Final Report 2016 EUROBATS Projects Initiative (EPI)

1. Project title/ Name of the Country

Plecotus sardus in Sardinia, Italy; Germany

2. Project Leader

Dr. Andreas Kiefer (AK)
AK is involved in bat conservation and bat research since 1989. He did field research (amongst others) in Germany, France, Luxembourg, Switzerland, Austria, Andorra, Italy (including Sardinia), Greece and Turkey. AK has knowledge of all relevant methods of bat research (e.g. radio-tracking, bio acoustic surveys and other field methods, genetics). AK has 20+ peer reviewed papers. From 2007-2013 he was the project leader of a large-scale conservation project of bats in the Eifel region, Germany. Since August 2013 AK is a member of the Dept. of Biogeography at Trier University (chair of Prof. Dr. Michael Veith). AK is interested in ecology and genetics of bats, especially the *Plecotus* species, and in bat conservation, here "Wind farms and bats" and protection of rare species such as *Plecotus sardus*.
Diploma thesis (1996): "Investigations to land use and interactions between populations of *Plecotus austriacus* in the Nahe region, Germany"
PhD thesis (2007): Phylogeny of Western Palearctic long-eared bats (Mammalia, Chiroptera, *Plecotus*) - a molecular perspective
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5. Region of project implementation

Sardinia (Italy) and Rhineland-Palatinate (Germany)

6. Project period

From 2015 to 2017.

7. Report on implementation and development

Sardinia is the second biggest island in the Mediterranean Sea with a surface of 24.100 km^2, therefore it is impossible to perform a survey on the entire island within one season with only a few people. In this year, 2016, we performed our research mainly in the central east and central west of Sardinia where the known nurseries are present. We also investigated other areas in accordance to the suggestions from cavers and employers from different public agencies (Forestry, Nature conservation, municipalities. We also developed different species distribution models (Fichera, Feldmeier, Mucedda,Veith & Kiefer, in prep) (Fig 1, 2, 3) and checked probable areas of occurrence of *Plecotus* species.

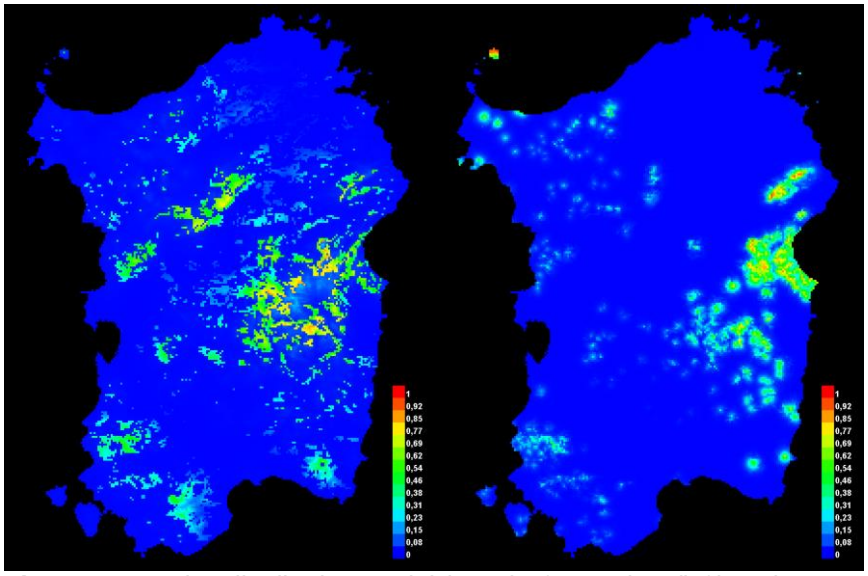

Figure 1: Species distribution model (SDM) of *P. auritus* (left) and *P. austriacus*(right) using known localities, the model was developed using Maxent (In prep.).

