MAMMAL SURVEY BIOGRADSKA GORA MONTENEGRO 2014

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Mammal survey Biogradska Gora Montenegro 2014

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.... this document

This document presents the work of the Field study Group of the Dutch Mammal Society during the annual Summer Mammal Study Camp in Montenegro, 2014.
The methods used and the results are presented.
The different chapters in the report are written by the responsible coordinator for the research method.
The pictures in the report are provided by the camp participants for free.
The species lists compile only the certain observation and are not exhaustive.

The participants in the Summer Mammal Study Camp 2014 in Biogradska Gora National Park, Montenegro

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14.Jan Buys
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Not on the picture:
16.Vernes Zagora
17.Klarissa Nienhuys
18.Alfred van Zwam

CONTENT

Every year the Field Study Group of the Dutch Mammal Society organizes a summer Mammal study camp. These camps take place in different countries in Europe and in 2014 the host country was Montenegro.

The 2014 annual Summer Mammal Study Camp was held from July 29 to August 8 in Biogradska Gora National Park in Montenegro. The park, that includes parts of Bjelasica mountain, lies in the central part of the country between the Tara and Lim rivers.

The park occupies an area of 5650 ha, preserving ancient beech forest - one of very few "primeval forests" in Europe, mountainous slopes and peaks up to 2000 masl, streams and glacial lakes, a high-mountainous zone with the characteristic alpine flora and fauna, wet meadows in a rocky surrounding, as well as small-scale agriculture in the valleys. The diversity of habitats maintains a great species richness.

The mammal fauna is represented by roe deer *(Capreolus capreolus)*, wild boar *(Sus scrofa)*, the introduced red deer *(Cervus elaphus)*, the otter *(Lutra lutra)*, many species of bats, insectivores and rodents.

There are 38 species of mammals confirmed for the National Park Biogradska Gora.

Marina Đurović was the contact person in Montenegro and she was of great help for the camp on site. The camp team consisted of 18 participants, of which 12 Dutch and 6 Montenegrin. The camp atmosphere was very nice - friendly, enjoying the field work and the evening chats.

Deciding which areas will be studied - Marina Đurović and Jan Wondergem.
© Kees Mostert

The study took part inside Biogradska Gora National Park and its immediate surroundings. In order to gather as much information as possible on the occurrence of mammals, various methods were used, such as interviews, observations, live-trapping animals, collecting dead animals, recording of bat sounds, mist netting for bats and camera trapping.
Two main types of live traps were placed in characteristic variety of habitats, aiming at a representative sampling of the small mammalian species, present in the area.
The smaller live traps, Longworth and Heslinga, were used for the small mammals living on the ground. And the bigger Sherman live-traps, were placed in trees, in order to catch the bigger sized mammals.
The work continued almost 24-7. In the evenings and early in the nights, bats were caught with mist nets placed alongside lakes, streams, ponds and brooks. Bat sounds were recorded with bat-detectors and analysed afterwards. The nights were also a good time to check roads with strong spotlights for night-active animals. Camera traps were placed at strategic points to “catch” the ”night life” of Biogradska Gora National Park.
During the day, houses, cellars and bridges were inspected for bats and other signs of mammalian life. Tracks and trails were also surveyed and registered.
After analysing all the datagathered during the camp, 37 mammal species were confirmed. (see Table1.)
The information collected is available for use by the partners there and uploaded at **Global Biodiversity Information Facility** for conservation work.

The glacier lake Biogradsko Jezero © Kees Mostert

Table 1. The list of the mammal species registered during the Summer Mammal Study Camp 2014 in Montenegro

	Scientific name	**English name**	**Dutch name**
1	*Erinaceus roumanicus*	Northern white-breasted Hedgehog	Oostelijke egel
2	*Sorex araneus*	Common shrew	Gewone bosspitsmuis
3	*Sorex minutus*	Pygmy shrew	Dwergspitsmuis
4	*Neomys anomalus*	Miller's water shrew	Millers waterspitsmuis
5	*Crocidura suaveolens*	Lesser white-toothed shrew	Tuinspitsmuis
6	*Talpa europaea*	European mole	Mol
7	*Talpa ceaca*	Blind mole	Blinde mol
8	*Rhinolophus hipposideros*	Lesser horseshoe bat	Kleine hoefijzerneus
9	*Myotis daubentonii*	Daubenton's bat	Watervleermuis
10	*Myotis mystacinus*	Whiskered bat	Baardvleermuis
11	*Myotis nattererii*	Natterer's bat	Franjestaart
12	*Myotis oxygnathus*	Lesser mouse-eared bat	Kleine vale vleermuis
13	*Pipistrellus pipistrellus*	Common pipistrelle	Gewone dwergvleermuis
14	*Pipistrellus pygmaeus*	Soprano pipistrelle	Kleine dwergvleermuis
15	*Pipistrellus kuhlii*	Kuhl's pipistrelle	Kuhls dwergvleermuis
16	*Hypsugo savii*	Savi's pipistrelle	Savi's dwergvleermuis
17	*Nyctalus leisleri*	Leisler's bat	Bosvleermuis
18	*Nyctalus noctula*	Noctule	Rosse vleermuis
19	*Barbastella barbarstellus*	Barbastelle	Mopsvleermuis
20	*Plecotus spp.*	Long-eared bat	Grootoorvleermuis
21	*Vestpertilio murinus*	Parti-coloured bat	Tweekleurige vleermuis
22	*Tadarida teniotis*	European free-tailed bat	Bulvleermuis
23	*Lepus europaeus*	Europaean hare	Haas
24	*Sciurius vulgaris*	Red squirrel	Eekhoorn
25	*Myodes glareolus*	Bank vole	Rosse woelmuis
26	*Microtus arvalis*	Common vole	Veldmuis
27	*Microtus subterraneus*	Pine vole	Ondergrondse woelmuis
28	*Apodemus sylvaticus*	Wood mouse	Bosmuis
29	*Apodemus flavicollis*	Yellow-necked mouse	Grote bosmuis
30	*Dryomys nitedula*	Forest dormouse	Bosslaapmuis
31	*Glis glis*	Edible dormouse	Relmuis
32	*Nannospalax leucodon*	Lesser mole rat	Westelijke blindmol
33	*Vulpes vulpes*	Red fox	Vos
34	*Meles melis*	Badger	Das
35	*Martes martes*	Pine marten	Boommarter
36	*Martes foina*	Stone marten	Steenmarter
37	*Cervus elaphus*	Red deer	Edelhert

INTRODUCTION *Lily Vercruijsse*

For some time already, Montenegro stood on the wish list of countries the field study group wanted to visit to conduct a survey on the mammals. On the advice of Marina Đurović of the 'Public Enterprise for National Parks of Montenegro', the Field Study Group chose Biogradska Gora National Park as the location for its 2014 camp, where it conducted surveys of small mammals. Limited all-weather road access within the Park meant that surveys were conducted both in the park and in adjacent locations.

Biogradska Gora is the smallest and the oldest of the four national parks in Montenegro. It was found by King Nikola in 1878 and became a National Park in 1952, together with the other two national parks Durmitor and Lovćen.

The camp was held from July 29 to August 8 at a campground adjacent to the Biogradsko Jezero lake. Participants slept in cabins and used the Visitors Center as a meeting room. The 12 Dutch participants formed smaller, compared to other years, but no less enthusiastic group. The 5 Montenegrin participants included our host Marina Đurović and a lecturer and 3 students from the Department of Biology at the Faculty of Natural Science of the University of Podgorica.

Lily Vercruijsse, Jan Boshamer and Kees Mostert were responsible for local coordination. Odile Schmidt and Bart Noort logged all data during the camp.

The camp evenings, before going for the night check of the traps. © *Kees Mostert*

Montenegro is in Southeast Europe and occupies some 14,000 square kilometres on the Adriatic coast between Albania, Kosovo, Serbia, Bosnia and Herzegovina and Croatia. Since June 2006 it has been an independent state and since 2010 is a candidate for EU membership and uses the Euro as its currency. Its population of some 650,000 people lived at a density of about 50 per sq km, although about 60% of the population was urban and 144,000 alone lived in the capital of Podgorica.

In 1991, its leaders declared in Article 1 of its Constitution Montenegro to be the world's first Ecological State. This coincided with the announcement of exceptional measures to control industrial pollution, which had increased enormously over the previous 50 years. The intention was to ensure the quality of meat, dairy, honey, fish and vegetables and to guarantee high-quality drinking water supplies.

Montenegro's climate varies from Mediterranean with dry, warm summers and mild, rainy winters in the lower regions to temperate continental in the mountains. Montenegro's mountainous regions are the wettest in Europe, and rainfall approaches an average of 5000mm per year on the coast in Kotor. During winter, a powerful, dry, north-eastern wind, called the Bora, rages on the Adriatic coast including Montenegro. The coast receives about 2700 hours of sunshine per year - among the highest in Europe.

Biogradska Gora National Park – high mountain flowery wet meadows. © Kees Mostert

Biogradska Gora National Park occupies 5650ha of the Bjelasica mountains between the Tara and Lim rivers. Its lower region includes a forest reserve of 1600ha, that preserves one of 'primeval' old-growth beech forests remaining in Europe. In the midst of a beech forest, at 1100m altitude, lies the large glacial lake Biogradsko Jezero. Above the forest level starts the alpine zone – grasslands, richly covered with flowers in the summer. The mountainous slopes are dissected by many streams, peaks of up to 2000 meters, 5 small glacial lakes and numerous small ponds and springs that drain into Biogradsko Jezero via the river Biogradska. The lake itself drains via the river Jezerštica into the Tara, which further streams in the Tara River Gorge, the deepest canyon in Europe. Within the alpine zone, small-scale grazing of cattle and sheep in the rocky wet meadows and in the broad valleys is practiced. There are no caves as the geology of the mountain is volcanic.
As well explained on the website of UNESCO, "the most impressive part of the National Park is the virgin forest reserve, surface of 16 sq km, where the strict protection system has been established. That is one of the last virgin forests in Europe. This part of the park is characterized by different species of trees and bushes (over 86) as well as the number of forest communities. Among them one of the special is the maple tree and ash community *(Aceri-Fraxinetum montenegrinum)."*
The Bjelasica mountains maintains a great diversity of species including endemic plants such as Bosnian pine *(Pinus heldreichii),* Macedonian pine *(Pinus peuce),* Balkan maple *(Acer heldreichii visianii), Potentilla montenegrina, Diantus pancicii, Valeriana pancicii, Lilium albanicum, Wulfenia blecicii, Myriaria ernestii mayeri* and *Achilea abrotanoides*.

The area aroung the lake Biogradsko Jezero, was declared in 1878 by King Nikola as a protected area, preserving the pristine forests covering Bjelasica until today. © Jan Buys

The dominant habitats are those of beech (*Fagetum*) and spruce (*Piceetum abietis*), while, from the national point of view, Macedonian pine habitat forest (*Pinetum peucis*) is of utmost importance. Forest eco-systems are characterized by differentiated vegetation, both vertically and horizontally, the abundance of plant communities and the representation of relict and endemic species.

About 2000 species and subspecies of higher plants have been confirmed in the area of Biogradska gora. Not less than 20% of the West-Balkan endemic plants have been registered here, such as: *Aconitum toxicum*, *Rumex balcanicus*, *Pancicia serbica*, *Dianthus pancicii*, *Dactylorhiza cordigeria* subsp. *bosniaca*, *Silene asterias*, *S. sendtneri*, *Dianthus nitidus* subsp. *lakusicii*, *Alyssum scardicum*, *Draba scardica*, *Alchemilla velebitica*, *Potentilla montenegrina*, several species of saxifrage -*Saxifraga prenja, Verbascum nikolai*, *S.adscendes* subsp. *blavii*, *Chamaecytisus tomasinii*, *Genista depresa* subsp.*csikii*, *Asperula doerflerii*, *Gentianella bošnjakii*, *Verbascum durmitoreum*, Greek maple *(Acer heldreichii* subsp. *visianii)*, Macedonian pine *(Pinus peuce)* and others.

The park supports also the populations of 200 species of birds, 38 species of mammals, 350 insect species and 164 lichens. The Balkan endemic slug *Deroceras turcicum* has been found. The Karst adder (*Vipera ursine)* is popular in the region. There are also three autochthonous species of fish, such us Brown trout (*Salmo trutta fario*), Minnow (*Plioxinus phoxinus)* and Bullhead (*Cottus gobio*).

Due to the presence of numerous endemic species and habitats, the area of the national park is recognized as an IPA area (Important Plant Area), IFA (Important Fungus Area) and IBA status (Important Bird Area).

