
Whiskered bat	1			4	3	3	4	7	22
Total Species	16	3	12	17	17	16	19	22	26
Total Records	56	27	73	156	89	134	532	220	1286

Birds

Table 2: Bird species recorded during point counts in KNP by OpWall/Biota staff, by year (2018-2025)

Species	2018	2019	2021	2022	2023	2024	2025	2026	Total
Barn Swallow	5	4	24	14	26	136	29	60	298
Black Woodpecker						2			2
Blue Rock Thrush				1				9	10
Cetti's Warbler		4	2	7	20	22	16	8	79
Cirl Bunting	33	3	15	12	18	43	50	33	207
Common Blackbird	51	37	78	116	188	269	159	174	1072
Common Buzzard	2		9	7	5	19	3	6	51
Common Chiffchaff		2		1	7	7	12	5	34
Common Cuckoo		2		1	6		36	24	69
Common Firecrest						6			6
Common Kestrel	1		6	5	2	6	4	1	25
Common Kingfisher			5	4	2	5	6	8	30
Common Linnet				3		13	1	3	20
Common Moorhen	3		4					2	9
Common Nightingale	41	23	3	12	23	24	29	51	206
Common Pheasant							3	17	20
Common Redstart							1		1
Common Reed Warbler							1		1
Common Sandpiper			3			3		2	8
Common Starling	2			3			3	4	12
Common Swift			1	2	4	20	1	5	33
Common Whitethroat				1				1	2
Common Wood-Pigeon							1		1
Corn Bunting				1	8		1	8	18
Duncock			1						1
Eastern Black-eared Wheatear						3			3
Eastern Olivaceous Warbler		1	2						3
Eastern Orphean Warbler		2		1	4	3	1		11
Eastern Subalpine Warbler	22	7	15	16	19	30	1	11	121
Eurasian Blackcap	32	15	64	103	112	332	152	112	922
Eurasian Blue Tit			22	15	27	88	46	24	222
Eurasian Bullfinch						2			2
Eurasian Chaffinch	2	9	23	4	69	62	38	56	263
Eurasian Collared Dove			8	1		7	8	26	50
Eurasian Crag Martin								2	2
Eurasian Golden Oriole	7	37	44	49	55	257	133	91	673
Eurasian Goshawk							3	1	4
Eurasian Hobby			1						1
Eurasian Hoopoe		1			14	1	12	20	48
Eurasian Jay	3	6	18	11	20	79	20	18	175
Eurasian Magpie				1					1
Eurasian Nuthatch	1		9						10
Eurasian Scops Owl	2								2
Eurasian Sparrowhawk			2		1			4	7
Eurasian Treecreeper			1	1	3	6		6	17
Eurasian Wren						3			3
European Bee-eater						3			3
European Goldfinch			5		1				6

European Green Woodpecker		2	2			2		1	7
European Greenfinch	1		1		3	10	4		19
European Honey Buzzard	1		1					2	4
European Nightjar	3		1	7	4		1	1	17
European Pied Flycatcher						1		1	2
European Robin	1			2		3	5		11
European Serin	2		1						3
European Turtle Dove	6	12	23	45	37	51	42	59	275
Garden Warbler		1	2	1	2				6
Glossy Ibis				1					1
Great Cormorant	1					1	7	2	11
Great Reed Warbler	7		3		3	24	12	7	56
Great Spotted Woodpecker	1	1	2	1	2	5	3	13	28
Great Tit	4	4	20	8	32	138	100	68	374
Green Sandpiper						3			3
Grey Heron			1	5	1	1	5		13
Grey Wagtail			1	1	1		19	6	28
Grey-headed Woodpecker						2			2
Hawfinch	1	1	4	4	16	35	28	19	108
Hooded Crow	3		1			5	1	3	13
House Sparrow		1	3	3	2	2	2	2	15
Icterine Warbler						2			2
Lesser Grey Shrike						1		1	2
Lesser Kestrel					2				2
Lesser Spotted Woodpecker	1						2	1	4
Lesser Whitethroat			5		1			1	7
Little Grebe	3		4						7
Long-tailed Tit				4	5	47	39	33	128
Mallard	2		11	7	2	10	7	9	48
Middle Spotted Woodpecker					1	7	6	4	18
Northern Raven						1		2	3
Pallid Swift					1	3		1	5
Purple Heron					1				1
Red-backed Shrike	1	4		2	2	11	12	4	36
Rock Dove/Feral Pigeon						2			2
Rock Partridge				1		2			3
Sand Martin						1			1
Sardinian Warbler			1				1	1	3
Short-toed Snake Eagle				1	3			1	5
Short-toed Treecreeper								1	1
Sombre Tit			4	5	4	27			40
Song Thrush						1	1		2
Spanish Sparrow								3	3
Spotted Flycatcher							9	1	10
Tawny Pipit			9	1	8	14	4	4	40
Tree Pipit		1							1
Tree Sparrow								1	1
Western House Martin	6		10	5	1	4	12	5	43
Western Yellow Wagtail						1			1
White Wagtail	1								1
Willow Warbler						5			5
Woodchat Shrike				2	4		3	8	17
Woodlark		5	7	23	10	6	1	7	59

