Bats of the Târnava Mare region of Transylvania
Operation Wallacea 2019

Introduction

Bats occupy a wide range of ecological niches due to their species-specific adaptations which determine their foraging ecology and roosting behaviour. As high trophic level predators, they are sensitive to agricultural intensification, deforestation, development and habitat fragmentation; therefore, they can be used as indicators of ecosystem health.

All bat species are protected in Europe under the EU habitats directive (2007), the Bern convention on the conservation of European wildlife and natural habitats (1979), and the Bonn convention on the conservation of migratory species of wild animals (1979). All bats are listed under annex IV of the EU habitats directive, which means that they require strict protection. An additional 14 species are listed under Annex II and hence require the designation of core sites for their protection (Special Areas for Conservation) and the implementation of conservation measures aiming at maintaining or restoring the species at a favourable status.

Romania is home to 32 bat species of which 13 are listed under Annex II. According to Dietz, Nill, and von Helversen (2009), around 20 bat species, from 10 genera, are likely to occur in the Târnava Mare Natura 2000 region. As mentioned in several reviews of Romanian bat fauna, the majority of records of bats from Romania come from several rather intensively studied regions (Bihor, Banat, Dobrogea and Danube delta); most of which were obtained by inspections of caves and roosts. This expedition therefore provides important data on bats from a lesser studied region of Romania, in a range of foraging habitats focussing around an inhabited village.

Commendable efforts have already been undertaken to safeguard bats as part of this network of protected areas in Romania. Most notably, a large EU funded project conducted by the Romanian Bat Protection Association titled ‘Bat conservation in Pădurea Craiului, Bihor and Trascău Mountains’, which implemented safeguarding measures at numerous cave sites, known to contain bat roosts, to the northeast of the Târnava Mare site.

The Târnava Mare region is likely to have a high diversity of bats species due to the presence of cave systems, un-polluted water courses, large old-growth forested areas and low levels of anthropogenic disturbance. However, increased levels of deforestation and agricultural intensification means there is a need to monitor

biodiversity trends in this region, which will allow for comparison with other parts of Europe that have already been exposed to much higher levels of anthropogenic landscape modification.

Despite Romania having valuable habitats that support much more diverse populations of bats than, for example, the UK; there is comparatively few monitoring or research initiatives underway. This further highlights the need for ongoing monitoring regimes to adequately inform policymakers of the biodiversity value of areas such as the Târnava Mare region.

The long-term aim of this project is to use bat diversity data, collected through monitoring bats in the Târnava Mare region, to inform stakeholders on a local and international level of the biological value of this region, and inform policy making in regards to biodiversity conservation. Additionally, the project aims to build capacity for future research endeavours and international collaboration, with the common goal of conserving bat populations. The primary objective is to include bats in the biodiversity monitoring programme of this region, so that the ecological importance of bats can be recognised as being a key aspect of the biological value of this Natura 2000 site.

Methods and Results

1. Trapping records

The results from the 2019 report are directly based on the framework established in 2018 developed to answer a range of research questions regarding bat distribution.

Bat surveys were conducted from June 17th to August 12th 2019. A total of 42 trapping surveys were conducted for a combined total of 184 hours and 19 minutes of trapping effort. One harp trap was used throughout all surveys, but the use of mist nets varied in size and numbers between surveys. The combined trapping effort using mist nets is calculated at 15,276 meters squared net hours (m^2nh). A total of 264 bats of 16 species were captured throughout the survey period (Figure 1).