Map 1: Map of the camp and the study area in Biogradska Gora, Montenegro. The star shows the camp location

GOAL OF THE STUDY AND METHODS

The mammal survey used a variety of methods to gather as much information as possible about the occurrence of mammal species in and around Biogradska Gora National Park. The goal of the study was a general survey of the mammalian fauna with a focus on the small mammals.
Bats were surveyed using mist nets placed along Biogradsko Jezero, ponds and small streams where bats were expected to forage and drink. They were sought using bat-detectors with recorders. The records were later analysed using a special sonogram-reading software. By daylight inspections of various (abandoned) buildings and bridges were visited in search of bats.

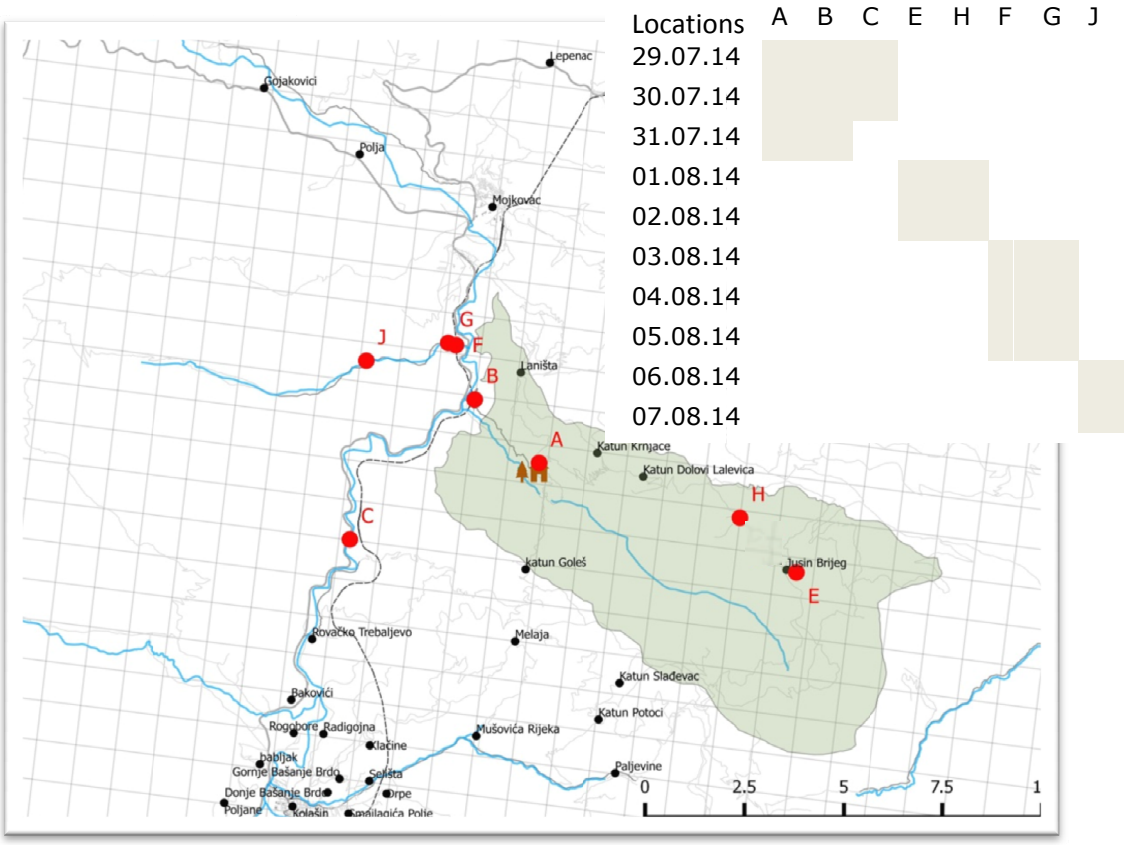
Small ground- and arboreal mammals were surveyed using live traps placed in a diversity of habitats. Longworth and Heslinga traps were used on the ground and Sherman traps in the trees.
More generally, mammals were surveyed also by examination of traces, spotlighting along narrow country roads at night and the placement of camera traps at strategic points in an attempt to find shyer species. Traces such as tracks, trails and droppings were investigated in a wide range of locations including in particular buildings and bridges. Although no owl pellets were found (whilst the Tawny owl was present, the Barn owl was absent in this mountainous region), the remains of several small mammals were found in fox droppings.

Biogradska Gora National Park and part of the lake Biogradsko Jezero © Jan Buys

Live traps were set in a variety of promising biotopes so as to maximise the number and the diversity of species caught.
Two very similar types of 24x7x8.5cm livetraps were used: 75 Longworth and 75 Heslinga traps. They were stuffed with straw and baited with rolled oats, peanut butter, pieces of carrot, apple and meal worms, the latter to improve the chances of survival of any shrews caught. The traps were inspected three times a day (at 07:00, 16:00 and 24:00) by small groups of participants.
The large numbers of captures made it impractical to systematically mark individuals by clipping a small patch of fur, although this was done a small number of times for demonstration purposes.

Locations

Transects of live traps numbered in ascending order were set at the 8 different locations. Within each line, pairs of traps of the 2 types (Longworth and Heslinga) were placed in the vegetation at intervals of approximately 10m, depending on the specifics of the terrain – the presence of boulders, bushes, trees, etc. The location of each trap was marked with a piece of aluminium foil fixt to a prominent branch or higher grass.



Map 2: Locations of the Longworth-Heslinga livetraps

The traps were initially placed on July 29 at locations A, B and C.
Location A was situated in old-growth beech forest 100m north of the campground.
Location B was in a grazed field near the park entrance 4km from the campground.
Location C was above a scree slope alongside the river Tara 7km south of the park entrance. After foxes removed 5 traps from Location C, on July 31 we collected the remaining traps. Of the 5 lost traps, 2 partially-damaged traps were later found during the search of the rubbish-strewn scree slope, where they had been placed.

On August 1, 50 Longworth traps were removed from locations B and C and placed at locations H and E in alpine grassland at about 1900m altitude, 10km northeast of the campground. A group of the participants camped there for 2 nights so they were able to check the traps regularly.

Location H was an alpine grassland high in the mountains, not far away from location E and with similar vegetation. Location H looked as a good habitat for voles and indeed two Common voles *(Microtus arvalis)* were caught.
August 3, 50 traps were placed on the **Locations F and G**, where they remained for the last 3 nights. Twenty of the Longworth traps were placed along a stony river shore (**Location F)**. Another dozen (12), where spread in the neighbouring grass field among the secondary ruderal vegetation with Agrimony *(Agrimonia spp)*, oregano *(Origanum vulgare)*, wild carrot *(Daucus carota),* red fescue *(Festuca rubra)*, cornflower *(Centaurea spp)*, Greater Yellow-rattle *(Rhinanthus angustifolius)*, Self-heal *(Prunella vulgaris),* Viper's bugloss *(Echium vulgar*e), Red clover *(Trifolium pratense)* and Colonial bent *(Agrostis capillaries).* And the last part of the traps were positioned along a bushy edge, consisting of hawthorn *(Crataegus spp)*, Field maple *(Acer campestre)*, Spindle tree (Euonymus) and Ash *(Fraxinus spp)*. **Location G** was the border of a forest with Ash *(Fraxinus spp),* Field maple *(Acer campestre)* and hawthorn *(Crataegus spp).* The neighbouring grass field was with the same vegetation cover as the one in location F. Most of the traps were placed along the forest border.

The last night eight Longworth traps were placed in the ruderal vegetation along the unpaved road bordering deciduous forest, near to a small trout farm **(Location J)**. The expectation was that the marshy stream along the trout farm would be inhabited by water shrews *(Neomys anomalis)* and with succes!

The Longworth livetraps are checked and prepared. © Kees Mostert

Results

A total of 468 captures of mammals were recorded in the 2150 trap-checks conducted over 918 trap-nights. The capture rate was thus 22% per trap-check and 51% per trap-night.
The 11 mammal species caught were Common shrew *(Sorex araneus),* Pygmy shrew *(Sorex minutus),* Miller's water shrew *(Neomys anomalus),* Lesser white-toothed shrew *(Crocidura suaveolens),* Common vole *(Microtus arvalis),* Bank vole *(Myodes glareolus),* Field vole *(Microtus agrestis),* Common pine vole *(Microtus suberraneus),* Wood mouse *(Apodemus sylvaticus),* Yellow-necked mouse *(Apodemus flavicollis)* and Forest dormouse *(Dryomis nitedula)*. One Forest dormouse was caught in a Longworth/Heslinga livetrap in the alpine zone. Other incidental unintended captures included several large snails, a grasshopper and a Common Wall Lizard *(Podarcis muralis)* in a trap set on rocks adjacent to a stream.
The majority of the 468 captures were of *Apodemus* mice (316 Yellow-necked mouse *(A.flavicolis)* and 49 Wood mouse *(A.sylvaticus)),* which were in fact so abundant that they could be seen at night on roads and bridges. In 52 cases, escaped or very young individuals could not be identified with certainty to species level. The high population density of *Apodemus* mice meant that it was more difficult to catch other, less "trap-happy" species. Most of the Bank voles *(Myodes glareolus)* were caught in the beech forest.
A small number of the Common voles *(Microtus arvalis)* were caught at a two locations.
From the 468 mammals caught, only 2 were found dead in the traps - a Pygmy shrew *(Sorex minutus)* and a Common pine vole *(Microtus subterraneus).*
The capture rates of both Yellow-necked mouse *(Apodemus flavicollis)* and Bank vole *(Myodes glareolus)* in the Longworth traps were almost twice those of the Heslinga traps. We don't have a good explanation for this. The trap types differ in colour, age and spring mechanism. Also, the number of times in which a trap was loaded, but without a capture were similar: Heslinga 13 and Longworth 16 times.

locations	A	B	C	E	F	G	H	J	Total
number of trap nights	150	150	100	150	150	100	100	16	918
Sorex araneus	1								1
Sorex minutes	1								1
Neomys anomalus								1	1
Crocidura suaveolens			1						1
Microtus subterraneus				2					2
Microtus arvalis		4					2		6
Myodes glareolus	33	1		3					37
Dryomys nitedula				1					1
Apodemus sylvaticus	31	8	2	1	2	5			49
Apodemus flavicollis	44	140	16	6	46	49		15	316
Apodemus spec	35	11			1	1		4	52
Podarcis muralis					1				1
	145	164	19	13	50	55	2	20	468

Table 1: Longworth/Heslinga livetraps captures

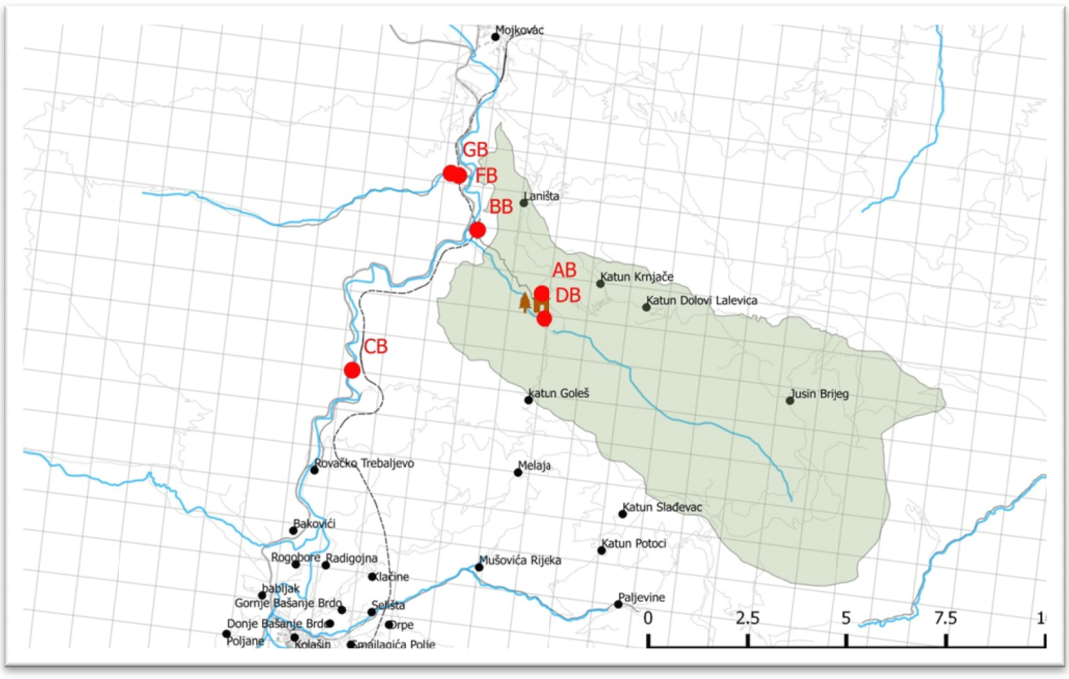
The dormouse population was surveyed using Sherman traps, placed in trees. Three of the five dormouse species in Europe were expected: Edible dormouse *(Glis glis),* Forest dormouse *(Dryomys nitedula)* and Hazel dormouse *(Muscardinus avellanarius).* The nearest place the fourth species, the Garden dormouse *(Eliomys quercinus)* is found is Croatia and Italy, but not in Montenegro. The fifth one occurs in the area on the border between Bulgaria and Turkey.