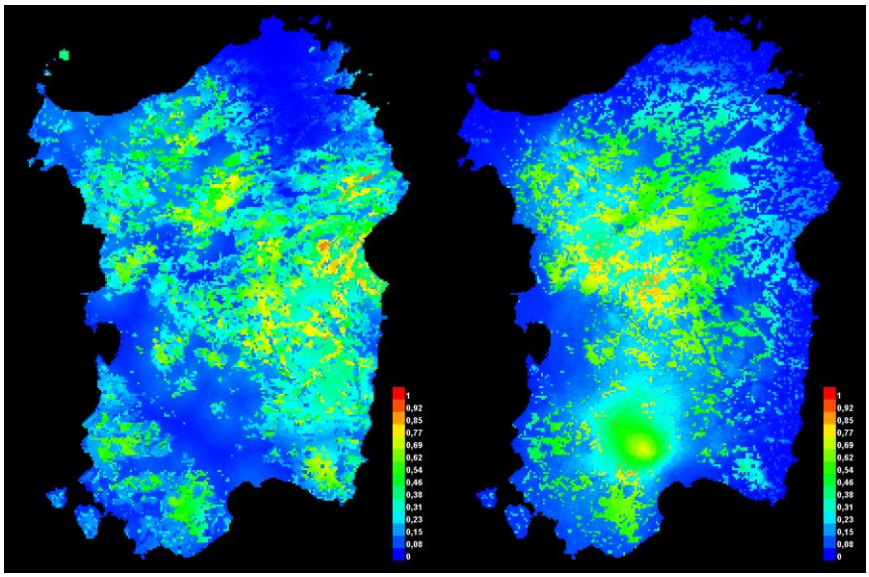

Figure 2: Two SDMs of *P. sardus*, using different back ground points, in the first on the left all the presence points, in the second on the right just the presence point from Lake Omodeo Area (in prep.).

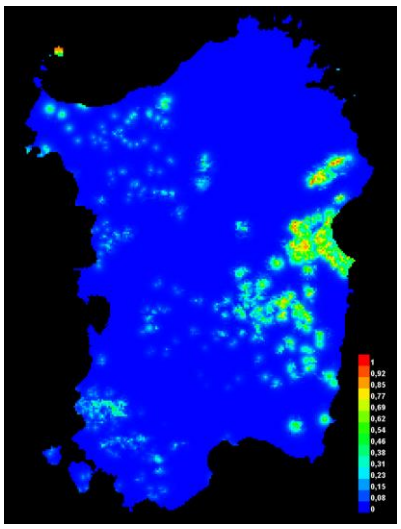

Figure 3: Another SDM of *P. sardus* developed using the presence point from Supramonte and Monte Albo (in prep.).

These SDMs were not only used to study the ecology of *P. sardus*, they also appeared to be helpful tools for field work, namely to identify areas for further field work.

Ce.Pi.Sar. worked in Sardinia throughout the year on public awareness, surveys of roosts and potential roosts, mist netting and acoustic monitoring (bat detector sessions). Field work started in January from Ce.Pi.Sar, but the most intensive field work was from 22 May to 30 September carrying out a big survey including all known roost and former points of the species' occurrence.

We carried out more than 60 nighttime netting (Fig.4) sessions in more than 45 places, more than 80 nights of bat detector sessions and 80 days of surveys for new roost and interview.