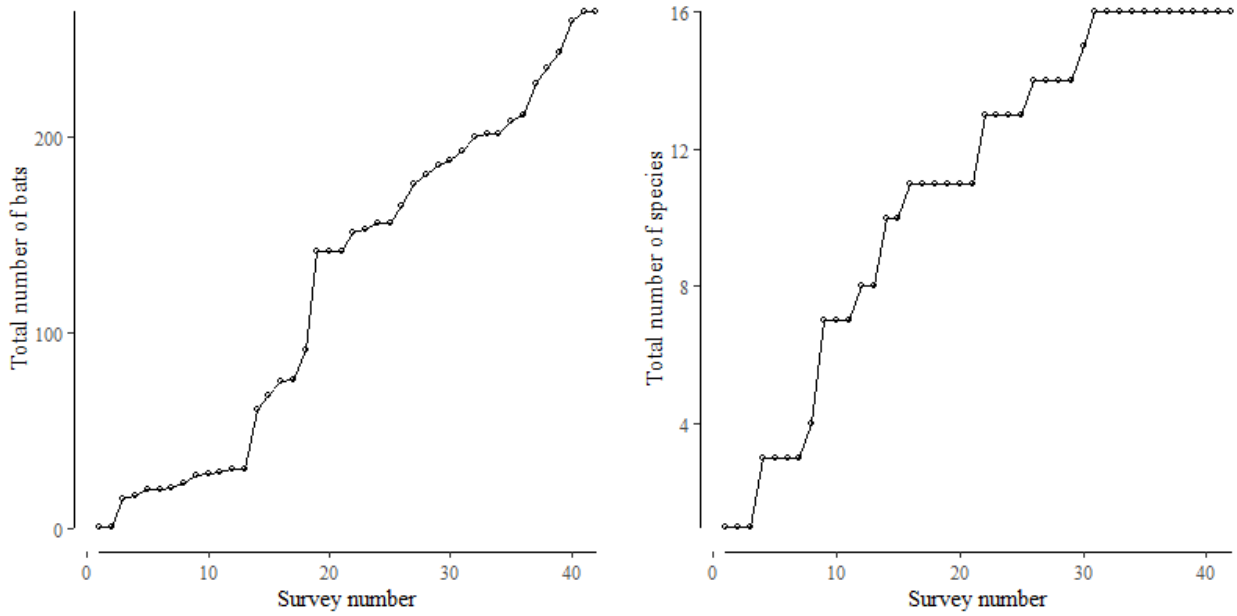


Figure 1. Number of bats and species accumulation throughout the 2019 expedition.

An average of 33 bats and 5.6 species were caught in each village catchment. The highest number of species was captured in the village of Nou Sasesc (8), while the lowest total was captured in Richis (3). Viscri was the village where the most bats were captured (66), while only nine bats were caught in Mesendorf (Figure 2).