Sherman live traps, generally baited with pieces of dried apricot, were placed 3-5m high in trees, mostly near their trunks on a strong branch. The traps should be high up enough in the canopy of the tree or in the shrub to be effective. Each trap was bound atop a small wooden board with a circular hole at the one end of a bare branch 2-3m long was inserted, so that it could be raised and balanced on a horizontal branch.

A brief demonstration sufficed to train a small group of participants in the positioning of the traps. When choosing the locations attention also was paid to the presence of edible plants in the vicinity such as rose, hazel or fruit trees.

Locations

At locations AB, BB, CB and FB, live traps were used both on the ground and in trees. At locations DB and GB, the livetraps were placed only in the trees.
Location AB was situated just behind the cabins, north of the lake Biogradsko Jezero on a rocky, south-facing slope in the old-growth beech forest with a sparse understory of ferns and hazel.



Map 3: Locations of the Sherman traps placed in trees

Location BB was situated behind a barrier at the entrance to the park in a south facing grassland field bordered by deciduous trees including beech, oak, elm, maple, linden, apple and blackthorn.

Location CB was situated outside the park, along the south facing unpaved road just behind a bridge over the Tara river about 7km southeast of Biogradsko Jezero, where open spaces were divided by juniper, oak and beech.

Location DB, 'the big boulder', was situated on a rocky, north-facing slope on the south side of Biogradsko Jezero, in a forest containing both pine and deciduous trees with little undergrowth. This location was chosen because the available literature suggested that a mixed forest on rocky ground was a suitable habitat for forest dormouse.

Location FB was situated along the Štitarica river near a railway bridge on a herbaceous riverbank containing shrubs and trees including hazel, oak, apple and cherry.

Location GB was situated close to location FB along an uphill path enclosed by hollow trees including beech and birch.

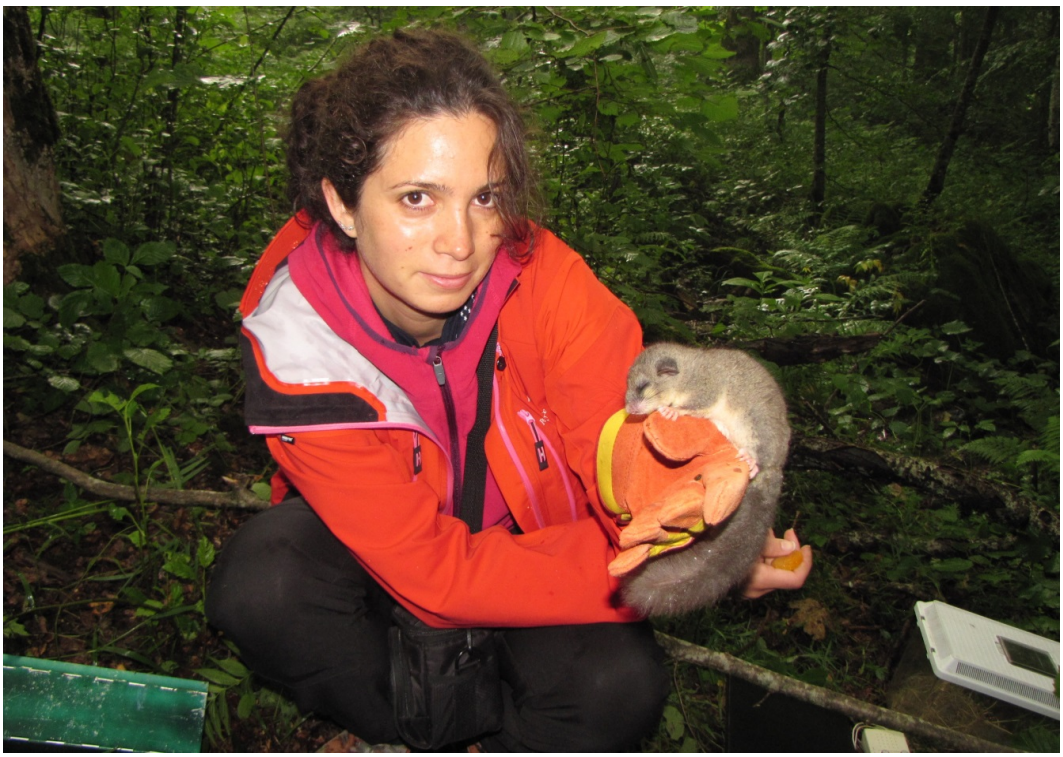
Jan Wondergem explains how the Sherman live trap works © Jan Buys

Results

The capture of many Edible dormice *(Glis glis)* at 5 of the 6 locations can be regarded as a reliable indication of a substantial presence of the species in that region.
The Forest dormouse *(Dryomis nitedula)* was caught with a Longworth live trap, placed on the ground for the survey at location E (see Longworth/Heslinga livetraps). That was an alpine environment consisting of grassland interspersed with 2m high thickets of juniper and Mountain pine (*Pinus mugo)* at an altitude of 1940masl.
Hazel dormouse *(Muscardinus avellanarius)* was not captured, nevertheless, the locations BB, CB, FB and GB were considered to be suitable habitat.
The capture of *Apodemus* mice at heights of 4-5m indicates that they are good at climbing trees.

Locations	Altitude	# of traps	# of nights	*Glis glis*	*Apodemus spp*
AB	1200	8	3	3	0
BB	883	8	3	3	2
CB	915	8	3	6	2
DB	1106	8	4	0	0
FB	845	8	3	2	0
GB	855	8	3	2	0
Total		48	19	16	4

Table 2: The results of the Sherman traps placed in trees.



Marina Đurović with Edible dormouse (Glis glis) © *Lily Vercruijsse*

The use of mist nets is an essential component of the surveys of bats, as observations made using bat detectors sometimes fail to discriminate between, in particular, *Myotis* species.

Mist nets are fine nets that can also be also used for surveys of birds. When used for catching bats, the nets are suspended between temporarily-erected aluminium poles. Several different nets are used simultaneously at each location to improve the chances of success.

In dry areas, bats visit water basins, such as rives, streams or pools, to drink and to catch insects amnd these sourses provide good locations for mistnetting. However, the many rivers and streams in the wet mountainous Biogradska Gora park made the selection of good catching locations adjacent to pools or dams difficult. The absence of mines and caves in the area further ruled out the usual practice of placing nets in front of the potential underground roosting sites.

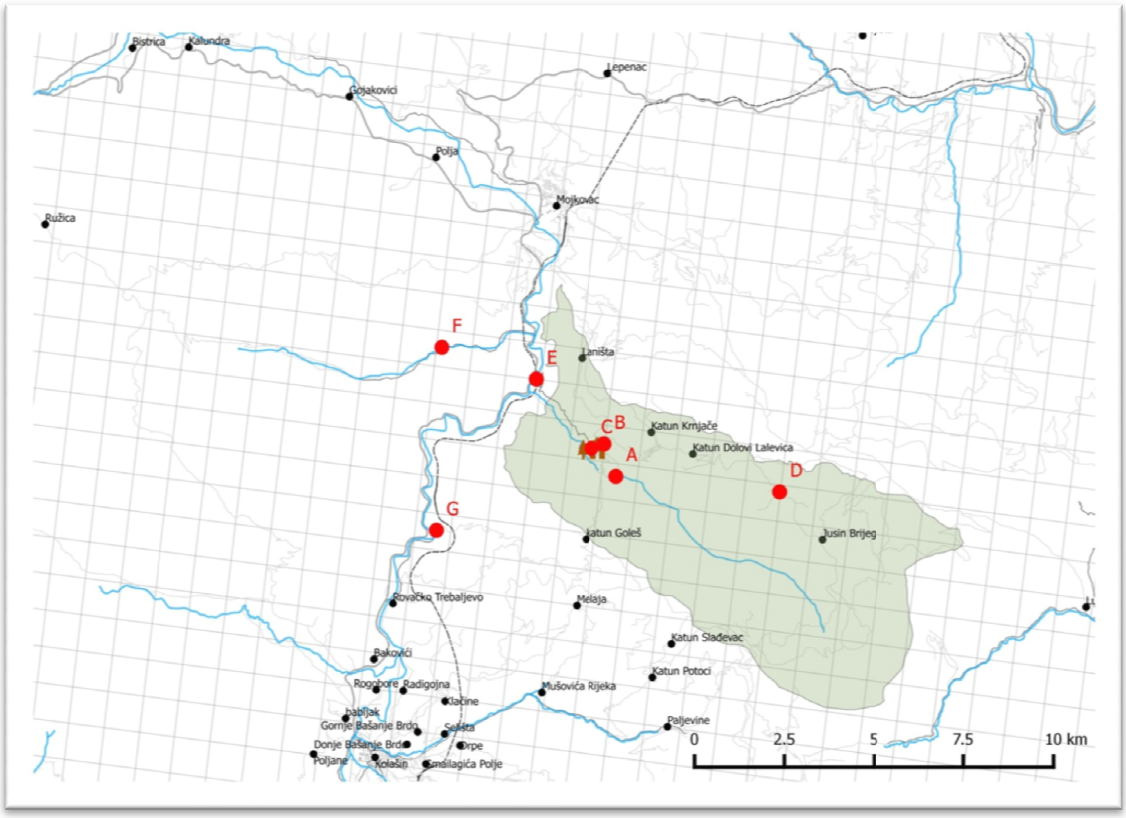
Bart Noort checking the mist nets. © Lily Vercruijsse

Locations

Between July 29 and August 5 mist nets were placed at 7 locations (Table 3) chosen for their potential attractiveness to bats and the feasibility of net placement. Of the 7 locations, 6 were above or directly adjacent to water, and 3 of these 6 lakes were trout farms. One location was adjacent to a colony of the Lesser horseshoe bat *(Rhinolophus hipposideros)* in a building near the camp, where no bats were caught.

date	location	description of the locations	*M.oxygnatus*	*M. daubentonii*	*M. mystacinus*	*N. leislerii*	*N. noctula*	*P. nvameus*	*V. murinus*
29-7-2014	A	On the boardwalk in the forest			1				
30-7-2014	B	Nearby the old troutfarm in the forest			1				
31-7-2014	C	Nearby the shore of Biogradsko Jezero		2	1			1	
2-8-2014	D	Nearby a pool high in the mountain							1
2-8-2014	E	Nearby colony of Lesser horseshoe bat							
4-8-2014	F	Nearby troutfarm near Stitarica	1			7	1		
5-8-2014	G	Nearby troutfarm N of Rovachko Trebalevo							

Table 3: Bat captures at mist netting locations



Map 4: Map of the region with the mist netting locations

Results

All bats captured were weighed and sexed and had their underarm lengths measured. Before release, their thumbs were marked with white nail polish to ensure that recaptured individuals were not counted twice.

A total of 16 bats of 7 species were caught. These 16, all but one of whom were male, included 7 individuals of Leisler's bat (*Nyctalus leisleri*), 3 of the Whiskered bat *(Myotis mystacinus),* 2 (one male and one female) of the Daubenton's bat *(Myotis daubentonii)* and 1 of each of the Lesser mouse-eared bat *(Myotis oxygnathus)*, Soprano Pipistrelle *(Pipistrellus pygmaeus),* Parti-coloured bat *(Vespertilio murinus)* and Common noctule *(Nyctalus noctula).*

The two Daubenton's bats, a male and a lactating female, were caught at the edge of the lake Biogradsko Jezero, adjacent to the campground (Location C). The bats had been observed flying above the water in the preceding days, sometimes even before dusk. That was an exciting catch since the species, had not been previously reported in Montenegro.