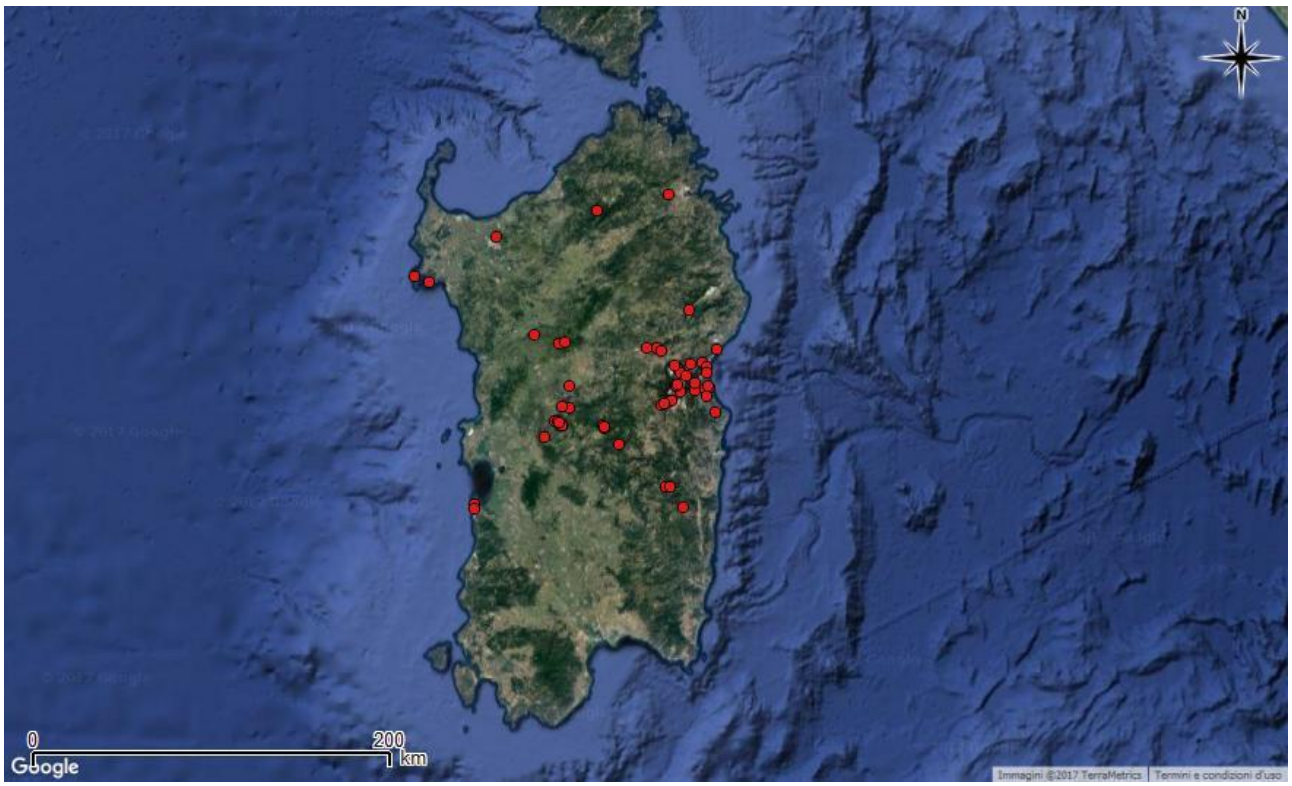

Figure 4: Map of the netting sessions of 2016. The red points indicate the localities of netting.

In every netting session, we collect DNA and record ultrasound with different kinds of bat detectors. We also collected feces, saliva and swabbed the skin surface in order to assess the presence of pathogen virus. The samples will be analyzed by the Veterinary Department of Sassari University.

We performed our nettings using puppy nets and a bat lure (Apodemus Batlure) to increase the number of caught bats. Netting was carried out from half hour before sunset for at least 6 hours or, when possible, until the sunset.

Survey of known nurseries:

This year we collected data about the parenthood in *P. sardus* and *P. auritus* for the first time and so got indications about when *P. sardus* and *P. auritus* gave birth (Fig.5).

Figure 5: Two new born juveniles of *P. sardus* from S. Chiara roost.

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According to our information, *P. sardus* starts to give birth mid May until the beginning of June.

In *P. auritus* we observed newborn juveniles from the second half of May until the beginning of June (Fig.6)

Figure 6: Adults and a new born juvenile (central) of *P. auritus* from Belvì.