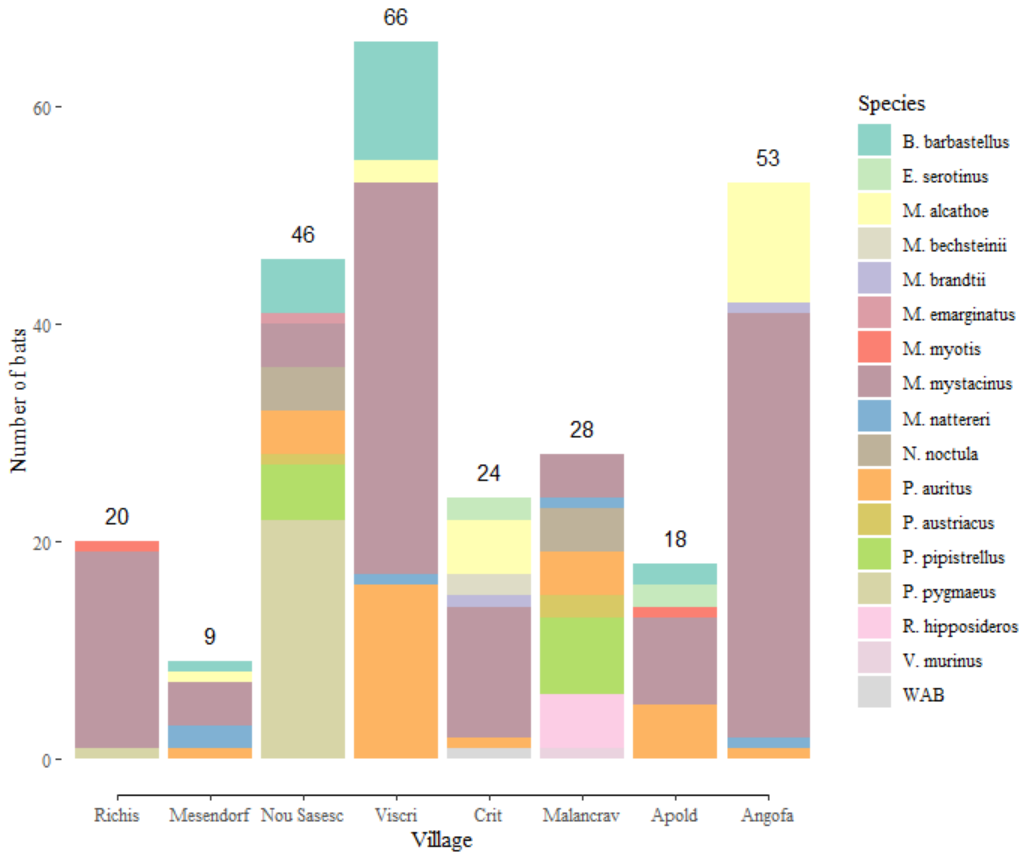


Figure 2. Number of bats of each species recorded at each village catchment through trapping (WAB – Whiskered, Alcathoe or Brandt's bat).

Myotis mystacinus (125) was the most recorded species from the trapping surveys, followed by *Plecotus auritus* (32) and *Pipistrellus pygmaeus* (23) (Figure 2 & 3). Of the 16 species recorded, only *M. mystacinus* was recorded at each village catchment. A total of 10 species were captured less than 10 times over the surveying and 4 species (*Myotis bechsteinii, Myotis emarginatus, Rhinolophus hipposideros, Vespertilio murinus*) were only caught in a single village area (Figure 2 & 3).