Yellow-legged Gull	1	1	7	2	18	1	2	19	51
Total Species	34	26	49	48	49	62	54	64	102
Total Records	253	186	489	523	800	1880	1098	1083	6312

*Surveys not conducted in 2020

Table 3: Bird species recorded during mist netting in KNP by OpWall/Biota staff, by year (2018-2025)

Species	2018	2019	2021	2022	2023	2024	2025	2026	To- tal
Barn swallow	24			7		1			32
Blackbird	9	45	9	77	37	22	71	124	394
Blackcap	46	23	2	43	21	2	44	57	238
Black-headed bunting	4								4
Blue tit		1	4	10	5		8	13	41
Cetti's warbler		3		35	2	1	3	8	52
Cirl bunting	25	2		39	12	3	39	35	155
Collared flycatcher		1							1
Common chaffinch	2			3	1		1	2	9
Common chiffchaff							7	2	9
Common cuckoo				1				1	2
Common greenfinch	10			4	3			1	18
Common house-martin	3			3					6
Common kingfisher				17		1		7	25
Common nightingale	11	7		4	4	3	8	5	42
Common reed warbler		1						1	2
Common sandpiper							1		1
Corn bunting	5			1					6
Crested lark	4								4
Eastern orphean warbler	9	1	1	2	6	2	9	1	31
Eastern subalpine warbler	43	34	9	36	32	10	81	28	273
Eurasian green woodpecker				1					1
Eurasian nuthatch			1						1
Eurasian treecreeper					1				1
Eurasian wryneck	6								6
European bee-eater	26				2				28
European goldfinch	3	1							4
European nightjar		1			5	1		3	10
European robin		1							1
Garden warbler			1		1				2
Golden oriole		1			1	1		1	4
Great reed warbler	1	3		20	1	1	7	16	49
Great spotted woodpecker	2	1						2	5
Great tit	13	3	14	16	9	1	47	31	134
Grey wagtail		1		2		4	13	3	23
Hawfinch	1			4	4		5	8	22
Hoopoe	1					1	1		3
House sparrow	26			1			3		30
Icterine warbler	3					2		3	8
Lesser spotted woodpecker				1					1
Linnet	3	1						1	5

Long-tailed tit			3		2	1	7		13
Melodious warbler	2								2
Middle-spotted woodpecker							1		1
Olive-tree warbler		1					2		3
Pied flycatcher								1	1
Red-backed shrike	5	3	1	1	8	3	1	3	25
Rock dove				2					2
Scops owl	1								1
Sedge warbler	1			5		1			7
Serin	6			2	4				12
Sombre tit		1	2	2	10	2	19	9	45
Spanish sparrow	10								10
Tawny pipit	1								1
Tree sparrow	4								4
Turtle dove	1			1			2		4
White wagtail	1								1
Whitethroat	3								3
Wood warbler	1		1	1	2	2			7
Woodchat shrike	3				3	1		3	10
Total Species	37	22	12	29	24	22	23	27	60
Total Records	319	136	48	341	176	66	380	369	1835

**Mist netting was not undertaken in 2020*

Butterflies

Table 4: Lepidoptera species recorded in KNP by OpWall/Biota staff, by year (2019-2025)

Species	2019	2021	2022	2023	2024	2025	2026	Total
Adonis blue	10		20		298	109	29	466
Amanda's blue					1	1		2
Anomalous blue			2		1			3
Balkan Marbled White					1	2		3
Berger's clouded yellow		1			4	3	6	14
Black hairstreak							1	1
Black-veined white						2		2
Blue-spotted hairstreak	6				1	3	2	12
Brown argus	10	7	41	44	38	33	33	206
Cardinal	1		1	6	11			19
Chalkhill blue	1			4				5
Chapman's blue			3	1		1		5
Cleopatra	1	1			1			3
Clouded yellow	1	2	1	26	4	39	4	77
Comma	1		1		1	2		5
Common blue	13	9	33	32	40	121	30	278
Common brimstone	4			11	8	5	3	31
Cretan small heath							1	1
Dingy skipper	1	1			2	1	1	6
Dusky meadow brown		1				1		2
Eastern bath white	1							1
Eastern wood white	2	1					3	6
Escher's blue	3		2	1	2			8
Essex skipper				7		1	5	13
Gatekeeper						1	8	9
Grayling	1	16	6	59	13	81	11	187
Great banded grayling	83	34	60	176	417	675	404	1849
Green-veined/Balkan green-veined white	44		12		9	10	3	78
Grizzled skipper				3		2	3	8
Hermit	9	1	1	15	9	1		36
High brown fritillary					2			2
Holly blue	5	4	34	3	41	8	14	109
Ilex hairstreak	2					9		11
Iolas blue	1							1
Lang's short-tailed blue		1	1	1	2		1	6
Large grizzled skipper						2	1	3
Large skipper	4				1	2		7
Large tortoiseshell				6	3	3		12
Large wall brown	9				2	2		13
Large white	2			58	12	7	35	114
Little tiger blue	2				2	2		6
Lulworth skipper	11	1	2	2	2	64	2	84