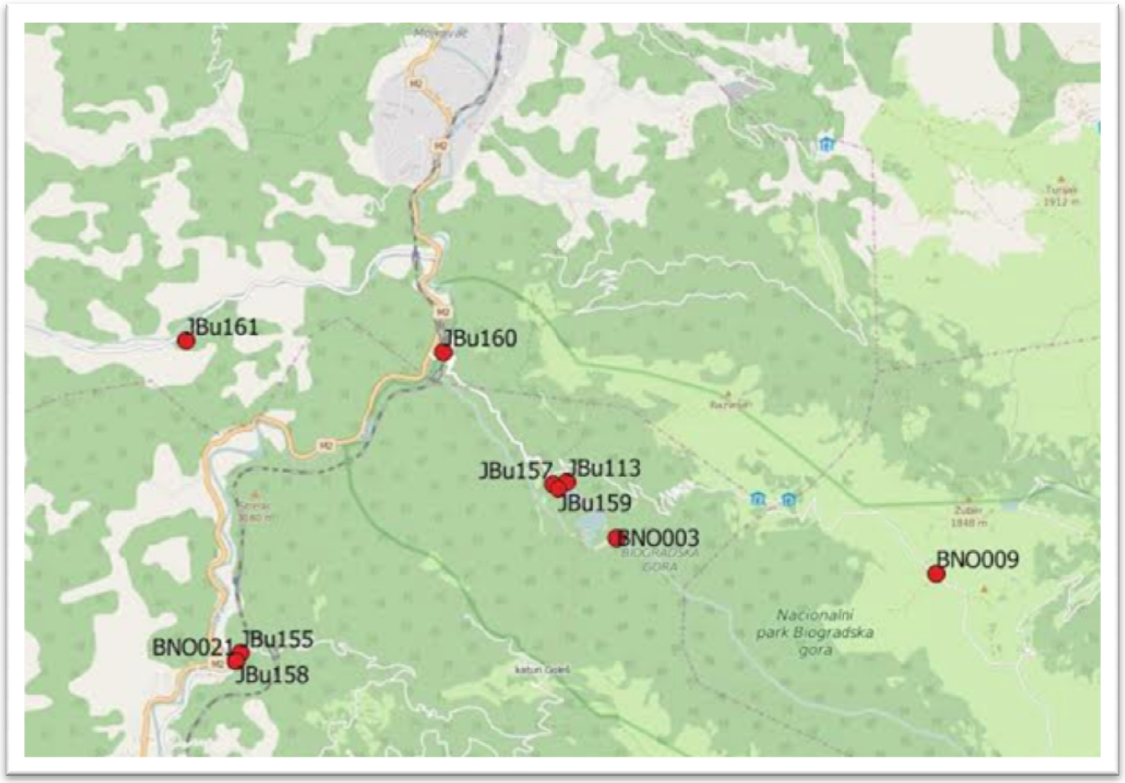
The single Parti-coloured bat was caught above a tiny livestock drinking pool at an altitude of 1930m on an open treeless windy ridge.

A Barn Swallow *(Hirundo rustic*a) and a European Dipper *(Cinclus cinclus)* were caught also when they unwisely flew into the just-placed nets at dusk.

Daubenton's bat (Myotis daubentonii) © Jan Buys

Digital recordings of echo location calls and occasionally social calls of bats were made at 10 locations. Petterson D240 and a Petterson D240x bat detectors were used. The recordings were later analysed using Cool Edit 2.0 and Adobe Audition 5.0.

Locations



Map 5: Map of the region with the bat recordings locations

date	**waypoint**	**location**
29-7-2014	BNO003	Southeastend of the Biogradsko lake
30-7-2014	JBu113	On the lake below the restaurant
31-7-2014	JBu157	Forest and lake near entrance NP
2-8-2014	BNO009	Mountains, along road
3-8-2014	JBu159	Forest trail along the lake
6-8-2014	JBu158	Trout nursery
6-8-2014	JBu155	Forest road
6-8-2014	BNO021	Trout nursery
31-7-2014	JBu160	“Horseshoe” house
6-8-2014	JBu161	Road workers barracks

Table 4: Descriptions of the bat recordings locations.

Results

A total of 15 taxa were recorded. Of these, *Myotis nattereri* and *Barbastella barbastellus* were not observed elsewhere during our survey.

The analysis was unable to distinguish the closely-related *Myotis* species - M.*daubentonii/capaccini, M. mystacinus/brandtii* and *M. myotis/oxygnatus*. The four *M.daubentonii/capaccini* recorded at Biogradsko Jezero (JBu113, JBu158, JBu160) were probably *M. daubentonii*, and the single *M. mystacinus/brandtii* recorded at the southeast end of Biogradsko Jezero (BNO003) was probably *M. mystacinus*.

The *Rhinolophus* species recordings were made in and around a house inhabited by a large colony of Lesser horseshoe bats *(Rhinolophus hipposideros)*. Although most recordings had a peak frequency lying within the range of *R. hipposideros*, one recording made within the roost had a peak frequency of 104.6 kHz, which is (just) outside this range. This latter recoding is nevertheless probably also of *R. hipposideros* as it is known that the species uses lower frequencies within roosts.

The *Nyctalus* spec. *(Nyctalus noctula/lasiopterus)* recording (JBu160) was of an echo location call with a peak frequency of about 18 kHz, which is within the range of both species.

Species/ Locations	**BNO003**	**BNO009**	**BNO021**	**JBu113**	**JBu155**	**JBu157**	**JBu158**	**JBu159**	**JBu160**	**JBu161**	**Total # recordings**
Barbastella barbastellus	1								4		5
Hypsugo savii		1									1
Myotis daubentonii						1					1
Myotis daubentonii/capaccini				1			1		2		4
Myotis mystacinus	1										1
Myotis nattereri					1				1		2
Myotis spp./smaller	1		1	1				1			4
Nyctalus leisleri						1					1
Nyctalus noctula						1			1		2
Nyctalus noctula / lasiopterus									1		1
Pipistrellus kuhlii									1		1
Pipistrellus kuhlii/nathusii						1					1
Pipistrellus pipistrellus		2					1		2		5
Pipistrellus pygmaeus			1			1	1		2		5
Rhinolophus hipposideros									3	1	4
Vespertilio murinus		1									1
Total # recordings	**3**	**4**	**2**	**2**	**1**	**5**	**3**	**1**	**17**	**1**	**39**

Table 5: Number of recordings per location

Next to the bat detector recordings, bat detector observations were made in the vicinity of Biogradska Gora. The species heard are the European free-tailed bat *(Tadarida teniotis),* the

Mouse-eared bat and Long-eared bat, and the later two species can only be distinguished through analysis of recordings.

CAMERA TRAPS *Lily Vercruijsse*

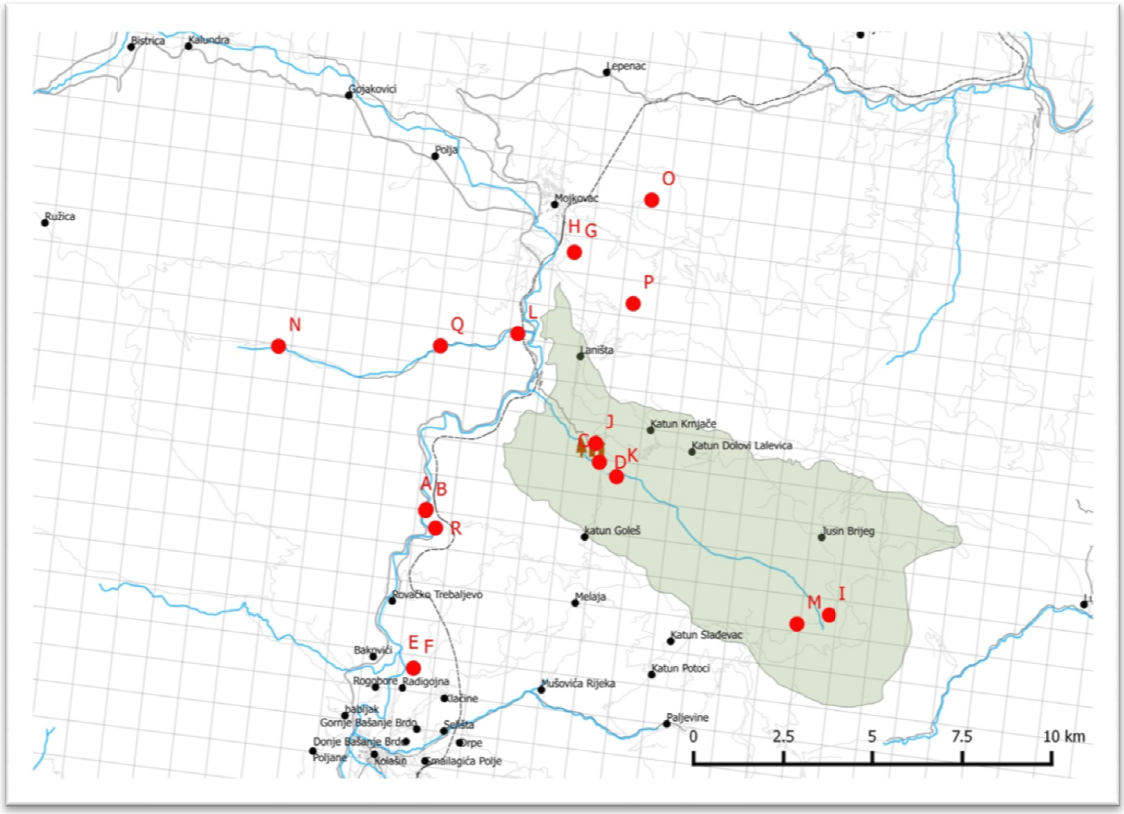
Camera traps can be used for both species inventories and the estimation of population densities of land mammals. Their use has increased in frequency and intensity with the quality improvements and the cost reduction in camera technology. The Field Study Group has been using camera traps for species inventories for several years, with varying success.

Camera traps triggered both by heat and motion were used during the survey. Our collection of camera traps consisted of a Reconyx HC500, only able to record still images, and several Moultrie and Uway cameras, that are also able to record video. The Moultrie cameras include a flash to enhance the traditional infrared recording. The camera traps were placed at locations, where traces of mammals had previously been found, at drinking places, and at grazing sites and other places expected to be visited by mammals.

Camera traps were placed at 18 locations in diverse biotopes for periods of up to 7 days. The cameras were manually set to shoot, after each trigger of the motion sensor, sequences of 5 still images at intervals of 1 second, or videos of 30 seconds, with an interval of 1 minute between sequences.
The traps were 'baited' with varying combinations of peanut butter, valerian, bacon, carrot, boiled egg, fish oil, aniseed, sheep cheese and, and in the hope of seeing otter, with fresh trout.

Moultry camera trap © Ed Goosens

Locations



Map 6: Camera trap locations

code	**description of the locations**
A	At the split of the path in the forest on the slope above the lake
B	At the curve of the path in the forest on the slope above the lake
C	At the end of the lake in the woods
D	At the end of the lake on a dry sandbank
E	Near the forest on a slope
F	In the forest, beside a large meadow
G	Forested slope next the a small meadow
H	Forested slope next the a small meadow
I	Mountain top
J	High vegetation where the Biogradska river flows into the lake
K	Upstream on an island in a shallow stretch of the Biogradska river
L	Near Stitarska river
M	In a thicket high in the mountain, along path
N	On the river bank (Stitarica river)
O	Camera quite high in grove near an electricity pole
P	On a road in beech forest
Q	On the river bank (Stitarica river) near the trout farm
R	On a forest path near the trout farm

Results

Although local people claimed that ungulates occurred in high numbers and that otters visited fish pools almost daily, neither were caught on camera. Despite the intensity of the placements, only very few recordings were made - an *Apodemus* mice, Red foxes *(Vulpes vulpes)*, an adult Beech marten *(Martes foina)*, a juvenile (probable) Pine marten *(Martes martes)*, dogs and ... people.