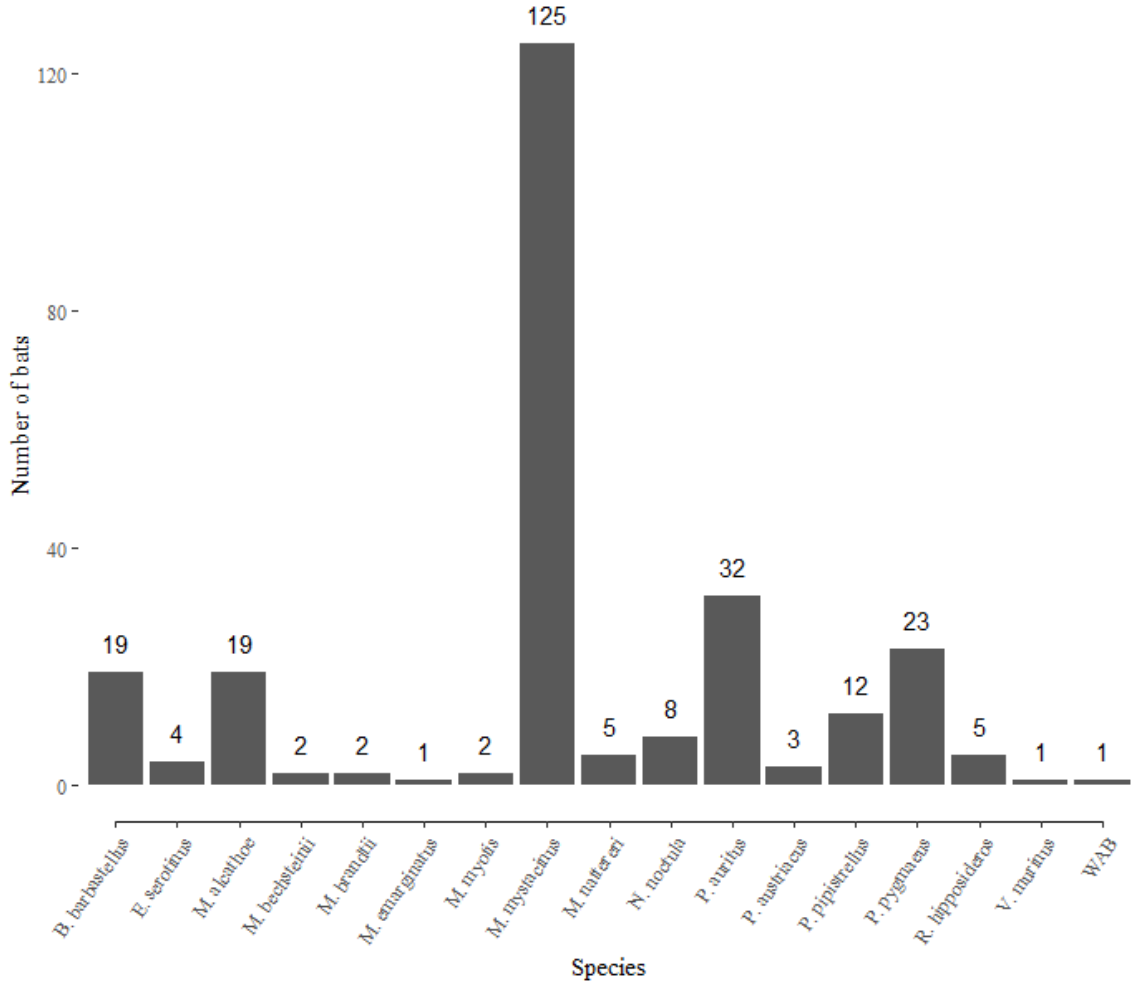


Figure 3. Total number of captures of each species throughout the 2019 survey period.

2. Acoustic records

Acoustics were recorded using an AudioMoth and an Echo Meter 2. The Echo Meter recordings were taken at trapping survey locations, while the AudioMoth was deployed at 1-3 locations at each village. Sonograms of bat calls were processed using Kaleidoscope Pro (v.1.1.20, Wildlife Acoustics) with Romanian bat classifiers (v.1.0.5) and then manually verified.

The addition of acoustic data helped to detect an additional two species (*N. lasiopterus* and *N. leislerii*) that had not been captured throughout the whole survey period. Six species on average were detected with acoustic data alone in each village. *P. pygmaeus* was the species with the highest number of passes (993), followed by *N. noctula* (427) and *P. pipistrellus* (179) (Figure 4).