Mallow skipper	2				5		2	9
Marbled fritillary	1						1	2
Marbled white	117	7	60	218	54	255	192	903
Marbled white (subs leucomelas)		1			2		1	4
Meadow brown	158	35	133	175	486	655	259	1901
Meleager's blue			1					1
Mountain small white	10	5	12	2	22	17		68
Nettle tree	4	1	7	2	10	10	3	37
Niobe fritillary	5		2	2	4	2	1	16
Oberthür's grizzled skipper	3	1	1		8	1		14
Old-world swallowtail	1			3	2	2	1	9
Olive skipper							1	1
Orbed red underwing skipper	2				15	1		18
Oriental marbled skipper	1				1			2
Oriental meadow brown	7		9	10	10	16		52
Painted lady	34		1			1	9	45
Peacock	2			2				4
Purple hairstreak				1				1
Queen of Spain fritillary				1	1	1		3
Red admiral	1	3	5	2	36	3	3	53
Scarce swallowtail	32	16	18	30	83	30	72	281
Short-tailed blue	1	1			4			6
Silver spotted skipper	1							1
Silver-studded blue	2		2	1	1	1		7
Silver-washed fritillary	13	11	58	42	352	264	180	920
Small blue	8			5	3	29	2	47
Small copper	4	6	9		5	2	6	32
Small heath	44	6	4	24	219	63	123	483
Small skipper	12	1	4	6	9	36	3	71
Small white	2		12	72	11	15	29	141
Southern comma	1		1					2
Southern small white						6	4	10
Southern white admiral	46	27	23	70	92	113	39	410
Speckled wood	62	8	7	47	118	157	24	423
Spotted fritillary	51	1		4	423	210	13	702
Tree grayling	53	21	110	10	221	10	175	600
Wall brown	12	11	8	41	74	55	21	222
White-letter hairstreak				4				4
Wood white	6	7	4	3	69	59	8	156
Woodland/Eastern rock grayling	32	31	259	125	390	151	206	1194
Total Species	59	34	40	44	58	58	48	82
Total Records	958	280	970	1357	3658	3358	1978	12559

**Surveys not conducted in 2020*

Herpetofauna

Table 5: Herptile species recorded in KNP by OpWall/Biota staff, by year (2018-2025)

Species	2018	2019	2021	2022	2023	2024	2025	2026	Total
Aesculapian snake		1						2	3
Agile frog	26	6			9	20	16	15	92
Balkan green lizard	18	28	5	4	11	27	18	38	149
Balkan marsh frog	35	1	4	1	6	4	13	12	76
Balkan whip snake	3	6	2	3	1	10	2	5	32
Cat snake		11		3	11	46	12	2	85
Common toad	15	16	12	2	7	25	24	49	150
Dahl's whip snake		3			3	3	2	1	12
Dalmatian algyroides		13	3				2	1	19
Dalmatian wall lizard	11	62	18	4	27	27	26	21	196
Dice snake	11	1	2	1	4	1	12	5	37
Eastern Montepellier's snake		29		4	4	4	2	1	44
European green lizard		2				2	2	1	7
European green toad	1	1				2		1	5
European legless lizard	3	2		1	5	6	13	13	43
European pond terrapin	4	3	1	1		2	2	3	16
European tree frog	1	2			1	1	1	12	18
Four-lined snake		5	2	1	1	6	3	5	23
Grass snake	6	1	4		3	11	17	4	46
Hermann's tortoise	4	72	4	9	3	50	33	68	243
Italian wall lizard	91	2	4	2	1	14	2	9	125
Leopard snake		1		2	1	4	6	5	19
Mediterranean house gecko		4				11	3	6	24
Nose-horned viper		7			8	13	17	9	54
Olm							1	2	3
Slow worm						2			2
Smooth Newt							2	1	4
Total Species	14	24	12	14	18	23	24	26	27
Total Records	229	279	61	38	106	291	231	291	1526

*Surveys not conducted in 2020

Mammals

Table 6: Mammal species (transects and incidentals) recorded by OpWall/Biota staff, by year (2018-2025)

Species	2018	2019	2022	2023	2024	2025	2026	Total
Badger		9		66	33	32	57	197
Beech marten	4	87		30	14	31	81	247
Bi-coloured shrew					1			1
Brown hare	1	12		39	20	20	29	121
Brown rat				1	1			2
Edible dormouse				1	11	6	15	33
European wildcat		2		11	21	22	30	86
Golden jackal	1			1	2	3	6	13
Grey wolf	4	2		1	2	4		13
Least weasel		3				3	4	10
Northern white-breasted hedgehog	3	2		42	37	35	40	159
Polecat		1						1
Pygmy white toothed shrew				1		2	1	4
Red fox	2	1		80	78	36	59	256
Red squirrel					1	6	1	8
Roe deer	1	8		45	34	39	61	188
Western broad-toothed field mouse					4	1	2	7
Wild boar	1	5		3	10	46	32	97
Wood mouse	2		5	2		11	1	21
Total Species	9	11	1	14	15	16	15	19
Total Records	19	132	5	323	269	297	419	1464

**Transects not completed 2020-2022*