



# **Strengthening the support and scientific evidence for conservation of "Europe's Amazon" through monitoring of bats as bioindicators and involvement of community**



Detailed report August 2011-August 2012

Author

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## Executive summary

Croatian rivers Mura and Drava represent some of the last river ecosystems in Europe that kept their natural dynamics and flow along with a variety of habitats that the river ecosystems support (river islands, oxbows, gravel and sand shores, floodplain forests and grasslands). As such, they became a part of Regional Park Mura-Drava and UNESCO transboundary Mura-Drava-Danube Biosphere Reserve (between Austria, Slovenia, Hungary, Croatia and Serbia) and the region is popularly called Europe's Amazon. Besides being an important harbour of biodiversity it also provides water, fish and timber to the local community. Due to a large number of current pressures (hydropower dams, illegal gravel digging, poaching and channelling of water) it is important to provide scientific evidence for conservation along with the education and support from the local community. In order to achieve this, we chose bats as our target group of bioindicators whose monitoring could imply a bigger environmental change in the entire ecosystem. Bats are thought to be a good bioindicator group because they reflect changes in invertebrate communities they feed upon, accumulate high levels of toxins from the environment, reflect climatic changes due to their specific microclimatic preferences and indirectly show quality of water and health of forests. However, due to scarce and unsystematic data on bats in the region, it was necessary to investigate first the bat community structure and locate sites with the highest benefit to future monitoring scheme. In this respect we surveyed thirteen sites in total, containing fifteen bat species making this more than a third of bat species in Croatia. Seven sites could be included in monitoring of the area along with eight church objects that have bats as their inhabitants. In order to produce a repeatable and standard method, we adjusted the procedure for echolocation transects used in Slovenia to our study sites. Research results are in preparation for responsible governmental bodies (Ministry of Environmental and Nature Protection and State Institute for Nature Conservation) that will help in filling in data in Natura 2000 Network on a national level. For a long-term impact in the region the most important was education and support of the local people and during the course of the project we held five lectures in the region that also served as a call for establishment of a volunteer network for future monitoring. This part of the project provided a starting point for intensive promotion and motivation of local community members that should be done in order for their active participation in monitoring scheme.

**Research team members:**

Marina Kipson, Charles University in Prague

Petra Žvorc, Croatian Biospeleological Society

Darija Josić, teacher of Biology and Chemistry

Željka Drdar, Tragus NGO for bat conservation

Jasna Medvedović, IMP - Research Institute of Molecular Pathology, Vienna

Marija Martinko, BSc in Biology

Sanja Jasek, student at Biology Faculty in Zagreb

Martin Šalek, Institute of Vertebrate Biology, Academy of Sciences of the Czech Republic

**Project was supported by the following organizations/institutions:**

- Međimurska Priroda
- Sv. Martin na Muri elementary school
- Mursko Središće elementary school
- Nedelišće elementary school
- Mountaineering club Bundeck
- Mountaineering club Extrem
- State Institute for Nature Conservation
- Baobab, NGO
- Croatian Biospeleological Society, NGO
- Association of fishermen of the Koprivničko-križevačka County

**Local community members that participated in the research are:**

Sara Janković, Ivana Turk, Zlatko Mihocek, Lana Đud, Janja Horvat, Borislav Šaulić

## ➤ Fieldwork research and results

The study area comprised two north-western Counties of the Regional Park Mura-Drava (Međimurje County and Koprivničko-križevačka County). Fieldwork research was conducted in summer months when bats are active: August and September of 2011, and June, July and August of 2012. For the purposes of determining the bat community structure we caught bats with mist nets, recorded echolocation calls on pre-determined transects and examined potential roost sites (church attics and towers). At the beginning and end of each surveyed night we recorded temperature and humidity in the air. In total, we examined thirteen sites, mainly situated in thick and dense floodplain forests, that were in the vicinity of rivers and that were accessible for the purposes of future monitoring. According to the research results, we propose seven of these sites to be included in the future monitoring scheme (Fig 1, Table 1).



Figure 1. Researched sites; blue marks present sites which were surveyed in order to provide baseline data for monitoring programme; white marks are church objects we checked in search for the roosts