The poor results could have been due to various causes. One of the reasons can be that there might have been the considerable human disturbance at the camera trap locations in the core area of the National Park, which was at that time very busy with visitors. The cameras should thus perhaps have been placed in more quiet places away from the intensively used areas. Secondly, even the longest observation period of 7 days may actually have been insufficient to gain the trust and film/catch the mammals on camera. And lastly, the density of the mammals might actually have been comparatively low due to the active hunting pressure.

type camera	3M	Uway	R1	R2	BJPW	BN-04	B	B	Bushnell	R4	Moultry	R3	R5	R3	M40	R6	Uway	Moultry	Total
location	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	#
species / # days	4	5	8	8	8	8	7	7	4	7	7	2	6	4	4	4	3	2	98
Apodemus spp	##	##	3	##	##	##	##	##	##	##	##	##	##	##	##	##	##	##	3
Vulpes vulpes	##	##	##	##	##	##	##	##	3	##	##	##	##	##	##	##	##	##	3
Martes foina	##	##	##	##	##	##	##	##	##	##	##	##	##	##	##	2	##	##	2
Martes martes	##	##	##	##	##	##	##	##	##	##	##	##	##	##	##	1	##	##	1
Dog	##	##	##	##	##	##	##	##	##	##	##	##	##	##	##	2	##	##	2

Table 6: Results of the camera traps

Beech (Stone) marten (Martes foina)

A total of 37 ammal species were identified during the camp. These included 1 hedgehog, 5 shrews, 2 moles, 15 bats, 1 squirrel, 1 hare, 3 voles, 2 true mice, 1 mole-rat, 1 blind mole-rat, 4 carnivores and 1 deer. No otters were seen, despite the efforts, and of the deer the a few hoof prints were seen.

	methods					
species	**sight**	**Capture**	**find**	**bat-detector**	**tracks**	**camera trap**
Erinaceus roumanicus	x		x		x	
Sorex araneus		x	x			
Sorex minutus		x	x			
Neomys anomalus		x				
Crocidura suaveolens		x				
Talpa europaea			x		x	
Talpa caeca			x		x	
Rhinolophus hipposideros	x		x		x	
Myotis daubentonii	x	x		x		
Myotis mystacinus		x		x		
Myotis nattereri				x		
Myotis oxygnatus		x				
Pipistrellus pipistrellus				x		
Pipistrellus pygmaeus		x		x		
Pipistrellus kuhlii				x		
Pipistrellus(Hypsugo) savii				x		
Nyctalus leisleri		x		x		
Nyctalus noctula		x		x		
Barbastella barbastellus				x		
Plecotus spec.				x		
Vestpertilio murinus		x		x		
Tadarida teniotis				x		
Lepus europaeus	x		x		x	
Sciurius vulgaris	x				x	
Myodes glareolus	x	x			x	
Microtus arvalis		x				
Microtus subterraneus		x				
Apodemus sylvaticus	x	x	x		x	
Apodemus flavicollis	x	x	x		x	
Apodemus spec						x
Dryomys nitedula		x				
Glis glis	x	x				
Vulpes vulpes	x		x		x	x
Meles meles					x	
Martes martes	x					x

Martes foina	x	x		x
Cervus elaphus			x	
Nannospalax leucodon			x	

Northern white-breasted hedgehog *(Erinaceus roumanicus)*
The species was observed 5 times at night. Findings (roadkill) and hedgehog droppings were found in many places.

Common shrew *(Sorex araneus)*
One Common shrew was caught in a live trap in old-growth beech forest near the campground and one freshly-dead specimen was found in alpine grassland at about 1800m altitude.

Pygmy shrew *(Sorex minutus)*
One Pygmy shrew was caught in a live trap in old-growth beech forest near the campground and one was found dead just above the treeline at about 1700m altitude.

Miller's water shrew *(Neomys anomalus)*
One Miller's water shrew was caught in a live trap on the muddy bank of a stream next to a trout farm on the Štitarica river.

Lesser white-toothed shrew *(Crocidura suaveolens)*
One Lesser white-toothed shrew was caught in a live trap on the Tara river, 7km from the entrance to Biogradska Gora.

European mole *(Talpa europaea)*
The many molehills seen in the grasslands along the Tara river were assumed to be of *Talpa europaea*.

Northern white-breasted hedgehog (Erinaceus roumanicus)
© Ed Goosens

Blind mole *(Talpa caeca)*

One freshly-dead, uninjured specimen of *Talpa caeca* was found on an unpaved road in an alpine meadow at an altitude of some 1800m. The body was remarkably small, and later laboratory examination of the skull measurements revealed that it was indeed *Talpa caeca* (and thus not *Talpa europaea*). With the permission of the authorities in Montenegro, the skeleton was placed in the collection of Naturalis in Leiden.

BATS

A total of 10 of the 15 bat species observed were identified using bat detectors, and of these 10 species, the following 6 were only recorded using bat detectors: Natterer's bat *(Myotis nattereri),* Common pipistrelle *(Pipistrellus pipistrellus),* Kuhl's pipistrelle *(Pipistrellus kuhlii),* Savi's pipistrelle *(Pipistrellus (Hypsugo) savii),* Barbastelle *(Barbastella barabastellus),* European free-tailed bat *(Tadarida teniotis).*

Totally 16 bats of 7 species were caught using mist nets. These captures included several individuals of the Whiskered bat *(Myotis mystacinus),* Lesler's bat *(Nyctalus leisleri)* and Daubenton's bat *(Myotis daubentonii),* a new species for the bat species list of Montenegro. There were no caves in the area and the local churches were not inspected as they appeared unsuitable for roosts. Inspection of empty buildings revealed colonies and roosts of 3 species of bats including Lesser horseshoe bat *(Rhinolophus hipposideros).*

Miller's Water Shrew (Neomys anomalus) © Jan Buys

Lesser horseshoe bat *(Rhinolophus hipposideros)*
During inspection of empty buildings in the area a number of colonies of the Lesser horseshoe bat were found (confirmed with photos). A particularly large colony (and one mummified juvenile) was found in the attic of an empty house at the park entrance, and a later count at dusk (using sight and bat detectors) recorded 175 individuals, two-thirds of whom directly flew to forage above the nearby Tara river.

Whiskered bat *(Myotis mystacinus)*
A total of 3 individuals of the Whiskered bat were caught in mist nets at locations around Biogradsko Jezero (where they were also heard using bat detectors).

Daubenton's bat *(Myotis daubentonii)*
Some 10-25 individuals of a *Myotis* species were observed to forage above Biogradsko Jezero. On July 31, 2 individuals were caught, in miss nets placed near to the southwest corner of the lake, which were identified as Daubenton's bat. The 2 bats emerged from the forest, flying in the northeast direction. One of the animals was of a lactating female, indicating that the species, previously not recorded in Montenegro, also breeds in Biogradska Gora.

Natterer's bat *(Myotis nattererii)*
Analysis of bat detector recordings revealed the presence of Natterer's bat at 2 locations around Biogradkso Jezero.

Lesser mouse-eared bat *(Myotis oxygnathus)*
One individual of the Lesser mouse-eared bat was caught in a mist net. There is also one observation with a bat detector of a *Myotis myotis/oxygnathus.*

Common pipistrelle *(Pipistrellus pipistrellus)*
A total of 5 bat detector recordings (at 3 locations) were made of the Common pipistrelle.

Soprano pipistrelle *(Pipistrellus pygmeus)*
Around Biogradkso Jezero, one individual Soprano pipistrelle was caught in a mist net, and 5 bat detector recordings (at 4 locations) were made. The Soprano calls (>55 kHz) were clear while the individuals foraged for considerable periods of time.

Kuhl's pipistrelle *(Pipistrellus kuhlii)*
One bat detector recording was made of the Kuhl's pipistrelle.

Savi's pipistrelle *(Pipistrellus (Hypsugo) savii)*
One bat detector recording was made of the Savi's pipistrelle, in an alpine meadow above the forest level.

Barbastelle *(Barbastella barbastellus)*
A total of 5 bat detector recordings (at 2 locations) were made of the Barbastelle.

Leisler'sbat *(Nyctalus leisleri)*
Several foraging Leisler's bats were heard (using bat detectors) above Biogradkso Jezero and the 7 individuals were caught in mist nets. That was the most-caught species.

Common noctule *(Nyctalus noctula)*
Several individuals of the Common noctule foraging at great heights were heard (using bat detectors) around the camp location, and 1 individual was caught in a mist net.

Parti-coloured bat *(Vespertilio murinus)*
One individual Parti-coloured bat was caught in a mist net and individuals of the species were heard a couple of times using bat detectors in the area at the drinking pool for sheep on the windy, treeless alpine ridge at an altitude of 1800m.

Long-eared bat *(Plecotus spec.)*
Long-eared bats were seen and heard using bat detectors in the forest in the immediate vicinity of the campground. These are most probably Brown long-eared bats *(Plecotus auritus),* considering the local environment and altitude.

European free-tailed bat *(Tadarida teniotis)*
Individuals of the European free-tailed bat were heard at 5 locations using bat detectors, although the species can actually be heard with a naked ear.

Hare *(Lepus europaea)*
Hares were seen several times after dusk, also, droppings and a roadkill were found.

Bart Noort and Vernes Zagora with the Forest dormouse © David de Wit

Red squirrel *(Sciurius vulgaris)*
Red squirrels, generally not red in Montenegro, were frequently observed, recorded 3 times, and many squirrel-gnawed pine cones were found.

Bank vole *(Myodus glareolus)*
Bank voles were frequently seen during daylight hours around the campground. This is probably because the camp was near the habitat they preferred most since 33 of the 37 Bank voles were caught on location A – the old-grown beech forest near the campground. Checking the fox droppings, confirmed also the importance of the Bank vole as a food resource.

Common vole *(Microtus arvalis)*
Totally 6 captures of Common voles at 2 locations were made.

Common pine vole *(Microtus subterraneus)*
Only 2 captures of Common pine vole were made on location E - the alpine meadow at an altitude of 1800masl.

Wood mouse *(Apodemus sylvaticus)* and Yellow-necked wood mouse *(Apodemus flavicollis)*
Live trap captures of small mammals were overwhelmingly dominated by *Apodemus* mice – the Wood mouse and the larger Yellow-necked wood mouse. In one case, two individuals were caught together in a single live trap in the Visitor's Centre. Distinguishing the subadults reliably to species level was somewhat tricky. Captures at 6 locations included 49 *A.sylvaticus*, 316 *A.flavicollis* and 52 as *Apodemus* species. The Yellow-necked wood mouse seems to enjoy climbing since 4 were caught in Sherman live traps placed in the trees. Two individuals were caught in one live trap in the campground building. These mice were further seen in the camera traps and their live presence remains were found in fox droppings around Biogradsko Jezero.

Yellow-necked mouse (Apodemus flavicollis) © *Kees Mostert*

Forest dormouse *(Dryomys nitedula)*

One Forest dormouse *(Dryomys nitedula)* was caught in a Longworth/Heslinga live trap, intended for voles and mice and placed on the ground in a thicket of Mountain pine *(Pinus mugo)* at an altitude of 1940masl.

Edible dormouse *(Glis glis)*

The Edible dormouse *(Glis glis)*, frequently seen and heard at night, was evidently very common in the area. The species was caught 16 times in Sherman tree traps and observed 6 times.

Lesser mole rat *(Nannospalax leucodon)*

The large numbers of 'Spalax' mole hills seen in the alpine meadows above the forest level indicated that the Lesser mole rat *(Nannospalax leucodon)* was common in Biogradska Gora. The species was recorded on 3 locations high in the mountains.

Red fox *(Vulpes vulpes)*

Foxes and their traces (droppings, footprints and scent marks) were frequently seen around the campground, elsewhere in the park and on local roads (as roadkill), and in the photo-camera traps records too. We have 12 records of the species and it should be considered as wide spread.

Forest Dormouse
(Dryomys nitedula)
© Jan Buys

Pine marten *(Martes martes)*

A juvenile marten caught in camera recordings was tentatively identified as a Pine marten *(Martes martes)*. Scats assumed to be from Pine marten were also found in various locations.

Beech (Stone) marten *(Martes foina)*

The Beech marten *(Martes foina)* was registered 4 times - 2 sightings, 1 camera recordings, and a single excrement identified as being of this species.

Badger *(Meles meles)*

Prints and other traces of Badger *(Meles meles)* were found at Longworth-Heslinga livetrap location C.

Red deer *(Cervus elaphus)*

Footprints of Red deer *(Cervus elaphus)* were found in the mud around Biogradsko Jezero some 3km from the campground.

Landschape in the Biogradska Gora National Park © Kess Mostert

Besides the mammals, which were the focus of the camp, hundreds of observations of other species were collected. All records are submitted to OBSERVADO biodiversity open data base.

Birds

A total of 76 species of birds were observed during the summer camp, mostly in the lower regions of the park. The old-growth beech forest in the immediate vicinity of the campground was inhabited by the typical forest bird species, including a few unusual species such as Three-toed woodpecker *(Picoides tridactylus)* and more prominent species such as White-backed woodpecker *(Dendrocopos leucotos),* Black woodpecker *(Dryocopus martius)*, Lesser spotted woodpecker *(Dryobates minor)*, Wood warbler *(Phylloscopus sibilatrix)*, Eurasian bullfinch *(Pyrrhula pyrrhula),* Marsh tit *(Poecile palustris)* and European nuthatch *(Sitta europaea)* (the latter in a very high population density). At night, Tawny owl *(Strix aluco)* were frequently heard.

Waterbirds seen on Biograsko Jezero were limited to Little grebe *(Tachybaptus ruficollis)*, Mallard *(Anas platyrhynchos)* and Grey heron *(Adrea cinerea)*. At night, Common sandpiper *(Actitis hypoleucos)* were frequently heard flying overhead. Along streams, many Dippers *(Cinclus cinclus*) and Grey wagtail *(Motacilla cinerea*) were seen.

In the alpine meadows, species such as Skylark *(Alauda arvensis)*, Water pipit *(Anthus spinoletta)*, Northern wheatear *(Oenanthe oenanthe)*, Whinchat *(Saxicola rubetra)*, Rock bunting *(Emberiza cia)* and Yellow hammer *(Emberiza citronella)* were seen. Common quail *(Coturnix coturnix)* and Grey partridge *(Perdix perdix)* were heard.