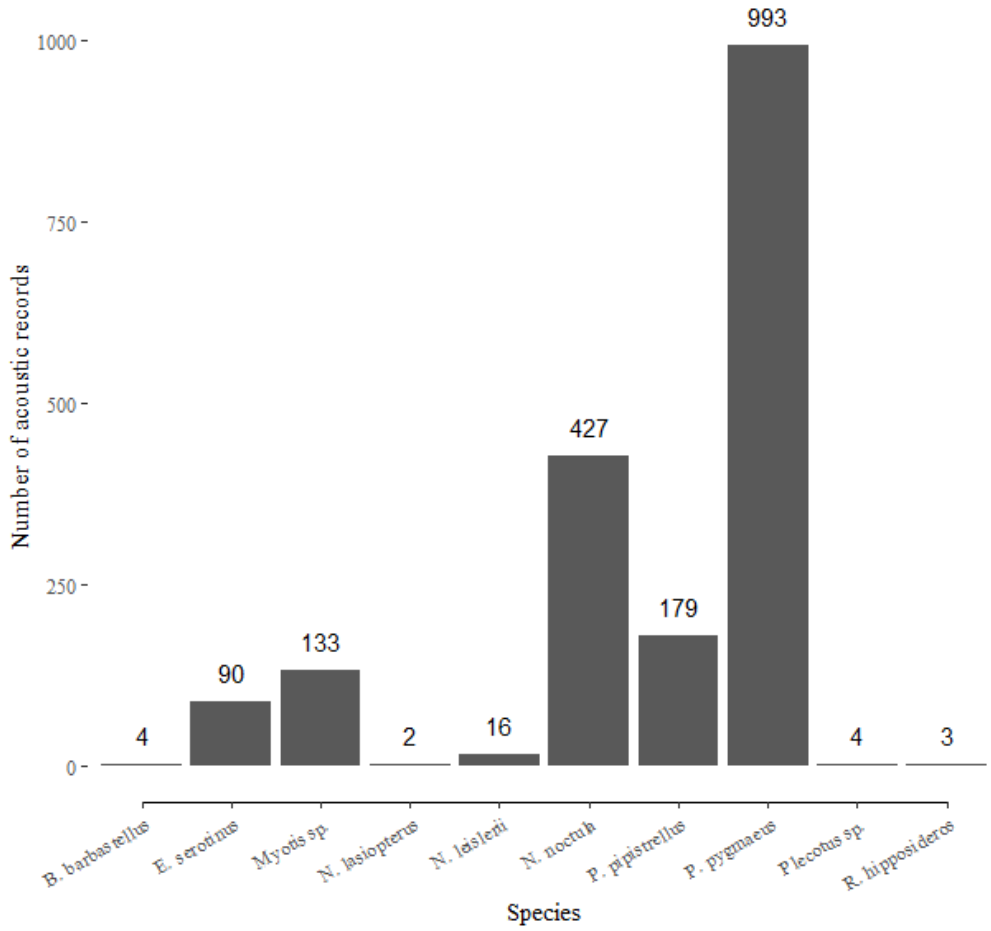


Figure 4. Total number of acoustic records of each species throughout the 2019 survey period.

The high levels of activity of both *P. pygmaeus* and *N. noctula* were mainly explained by the placement of the static detector by a pond in Nou Sasesc where a lot of activity was recorded (Figure 5). The use of detectors was particularly valuable in villages where very few species had been captured. For example, an additional 6 species were detected in Richis while only three were captured and *E. serotinus* was recorded in an additional 4 villages (Figure 5; Table 1).