Table 1. Sites that are proposed for monitoring programme by recording of echolocation

| Site                        | Latitude | Longitude | Fieldwork period                                    | Habitat type                                    |
|-----------------------------|----------|-----------|---|---|
| <i>Križovec</i>             | 46,49762 | 16,49391  | September 2011, June 2012, August 2012              | Floodplain forest along Mura                    |
| <i>Dekanovec</i>            | 46,46582 | 16,61437  | August 2011, June 2012                              | Floodplain forest along Mura                    |
| <i>Mikuličev most</i>       | 46,30744 | 16,85421  | August 2011   | Floodplain forest along Drava                   |
| <i>Čambina</i>              | 46,12250 | 17,16484  | August 2011, September 2011, June 2012, August 2012 | Oxbows and oak forest                           |
| <i>Otok kod Preloga</i>     | 46,32423 | 16,58624  | June 2012   | Oxbows and mixed forest (deciduous and conifer) |
| <i>Rukavac kod Šoderice</i> | 46,25728 | 16,91854  | June 2012   | Mosaic of floodplain forest, oxbows and fields  |
| <i>Otočka</i>               | 46,20443 | 16,99945  | July 2012   | Mosaic of floodplain forest, oxbows and fields  |

Photos of the sites:



Križovec, Photo by J. Medvedović



Dekanovec, Photo by M.Kipson





Čambina, Photo by J.Medvedović



Rukavac kod Šoderice, Photo by P.Žvorc



Otočka, Photo by P.Žvorc



Otok kod Preloga, Photo by P.Žvorc



Mikulićev most, Photo by J.Medvedović

In total, we confirmed fifteen species of bats in the area, eleven of which are new or confirmed records for the region. List of bat species and their conservation status in Croatia is provided in Table 2.

Table 2. Recorded bat species in the region caught with mist nets and recorded with echolocation signals and their conservation status

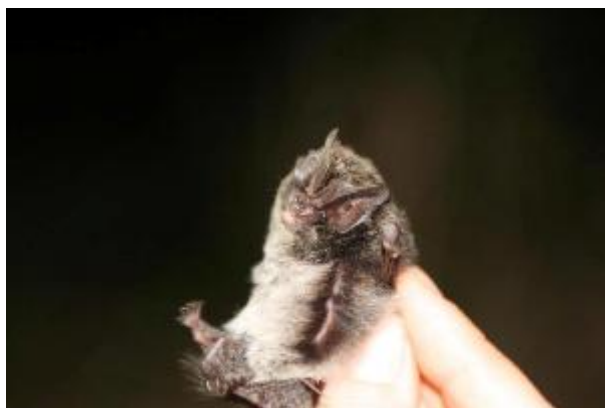
| Species  | Habitats Directive Annex | Croatian Red book of Mammals | Bern Convention Annex |
|--|--------------------------|------------------------------|-----------------------|
| Greater mouse-eared bat<br>( <i>Myotis myotis</i> )                        | II,IV                    | NT                           | II                    |
| Daubenton's bat<br>( <i>Myotis daubentonii</i> )                           | IV                       |                              | II                    |
| Bechstein's bat<br>( <i>Myotis bechsteinii</i> )                           | II,IV                    | VU                           | II                    |
| Natterer's bat<br>( <i>Myotis nattereri</i> )                              | IV                       |                              | II                    |
| Whiskered bat<br>( <i>Myotis mystacinus</i> )                              | IV                       |                              | II                    |
| Brandt's bat<br>( <i>Myotis brandtii</i> )                                 | IV                       |                              | II                    |
| Soprano pipistrelle<br>( <i>Pipistrellus pygmaeus</i> )                    | IV                       |                              | II                    |
| Nathusius' /Kuhl's pipistrelle<br>( <i>Pipistrellus nathusii/kuhlai</i> )* | IV                       |                              | II                    |
| Barbastelle<br>( <i>Barbastella barbastellus</i> )                         | II,IV                    | DD                           | II                    |
| Greater Horeshoe bat<br>( <i>Rhinolophus ferrumequinum</i> )               | II,IV                    | NT                           | II                    |
| Grey long-eared bat<br>( <i>Plecotus austriacus</i> )                      | IV                       | EN                           | II                    |
| Brown long-eared bat<br>( <i>Plecotus auritus</i> )                        | IV                       |                              | II                    |
| Noctule<br>( <i>Nyctalus noctula</i> )                                     | IV                       |                              | II                    |
| Savi's bat<br>( <i>Hypsugo savii</i> )                                     | IV                       |                              | II                    |
| Serotine<br>( <i>Eptesicus serotinus</i> )                                 | IV                       |                              | II                    |

\*Nathusius' /Kuhl's pipistrelle complex is not separable based solely on echolocation calls, although Nathusius' pipistrelle was caught on one occasion, the possibility of occurrence of Kuhl's pipistrelle could not be discriminated

Species listed under Habitats Directive have a particular value as bioindicators because they can directly inform about general habitat quality. However, they are usually also more difficult to notice. Therefore, essential species on our sites will be the ones which are most abundant. Abrupt and sudden changes in occurrence and

activity of these species are a valuable source of information that can help in generating a bigger picture in environmental changes. The most abundant species that occurred on majority of localities (determined primarily through echolocation transects) were Noctule (*Nyctalus noctula*), Daubenton's bat (*Myotis daubentonii*), Soprano pipistrelle (*Pipistrellus pygmaeus*) and Nathusius'/Kuhl's pipistrelle (*Pipistrellus nathusii/kuhlii*).