Whinchat (Saxicola rubetra), *juv. © Kess Mostert*

In the alpine zone, thickets of (dwarf) pine supported Nutcracker *(Nucifraga caryocatactes),* Ring ouzel *(Turdus torquatus),* Goldcrest *(Regulus regulus),* Coal tit *(Parus ater)* and Common crossbill *(Loxia curvirostra)*. The rare Western capercaillie *(Tetrao urogallus)* was not seen. On scree slopes and granite boulders, Crag martin *(Ptyonoprogne rupestris),* Black redstart *(Phoenicurus ochruros)*, Raven *(Corvus corax)* and groups of Yellow-billed chough *(Pyrrhocorax graculus)* were frequently seen.
Raptors were rare and restricted to Common buzzard *(Buteo buteo),* Honey buzzard *(Pernis appivorus),* Eurasian sparrow-hawk *(Accipiter nisus)*, Eurasian hobby *(Falco subbuteo)* and Common kestrel *(Falco tinunculus).*
To the west of the Park in an extensive small-scale agricultural region, species such Red-backed shrike *(Lanius collurio)* and European serin *(Serinus serinus)* were common.

Biogradska Gora and surroundings

Scientific name	English name	Dutch name
Tachybaptus ruficollis	Little grebe	dodaars
Ciconia ciconia	White stork	ooievaar
Adrea cinerea	Grey heron	blauwe reiger
Anas platyrhynchos	Mallard	wilde eend
Buteo buteo	Common buzzard	buizerd
Pernis apivrous	Honey buzzard	wespendief
Acciptter nisus	Eurasian sparrow-hawk	sperwer
Falco tinnunculus	Common kestrel	torenvalk
Falco subbuteo	Eurasian hobby	boomvalk
Coturnix coturnix	Common quail	kwartel
Perdix perdix	Grey partridge	patrijs
Actitis hypoleocus	Common sandpiper	oeverloper
Columba oenas	Wood pigeon	houtduif
Columba livia	Rock dove	rotsduif/tamme duif
Cuculus canorus	Common cuckoo	koekoek
Strix aluco	Tawny owl	bosuil
Picus viridis	European green woodpecker	groene specht
Dendrocopos major	Great spotted woodpecker	grote bonte specht
Dendrocopos minor	Lesser spotted woodpecker	kleine bonte specht
Dendrocopos leucotos	White-backed woodpecker	witrugspecht
Picoides tridactylus	Three-toed woodpecker	drieteenspecht
Dryocopus martius	Black woodpecker	zwarte specht
Alcedo atthis	Common kingfisher	ijsvogel
Upupa epops	Hoopoe	hop
Lullula arborea	Woodlark	boomleeuwerik
Alauda arvensis	Skylark	veldleeuwerik
Anthus spinoletta	Water pipit	waterpieper
Anthus trivalis	Tree pipit	boompieper
Motacilla alba	White wagtail	witte kwikstaart
Motacilla cinerea	Grey wagtail	grote gele kwikstaart

Hirundo rustica	Eurasian swallow	boerenzwaluw
Delichon urbica	House martin	huiszwaluw
Hirundo daurica	Red-rumped swallow	roodstuizwaluw
Ptyonoprogne rupestris	Crag martin	rotszwaluw
Cinclus cinclus	Dipper	waterspreeuw
Troglodytes troglodytes	Wren	winterkoning
Prunella modularis	Dunnock	heggemus
Erithacus rubecula	European robin	roodborst
Oenanthe oenanthe	Northern wheatear	tapuit
Saxicola rubetra	Whinchat	paapje
Saxicola rubicola	European stonechat	roodborsttapuit
Phoenicurus ochruros	Black redstart	zwarte roodstaart
Turdus merula	Common blackbird	merel
Turdus torquatus	Ring ouzel	beflijster
Turdus philomelos	Song thrush	zanglijster
Turdus viscivorus	Mistle thrush	grote lijster
Sylvia atricapilla	Blackcap	zwartkop
Phylloscopus collybita	Common chiffchaff	tjiftjaf
Phylloscopus sibilatrix	Wood warbler	fluiter
Regulus regulus	Goldcrest	goudhaantje
Parus palustris	Marsh tit	glanskop
Parus montanus	Willow tit	matkop
Aegithalos caudatus	Long-tailed tit	staartmees
Parus caeruleus	Blue tit	pimpelmees
Parus major	Great tit	koolmees
Parus ater	Coal tit	zwarte mees
Sitta europaea	European nuthatch	boomklever
Certhia brachydactyla	Treecreeper	boomkruiper
Lanius collurio	Red-backed shrike	grauwe klauwier
Corvus cornix	Carrion crow	bonte kraai
Garrulus glandarius	Jay	gaai
Nucifraga caryocatactes	Nutcracker	notenkraker
Corvus corax	Common raven	raaf
Pyrrhocorax graculus	Yellow-billed chough	alpenkauw
Passer domesticus	House sparrow	huismus
Passer montanus	Eurasian tree sparrow	ringmus
Fringilla coelebs	Chaffinch	vink
Pyrrhula pyrrhula	Eurasian bullfinch	goudvink
Serinus serinus	European serin	Europese kanarie
Carduelis carduelis	European goldfinch	putter
Carduelis flavirostris	Eurasian twite	kneu
Carduelis spinus	Siskin	sijs
Coccothraustes coccothraustes	Hawfinch	appelvink
Loxia curviostra	Common crossbill	kruisbek
Emberiza cia	Rock bunting	grijze gors

Amphibians and reptiles

A total of 8 amphibian and 9 reptile species were observed.
Yellow-bellied toads *(Bombina variegata)* were widely seen in pools, streams and even water-filled ruts on unsealed roads. Very large individuals of Common toad *(Bufo bufo)* were regularly seen at night on the campground. Many larvae of Smooth newt *(Lissotriton vulgaris),* Alpine newt *(Ichthyosaura alpestris)* and Fire salamander *(Salamandra salamandra)* were seen in small pools.

Sand lizard *(Lacerta agilis)* and European green lizard *(Lacerta viridis)* were locally seen. Slow worm *(Anguis fragilis)* was widespread and one European Glass Lizard (*Pseudopus apodus)* was seen. The Common wall lizard *(Podarcis muralis),* one of which was recorded as bycatch in a live trap, was the only widespread reptile species in the alpine zone. Grass snake *(Natrix natrix)* and Dice snake *(Natrix tessellata)* were seen around Biogradsko Jezero. Long-nosed viper *(Vipera ammodytes)* was seen on the rocky slopes and along the river Tara.

Yellow-bellied toad (Bombina variegata) *© Kess Mostert*

Amphibians

Scientific name	English name	Dutch name
Lissotriton vulgaris	Smooth newt	kleine watersalamander
Triturus karelinii	Southern crested newt	balkankamsalamander
Mesotriton alpestris	Alpine newt	alpenwatersalamander
Salamandra salamandra	Fire salamander	vuursalamander
Bombina variegata	Yellow-bellied toad	geelbuikvuurpad
Bufo bufo	Common toad	gewone pad
Rana temporaria	Common frog	bruine kikker
Hyla arborea	European tree frog	boomkikker

Reptiles

Pseudopus apodus	European Glass Lizard	Europese glasslang
Anguis fragilis	Slow worm	hazelworm
Lacerta agilis	Sand lizard	zandhagedis
Lacerta viridis	Green lizard	oostelijke smaragdhagedis
Podarcis muralis	Common wall lizard	muurhagedis
Natrix natrix	Grass snake	ringslang
Natrix tessellata	Dice snake	dobbelsteenslang
Viperia ammodytes	Long-nosed viper	zandadder
Testudo h. boettgeri	Eastern Hermann's tortoise	Griekse landschildpad

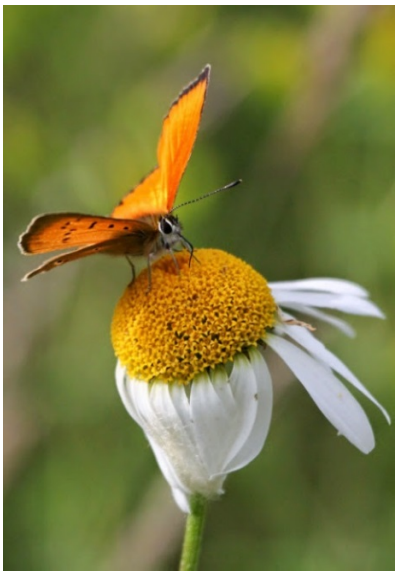
Long-nosed viper (Vipera ammodytes) © *David de Wit*

Butterflies

The 48 butterfly species identified included 7 blue and 8 fritillary species, that were able to be identified to species level (as checked from photos, there may have been more). The Apollo *(Parnassius apollo)* was remarkably common. Prominent species included Large copper *(Lycaena dispar)*, Cardinal *(Argynnis pandora)*, Eastern large heath *(Coenonimpha rhodopensis)* and Eastern rock grayling *(Hypparchia syriaca)*. In the lower regions, the more diverse spectrum included Scarce swallowtail *(Iphichlides podarlirius)*, Silver-washed fritillary *(Argynnis paphia)* and Spotted fritillary *(Melitaea* dydima*)*.

Purple-shot Copper (Lycaena alciphron) © Kess Mostert

High brown fritillary (Argynnis adippe) © Kess Mostert



Scarce Copper (Lycaena virgaurae) © Kess Mostert

Butterflies		
Scientific name	English name	Dutch name
Papilio machaon	Swallowtail	koninginnepage
Piphiclides podulirius	Scarce swallowtail	koningspage
Parnassius apollo	Apollo	apollovlinder
Pieris rapae	Small white	klein koolwitje
Pieris brassicae	Large white	groot koolwitje
Leptidea sinapis	Wood white	boswitje
Colias croceus	Clouded yellow	oranje luzernevlinder
Gonepteryx rhamni	Brimstone	citroenvlinder
Lycaena dispar	Large copper	grote vuurvlinder
Lycaena phlaeas	Scarce copper	morgenrood
Lycaena tityrus	Scooty copper	bruine vuurvlinder
Lycaena alciphron	Purple-shot copper	violette vuurvlinder
Cupido osiris	Osiris blue	zuidelijk dwergblauwtje
Polyommatus amandus	Large blue	wikkeblauwtje
Polyommatus thersites	Chapman's blue	esparcetteblauwtje
Polyommatus coridon	Chalk-hill blue	bleek blauwtje
Polyommatus icarus	Common blue	icarusblauwtje
Polyommatus bellargus	Adonis blue	adonisblauwtje
Aricia agestis	Brown argus	bruin blauwtje
Brenthis daphne	Marbled fritillary	braamparelmoervlinder
Argynnis aglaja	Dark green fritillary	grote parelmoervlinder
Argynnis adippe	High brown fritillary	adippevlinder
Issoria lathonia	Queen	kleine parelmoervlinder
Argynnis paphia	Silver-washed fritillary	keizersmantel
Argynnis pandora	Cardinal	kardinaalsmantel
Melitaea didyma	Spotted fritillary	tweekleurige parelmoervlinder
Melitaea athalia	Heath fritillary	bosparelmoervlinder
Limenitis camilla	White admiral	kleine ijsvogelvlinder
Vanessa atalanta	Red admiral	atalanta
Vanessa cardui	Painted lady	distelvinder
Aglais urticae	Small tortoiseshell	kleine vos
Nymphalis polychloros	Large tortoiseshell	grote vos
Inachis io	Peacock	dagpauwoog
Polygonia c-album	Comma	gehakkelde aurelia
Melanargia galathea	Marbled white	dambordje
Erebia pandrose	Dewy ringlet	gewone dauwerebia
Hipparchia syriaca	Eastern rock grayling	balkanboswachter
Lasiommata maera	Large wall brown	rotsvlinder
Maniola jurtina	Meadow brown	bruine zandoog
Pararge aegeria	Speckled wood	bont zandoogje
Coenonympha pampilus	Small heath	hooibeestje
Coenonympha arcania	Pearly heath	tweekleurig hooibeestje
Coenonympha glyceron	Chestnut heath	roodstreephooibeestje
Coenonympha rhodopensis	Eastern large heath	balkanhooibeestje
Thymelicus lineola	Essex skipper	zwartsprietdikkopje
Hesperia comma	Silver-spotted skipper	kommavlinder
Ochlodes venata	Large grizzled skipper	groot dikkopje

Dragonflies and damselflies

A total of 11 dragonfly and damselfly species were observed. Most, including Blue hawker *(Aeshna cyanea)*, Beautiful demoiselle *(Calopteryx virgo)*, Banded demoiselle *(Calopteryx splendens)*, Common bluet *(Enallagma cyathigerum)* and Balkan emerald *(Somatochlora meridionalis),* were seen above or near Biogradsko Jezero. The species that were seen in the semi-open forest, where sunlight partially penetrated, included Large Red damselfly *(Pyrrhosoma nymphula)*, Migrant hawker *(Aeshna mixta)* and Broad-bodied chaser *(Libellula depressa),* and above small alpine ponds, species such as Robust Spreadwing (*Lestes dryas)* were observed.