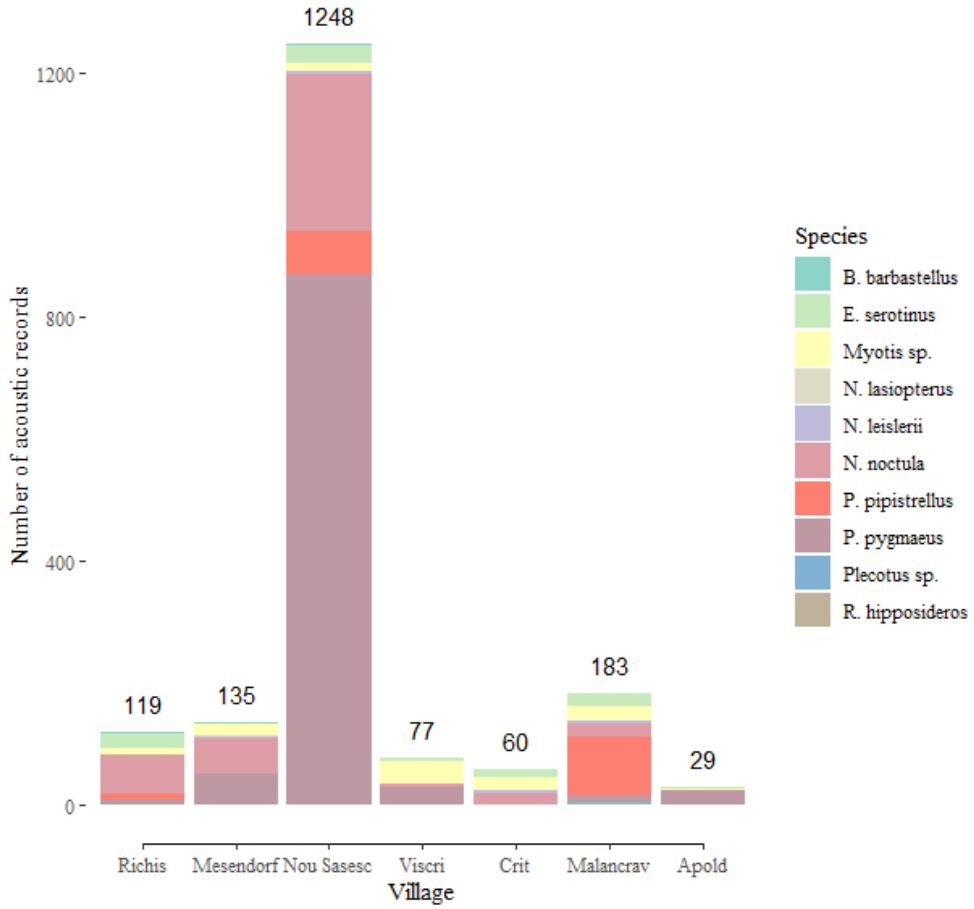


Figure 5. Number of acoustic recordings of each species recorded at each village catchment through trapping (all *Myotis* calls were grouped together).

Table 1. Summary of the number of species detected in each village for each surveying technique.

	Captures	Acoustic	Combined
Richis	3	8	9
Mesendorf	5	6	9
Nou Sasesc	8	7	10
Viscri	5	4	8
Crit	7	4	9
Malancrav	8	8	12
Apold	5	5	7
Angofa	5	-	5

3. Roost surveys

Roost inspections were undertaken in all Saxon churches with the exception of Malancrav for which we did not have access. All churches showed evidence of bat activity (droppings, observed, caught) (Table 2). *P. auritus*, *M. Myotis*, *E. serotinus* and *M. mystacinus* were the most commonly observed species in the churches. The most significant colony observed remains the *M. Myotis* maternity in Richis where approximately 300 bats were observed in the church tower. Viscri, Apold and Nou Sasesc churches showed significant evidence of bats roosting in the church tower and building. In Mesendorf and Crit, however, very little evidence of bats was found. This information can be concerning in Crit as a *P. austriacus* roost was present in 2018.

.**Figure 6.** Photograph showing some of the *M. Myotis* droppings in the Saxon church of Richis.

Table 2. Summary of the church inspections undertaken in each village

Village	Bats caught/ observed	Droppings	Other comments
Richis	Large *M. myotis* maternity roost (~300 bats) inside church tower	Large amounts of guano (Figure 6) reported to lilieci.ro as they offer guano cleaning.	Possible disturbance by tourists regularly visiting during the breeding period
Mesendorf	*M. mystacinus* and *P. auritus* caught in churchyard	Small amounts of droppings in the church tower (no access to roof void).	Evidence of tawny owl and beech marten using the tower
Nou Sasesc	*P. auritus* and *M. emarginatus* caught in churchyard	Large and small droppings found in the tower. Very few inside the church (no access to roof void).	*P. auritus* likely to be roosting in the main church building in addition to the bell tower
Viscri	*P. auritus* caught inside church and *M. myotis* observed in tower	Significant amounts of droppings observed in the tower and roof void.	Warden was told that a colony of 78 bats (unknown species) was roosting in the church a few years ago. The number of species observed in 2019 was also lower than in 2018. *P. auritus* colony may have also moved as 16 bats were seen emerging from a different nearby roost.
Crit	*P. auritus* caught inside church	Very few droppings observed	*P. austriacus* is known to roost inside the church and was observed in 2018, but there was no evidence of the species in 2019. Important flood lighting on the church which may cause disturbance to the bats.
Apold	*M. mystacinus* caught in churchyard; *P. auritus & E. serotinus* caught inside church & tower	Small amounts of droppings observed in throughout the tower and roof void	–