Selected species photos:



Barbastelle, photo by M.Šalek



Greater horseshoe bat, photo by P.Žvorc



Bechstein's bat, Photo by M.Kipson



Soprano pipistrelle, photo by M.Kipson





Greater mouse-eared bat, Photo by J. Medvedović



Noctule, Photo by M.Kipson



Daubenton's bat, Photo by P.Žvorc

In search for bat roosts we examined twenty church objects and found bats present in eight of them. These objects should also be included in a regular monitoring on a yearly basis and a subject to discussion in the face of possible reconstruction of old churches. Maternity colonies were discovered for three species Grey long-eared bat (*Plecotus austriacus*), Brown long-eared bat (*Plecotus auritus*) and Serotine (*Eptesicus serotinus*). Churches that contained bats, usually were maintained by people that did not consider bats as a threat, however in one case it was a matter of conflict with humans. These objects should therefore, in general, be a matter of careful examination, simultaneous work with people and their education, in order to minimise consequences of the possible conflict.

## Roost photos:



Serotine colony in a church attic, Photo by P.Žvorc



Serotine with offspring in its wing, Photo by M.Kipson



Long-eared bat, Photo M.Kipson



Young long-eared bats in church tower, Photo M.Kipson



Typical roosts in church towers, Photos by P.Žvorc

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### ➤ Education and local community participation

Lectures were held in three elementary schools (Nedelišće, Sv. Martin na Muri and Mursko Središće), for members of mountaineering club Bundek and for general audience in a lecture hall in Nedelišće. We organized a workshop during which bat houses were installed in a school yard in Nedelišće. Around two hundred people participated in the lectures, which also served as a call for joining our fieldwork activities where members of the community were able to learn fieldwork techniques necessary for monitoring conduction. Lectures and workshops were organized in March 2012. For the purposes of project promotion and invitation to active participation, we printed information leaflet (A4), that was distributed during fieldwork in the local community.



Sv. Martin na Muri elementary school, Photos by M.Mesarić



Lecture for general audience in Nedelišće, Photo by M.Martinko Lecture for mountaineering club Bundek, Photo by M.Martinko





Lecture in Nedelišće elementary school, Photo by D.Crnčec



Bathhouse workshop, Photo by D.Crnčec



Installation of bathhouse in a school yard, Photo by D.Crnčec



Lecture in Mursko Središće, Photo by M.Martinko



Ranger of Međimurska priroda with a bathhouse, Photo by M.Mesarić S.Janković releasing a bat, Photo by I.Turk



B.Šaulić, J.Horvat, L.Đud and M.Kipson on a way to gravel island on Drava for echolocation recording



Promotional A4 leaflet

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➤ **Media and internet portal coverage**

<http://www.emedjimurje.hr/udruge-i-klubovi/otkrivanje-tajni-iz-zivota-sismisa--letecih-sisavaca>

Basic information about bats and the project that was published on a regional web portal.

[http://www.mnovine.biz/novo/index.php?option=com\\_content&view=article&id=13660:ukljuite-se-u-istraivanje-ivota-imia-u-meimurju&catid=42:vijesti&Itemid=400](http://www.mnovine.biz/novo/index.php?option=com_content&view=article&id=13660:ukljuite-se-u-istraivanje-ivota-imia-u-meimurju&catid=42:vijesti&Itemid=400)

Invitation for local community members to participate in the fieldwork activities.

<http://emedjimurje.hr/opcenito/zelite-proucavati-sismise-u-medjimurju>

Invitation for local community members to participate in the fieldwork activities.

<http://www.medjimurska-priroda.info/tag/imii/>

Information on bat research that is being carried out in the region.

<http://www.medjimurska-priroda.info/2012/06/istraivanje-imia-2012/>

Information on bat research that is being carried out in the region.

[http://www.extrem.hr/index.php?start\\_from=20&ucat=&archive=&subaction=&id=&](http://www.extrem.hr/index.php?start_from=20&ucat=&archive=&subaction=&id=&)

Call for participation in the lecture for general audience and fieldwork activities.

[http://www.os-svetimartinnamuri.skole.hr/?news\\_hk=1&news\\_id=154&mshow=290#mod\\_news](http://www.os-svetimartinnamuri.skole.hr/?news_hk=1&news_id=154&mshow=290#mod_news)

Summary and information about lecture that was given in the school Sv. Martin na Muri.

<http://www.bundek.hr/index.php?start=20>

Invitation to join fieldwork activities.