Dragonflies and damselflies

Scientific name	English name	Dutch name
Calopteryx virgo	Beautiful demoiselle	bosbeekjuffer
Calopteryx splendens	Banded demoiselle	weidebeekjuffer
Lestes dryas	Robust spreadwing	tangpantserjuffer
Enallagma cyathigerum	Common bluet	watersnuffel
Pyrrhosoma nymphula	Large red damselfly	vuurjuffer
Anax imperator	Emperor dragonfly	grote keizerlibel
Aeshnea cyanea	Blue hawker	blauwe glazenmaker
Aeshnea mixta	Migrant hawker	paardenbijter
Libellula depressa	Broad-bodied chaser	platbuik
Sympetrum fonscolombii	Red-veined darter	zwervende heidelibel
Somatochlora meridionalis	Balkan emerald	zuidelijke glanslibel

Common Spreadwing (Lestes dryas) © *Jan Buys*

Grasshoppers and Crickets

A few species of grasshoppers and crickets that were incidentally recorded.

Grasshoppers and crickets		
Scientific name	**English name**	**Dutch name**
Decticus verrucivorus	Wart-biter	wrattenbijter
Gryllus bimaculatus	Southern field-cricket	zuidelijke veldkrekel
Oedipoda caeruescens	Blue-winged grasshopper	blauwvleugelsprinkhaan
Tettigonia viridissima	Great green bush-cricket	grote groene sabelsprinkhaan
Metrioptera roeselii	Roesel's bush-cricket	greppelsprinkhaan
Ephippiger ephippiger	Saddle-backed bush-cricket	zadelsprinkhaan
Omocestus viridulus	Common green grasshopper	wekkertje
Chorthippus parallelus	Meadow grasshopper	krasser
Chorthippus bigutullus	Bow-winged grasshopper	ratelaar
Philodoptera griseoaptera	Dark bush-cricket	bramensprinkhaan
Polysarcus denticauda	Large saw-tailed bush-cricket	dikbuiksprinkhaan
Psorodonotus fieberi	(a bush-cricket)	(een sabelsprinkhaan)

Saddle-backed Bush-cricket (Ephippiger ephippiger) #© *Lily Vercruijsse*

The list of moths identified were those attracted to the lights above the doors and in the paths at the campground. No special lamp for moth was used, so the list of moths is short.

Moths		
Scientific name	**English name**	**Dutch name**
Phalera bucephala	Buff-tip	Wapendrager
Arctia caja	Garden Tiger	Grote beer
Eilema lurideola	Common Footman	Plat beertje
Lithosia quadra	Four-spotted Footman	Viervlakvlinder
Miltochrista miniata	Rosy Footman	Rozenblaadje
Malacosoma neustria	The Lackey	Ringelrups
Dysauxes ancilla	The Handmaid	Dinares
Alcis repandata	Mottled Beauty	Variabele spikkelspanner
Campaea marginata	Light Emerald	Appeltak
Paradarisa consonaria	Square Spot	Vierkantspikkelspanner
Ectropis crepuscularia	Small Engrailed	Gewone spikkelspanner
Aplocera plagiata	Treble-bar	Streepblokspanner
Idaea aversata	Riband Wave	Grijze stipspanner
Colostygia olivata	Beech-green Carpet	Groene bergspanner
Triphosa dubitata	The Tissue	Grote boomspanner
Idaea trigeminata	Treble Brown Spot	Zuidelijke stipspanner
Horisme tersata	The Fern	Egale bosrankspanner
Colocasia coryli	Nut-tree Tussock	Hazelaaruil
Lymantria monacha	Black Arches	Nonvlinder
Noctua fimbriata	Broad-bordered Yellow Underwing	Breedbandhuismoeder
Leucania loreyi	The Cosmopolitan	Kosmopoliet
Drymonia obliterata	Indistinct Marbled Brown	beukentandvlinder
Evergestis limbata	Dark Bordered Pearl	gezoomde valkmot
Eudonia mercurella	Small Grey	Variabele granietmot
Udea prunalis	Dusky Pearl	Grijze kruidenmot
Evergestis forficalis	Garden Pebble	Lijnvalkmot
Pyralis farinalis	Meal Moth	Grote meelmot
Synaphe punctalis	Long-legged Tabby	Pinokkiomot
Catoptria pinella	Pearl Grass-veneer	Egale vlakjesmot
Endotricha flammealis	Rosy Tabby	Strooiselmot

There are about 2000 vascular plants identified in Biogradska Gora National Park. Here is a small selection of the plants we came across.

Endemic plants

Scientific name	English name	Dutch name
Acanthus balcanicus	Bear's breeches	(een) acanthus
Acer heldreichii	Balkan maple	balkanesdoorn
Scorzonera purpurea	Rose-flowered salsify	rose schorseneer

Plants, from the alpine meadows above 1800m

Scientific name	English name	Dutch name
Antenaria dioica	Mountain everlasting	rozenkransje
Gentiana utriculosa	Bladder gentian	blaasgentiaan
Gentiana punctate	Spotted gentian	gespikkelde gentiaan
Gentiana lutea	Great yellow gentian	gele gentiaan
Gentiana crispata	-	-
Campanula cervicaria	Bristly bellflower	-
Bupleurum falcatum	Sickle hare's ear	sikkelgoudscherm
Carduus defloratus	Alpine thistle	bergdistel
Carex atrata atrata	Black alpine sedge	zwarte alpenzegge
Dianthus carthusianorum	Clusterhead pink	karthuizer anjer
Dianthus deltoides	Maiden pink	steenanjer
Dianthus nitidus	Carpathian glossy pink	anjer
Jasione montana	Sheep's bit scabious	zandblauwtje
Knautia dipsacifolia	Wood scabious	bergknautia
Juniperinus communis nana	Common juniper	jeneverbes
Viola calcarata	Spurred violet	langsporig viooltje
Anemone narcissiflora	Narcissus-flowered anemone	(een) anemoon
Scleranthus perennis	Perennial knawel	overblijvende hardbloem
Hypericum maculatum	Spotted St John's wort	gevlekt hertshooi
Rosa pendulina	Mountain rose	-
Helianthemum nummularium	Common rock rose	geel zonneroosje
Nardus stricta	Matgrass	borstelgras
Veratrum album	False helleborin	witte nieswortel
Campanula glomerata	Clustered bellflower	kluwenklokje
Teucrium chamaedrys	Wall germander	echte gamander
Trifolium alexandrinum	Egyptian clover	Alexandrijnse klaver
Trifolium alpestre	Alpine clover	alpenklaver
Trifolium aureum	Large hop	trefoil akkerklaver
Trifolium badeum	Brown clover	bruine alpenklaver
Centaurea valesiaca	-	(een) knoopkruid
Cirsium eriophorum	Woolly thistle	wollige distel
Hieracium pilosella	Mouse-ear hawkweed	gewone muizenoor
Linum capitatum	-	-

Plants from the grasslands below 1800m

Scientific name	English name	Dutch name
Cichorum intybus	Common chicory	cichorei
Onobrychis viciifolia	Sainfoin	esparcette
Prunella laciniata	Cutleaf self-heal	witte brunel
Tragopogon pratensis	Meadow salsify	gele morgenster
Clinopodium vulgare	Wild basil proper	borstelkrans
Heracleum sphondylium	Hogweed	gewone berenklauw
Allium carinatum	Keeled garlic	berglook
Allium pulchellum elegans	Keeled garlic	berglook
Origanum vulgare	Oregano	marjolein
Stachys officinalis	Betony	betonie
Campanula patula	Spreading bellflower	weideklokje
Chamaecytisus supinus	Big-flower broom	-
Melampyrum nemorosum	Cow wheat	zwartkoren
Hypericum perforatum	St John's wort	sint-janskruid

Great yellow gentian (Gentiana lutea) © Jan Buys

Plants from the alpine marshland fed by springs		
Scientific name	**English name**	**Dutch name**
Eriophorum angustifolium	Common cottongrass	veenpluis
Epilobium palustre	Marsh willowherb	moerasbasterdwederik
Caltha palustris	Marsh marigold	dotterbloem
Parnassia palustris	Marsh grass-of-parnassus	parnassia
Dactylorhiza maculata	Heath spotted orchid	gevlekte orchis
Dactylorhiza saccifera	Sack-carrying Dactylorhiza	(een) handekenskruid

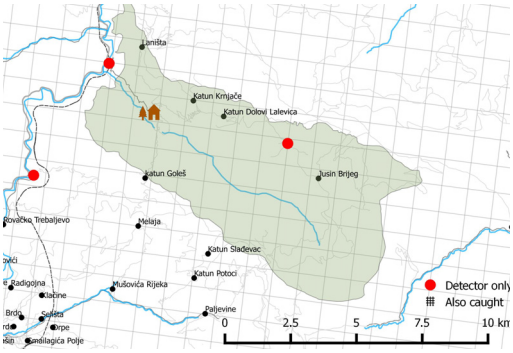
Plants in the forests		
Scientific name	**English name**	**Dutch name**
Cicerbita plumieri	Blue sow thistles	franse alpenmelksla
Digitalis lutea	Foxglove	geel vingerhoedskruid
Inula helenium	Horse-heal	griekse alant
Calamintha grandiflora	Large-flowered calamint	grote steentijm
Veronica urticifolia	Nettle leaf speedwell	netelereprijs
Achillea distans	Tall yarrow	(een) duizendblad
Cardamine impatiens	Narrow-leaved bittercress	springzaadveldkers
Hordelymus europaeus	Wood barley	bosgerst
Melampyrum sylvaticum	Small cow-wheat	boszwartkoren
Senecio ovatus	Wood ragwort	schaduwkruiskruid
Solidago virgaurea minuta	European goldenrod	echte guldenroede
Euphorbia amygdaloides	Wood spurge	amandelwolfsmelk
Campanula latifolia	Giant bellflower	breed klokje
Galium sylvaticum	Scotch mist	boswalstro
Prenanthes purpurea	Rattlesnake root	-
Scutellaria altissima	Somerset skullcap	groot glidkruid
Astrantia major	Great masterwort	zeeuws knoopje

Martagon lily (Lilium Martagon) © *Jan Buys*

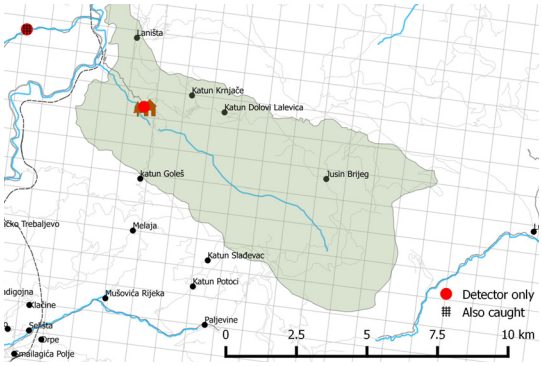
Scientific name	English name	Dutch name
Achillea nobilis	Noble yarrow	(een) duizendblad
Dipsacus laciniatus	Cutleaf teasel	slipbladkaardebol
Cicerbita alpina	Alpine sow-thistle	(een) cicerbita
Sambucus ebulus	Danewort	kruidvlier
Aconitum variegatum	Monkshood	monnikskap
Rumex alpinus	Monk's-rhubarb	-
Anthemis carpatica	Snow carpet	schubkamille
Erigeron annuus	Annual fleabane	zomerfijnstraal
Cnidium silaifolium	-	schermbloemige
Carlina acaulis nana	Stemless carline thistle	-
Linaria angustissima	Narrow leaved toadflax	-
Petasites hybridus	Butterbur	groot hoefblad
Salvia verticillata	Purple rain	kranssalie
Cornus mas	Cornelian cherry	gele kornoelje
Gnaphalium sylvaticum	Wood cudweed	bosdroogbloem
Salvia glutinosa	Glutinous sage	kleverige salie