Discussion

The overall abundance and diversity of species identified in 2019 was similar to 2018 as only *M. emarginatus* and *V. murinus* were not caught the previous year. Results from both years also confirm the presence in large numbers of *M. mystacinus* throughout the Tarnava Mare region.

Interestingly, *M. alcathoe* was caught in large numbers in Angofa, but also in Crit, Viscri and Mesendorf. Such information is particularly valuable as the species was only recorded for the first time in Mesendorf and Malancrav in 2018. These records are important as the species was only discovered in 2001 and is classified as data deficient (DD) by the IUCN. In addition, the confirmed presence of five Annex II species (*B. barbastellus*, *M. bechsteinii*, *M. emarginatus*, *M. Myotis* & *R. hipposideros*) throughout the surveying period and the presence of at least one species of conservation interest at each village catchment (DD or Annex II) confirms the importance of the Tarnava Mare region for bats.

The addition of acoustic data, whilst being limited to the use of a single static detector and the ad-hoc use of an Echo Meter Pro, was very useful in confirming the presence of a number of species that were not caught in certain villages. For example, only three species were caught in Richis, but an additional six species were identified with detectors. The possible presence of *N. lasiopterus* in the region is also of particular interest, because the species is sporadically distributed in Europe and classified as DD in Europe. The species is known to migrate long distances (). Therefore, the bats could originate from neighbouring populations in the Carpathians.

It has been reported that a lot of church renovation work is going on in Romania. For example, two colonies were destroyed, in spite of good relations with priests. It appears that efforts by conservation charities, such as lilieci.ro, are ignored if funding for renovation is acquired. Such problems of abusive, ad-hoc building renovation and colony destruction appear to be accelerating in Romania.

Further research

The bat surveys in their current form provide essential information that is currently lacking on the presence and distribution of bats in the Tarnava Mare region.

However, the amount of data collected is very much limited in comparison to other surveys and does not answer questions regarding farming practices. The additional use of static detectors can help fill these knowledge gaps as they can generate large amounts of data within a short period of time. With a clear set of aims and objectives, this data could provide information on the effect of different farming practices on bat diversity, activity and their role as ecosystem service providers.

As mentioned previously, the renovation of buildings, such as churches, can have a serious impact on bat populations. Operation Wallacea's presence in each village is limited to a single week. Therefore, it is very hard to deal with any conflicts in relation to bats in buildings. Instead, farm surveys could also be target churches and include additional questions regarding the presence of bats and whether they are causing any issues. This information could then be directly passed on to organisations, such as lilieci.ro, who have more time and capacity to deal with such issues.