Yellow Foxglove
(Digitalis ambigua)
©Kees Mostert

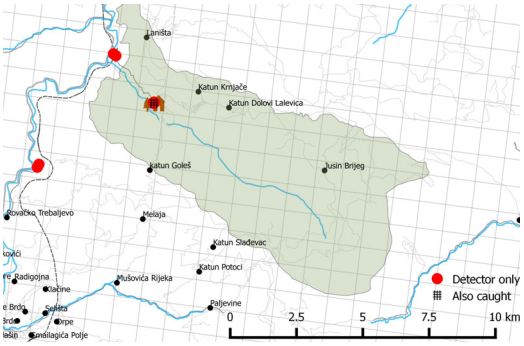
Maps



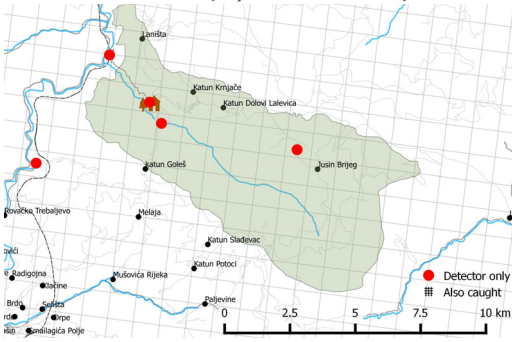
Common pipistrelle (Pipistellus pipistrellus)



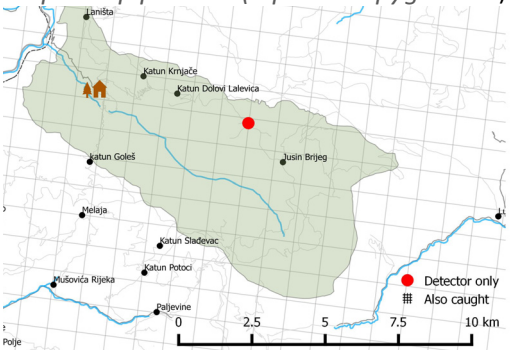
Leisler's noctule (Nyctalus leisleri)



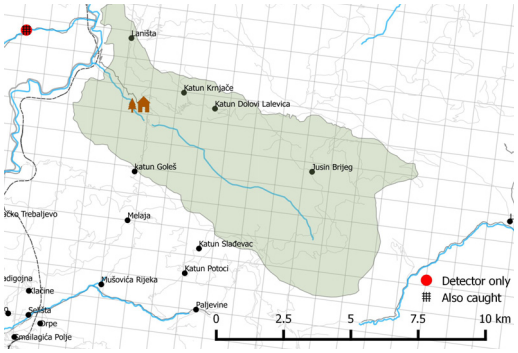
Soprano pipistrelle (Pipistellus pygmaeus)



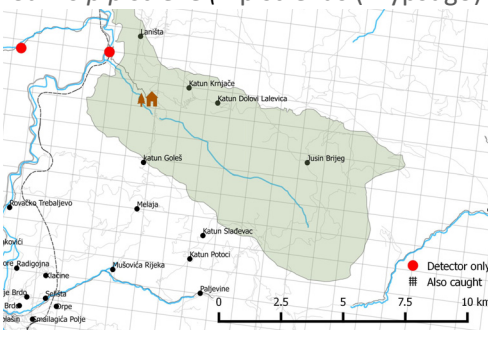
Kuhl's pipistrelle (Pipistrelus kuhlii)



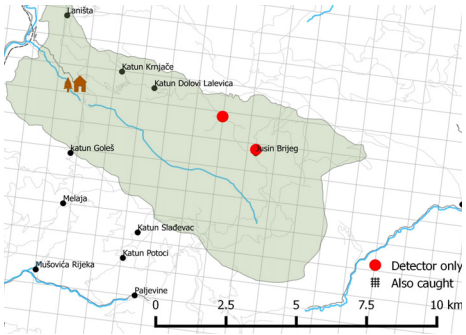
*Savi's pipistrelle (*Pipistrellus (Hypsugo) savii)



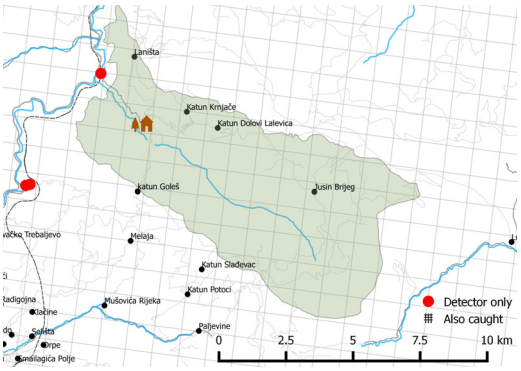
Lesser mouse-eared bat (*Myotis oxygnathus)*



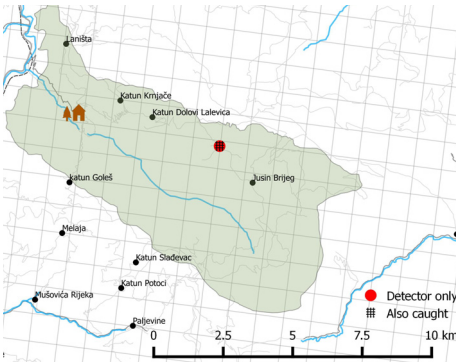
Lesser horseshoe bat (Rhinolophus hipposideros)



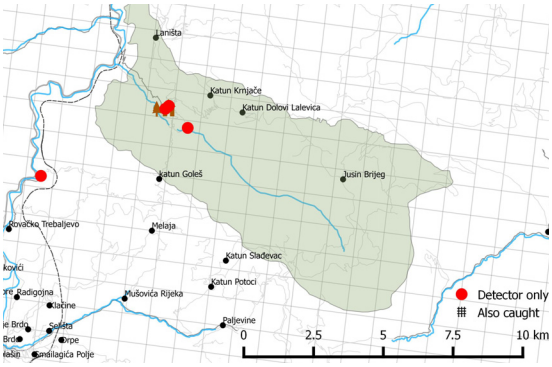
European free-tailed bat (Tadarida teniotis)



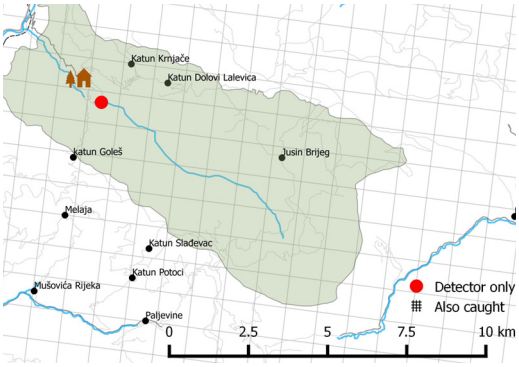
Naterrer's bat (Myotis nattereri)



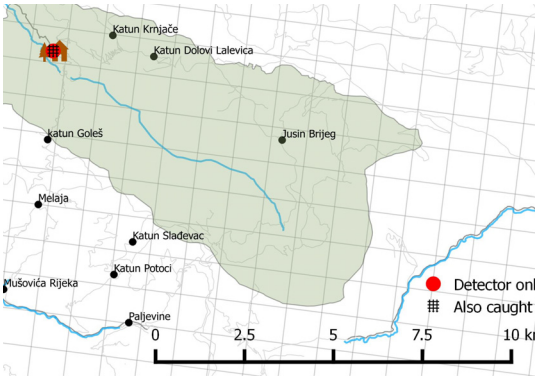
Parti-colloured bat (Vespertilo murinus)



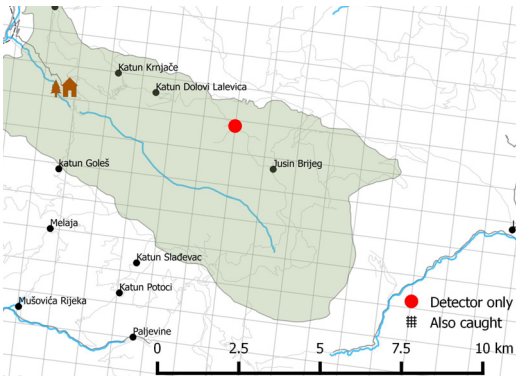
smaller Myotis spec.



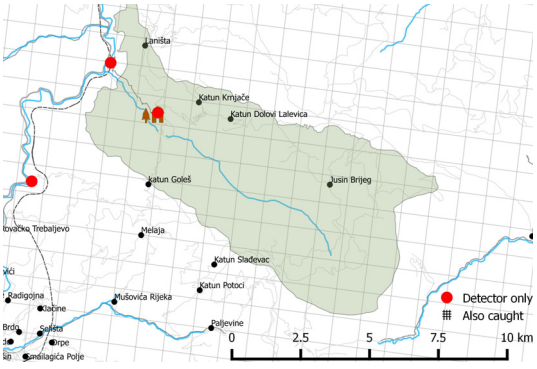
Myotis spec.



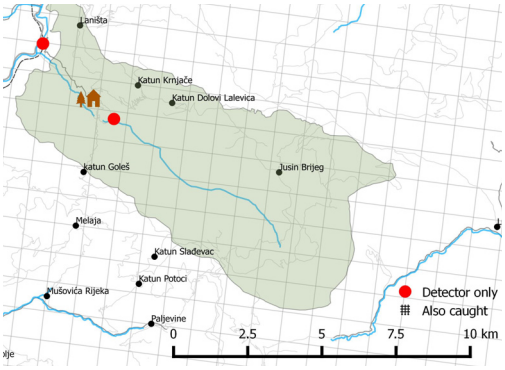
Daubenton's bat (Myotis daubentonii)



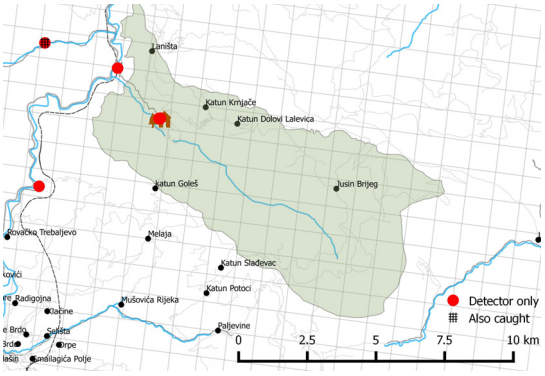
Pipistrellus spec



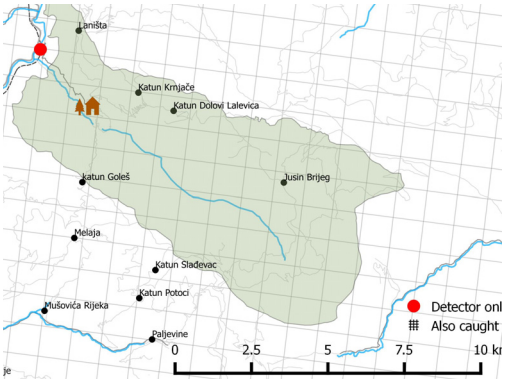
Myotis daubentonii or capaccini



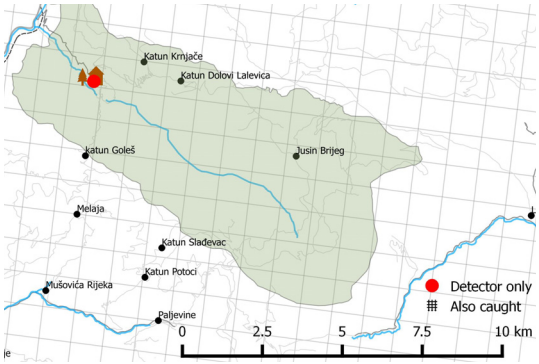
Barbastella (Barbastella barbastellus)



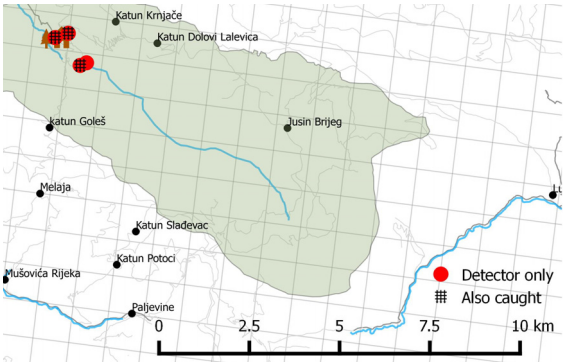
Noctule (Nyctalus noctula)



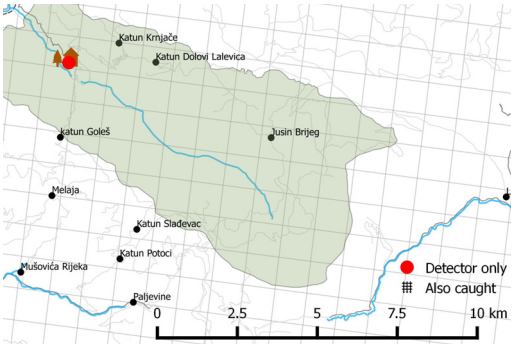
Nyctalus noctula/lasiopterus



Pipistrelus kuhlii/nathusii



Whiskered bat (Myotis mystacinus)



Myotis mystacinus or brandtii

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