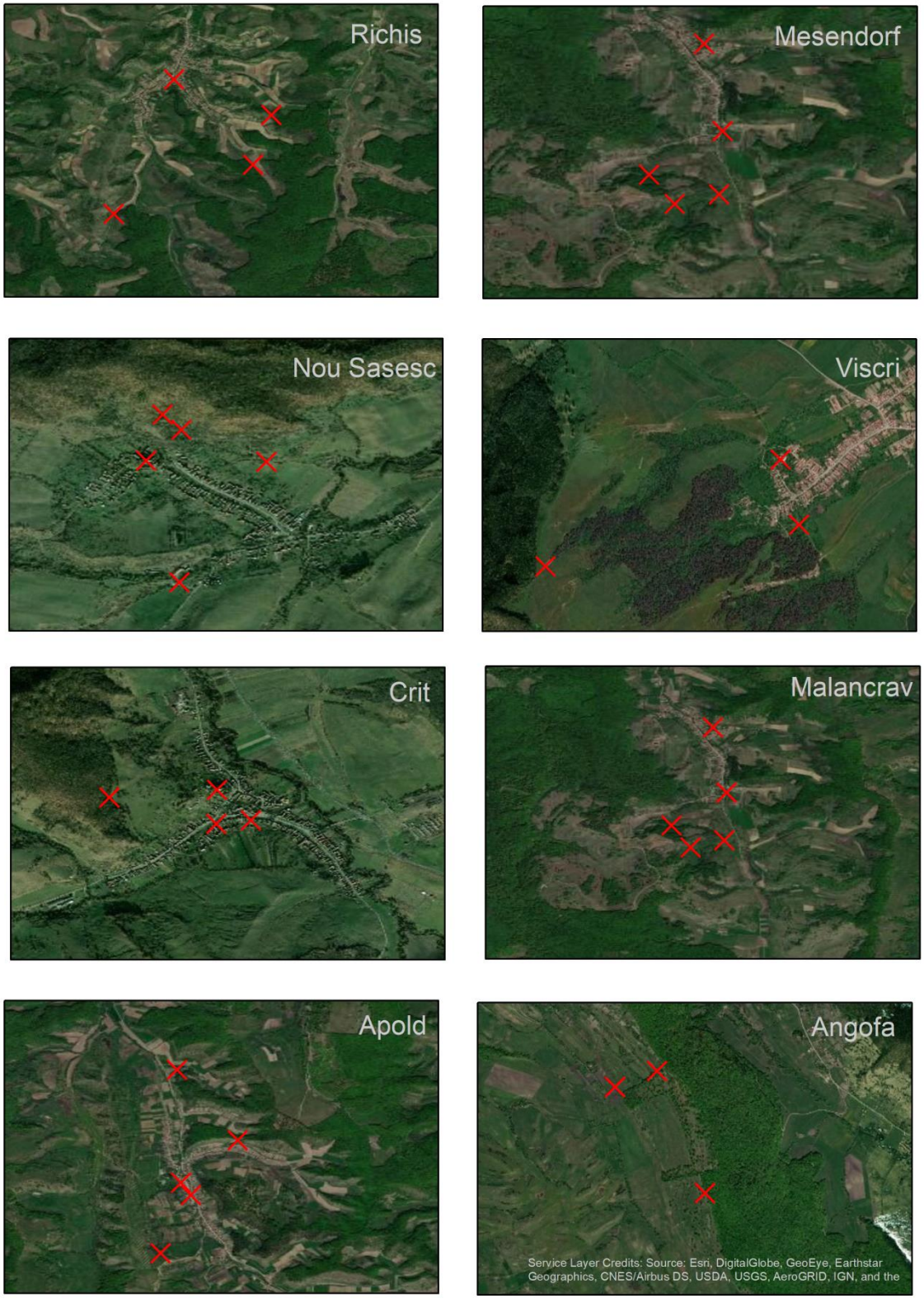
Conclusion

The 2019 Tarnava Mare - Opwall bat expedition identified 16 species throughout the region. Five of the species present in the area are included in Annex II of the habitats directive and, therefore, require the designation of core sites for their protection. (Special Areas for Conservation – SAC). The project also provides several records of *M. alcathoe,* a species classified as DD under the IUCN Red Listing. The additional use of static detectors during the project helped to provide a better picture of the species diversity at each village catchment. Overall, these results provide essential information that will contribute towards the conservation of bats in this Natura 2000 site.

References

Dietz, C., Nill, D., & von Helversen, O. (2009). Bats of Britain, Europe and Northwest Africa. London: A & C Black.

Mitchell-Jones, A.J., Moutou, F. and Zima, J., 2009. Mammals of Europe, North Africa and the Middle East. London: A&C Black.



Appendix 1: Summary of trapping sites at each village catchment