Unfortunately in 2016 the weather conditions were different than usual, with very low temperature in May, therefore we don’t know if and how this affected the time of births.

In order to collect more data in *P. sardus* colony of S.Chiara we used a camera trap inside the nursery (Bushnell Trophy Cam HD Max).

The attic where the bats stay is divided into one central part where usually also a colony of *M. emarginatus* lives and two parts where the roof is sloping and which is used by *P. sardus* and some *R. hipposideros*.

Every time we used the camera trap in one of the two sides, the *P. sardus* individuals moved to the opposite side; while *R. hipposideros* showed no problems with this gear. Just using the Petterson D1000 we could record a weak hiss with CF of 47 kHz produce by the camera trap. Also with others camera trap models and brands we recorded a very weak sound. *P. sardus* seems highly disturbed from such noise, more than *P. auritus* and *P. austriacus* that are often filmed with camera traps or webcams.

Since half of the few known nursery colonies of *P. sardus* live in buildings, a monitoring based on camera traps or webcams with successive web-streaming might be helpful for monitoring and public awareness. However, every action in this direction should be carried out with the awareness that it must be tested previously if the used electronic devices may disturb the colony.

About 20 years after the first and only survey we could reinvestigate the two cave-dwelling colonies of *P. sardus*, one of which lived in a sea cave. In 2016 we surveyed five sea and coast caves in three parts of Sardinia using a boat, when it was impossible to reach the entrance from land (Tab. 1)

Tab 1: Coast and Sea caves checked in 2016 on Sardinia.

Coast	Province	Data	Cave	Activity	Presence of bats
Golfo di Orosei	**Nuoro**	**30/07/2016**	**Grotta della Madonna**	**survey and mist netting**	**50 *P. sardus*; the largest nursery colony in Supramonte Area**
Capo Caccia	Sassari	05/08/2016	Grotta Verde	mist netting	*R.ferrumequinum* *M. capaccinii* *P. austriacus* *T. teniotis* *E. serotinus*
Capo Frasca	Oristano	25/08/2016	Grotta Panza	survey and mist netting	1000 *M. mehely* in a Nursery colony
Golfo di Orosei	Nuoro	30/08/2016	Grotta del bue Marino	mist netting and bat detector session	*T. teniotis* and *M. schreibersii*
Capo Frasca	Oristano	25/08/2016	Grotta S'Acqua de Is Caombus	Survey and mist netting	*M. schreibersii and M. daubentonii* nursery colony

The presence of a nursery colony of *P. sardus* in a sea cave leads us to the conclusion that any further survey of the species should be also focused on sea caves. Such surveys may lead to the discovery of new colonies, but however it would be very time consuming and expensive, since Sardinia has 1.897 km of coast and from which 76% is rocky and could be suitable for roosts

As a rough estimate of the known population of *P. sardus* based on our survey we counted less than 200 individuals in the four known nurseries (Santa Chiara Village; Busachi school; Grotta myotis;

Grotta della Madonna). Contrary to *P. auritus* where male and female stay together in the nurseries, in *P. sardus* males are present but not in big numbers. For an estimate of the entire population size and assuming an equal sex ration we should add the hypothetic number of males that do not live in the nurseries.

Finding new roosts

We also carried out a presence/absence survey of *P. sardus* across the western part of Sardinia. Therefore, we interviewed several categories of persons (hunters, cavers, shepherds, farmers, workers in archaeological sites and in public agencies) and did a survey of Nuraghi, Domus De Janas (prehistoric ruins that are present only in Sardinia), caves, dams, churches, monasteries and all kind of abandoned buildings, either private or public. Overall we checked more than 80 potential roosts in this area and interviewed more than 60 persons. Since it is not possible to trust the description of people on bat species we personally checked all bat roost reported by them. We selected the most reliable information and checked all these potential bats roost. All colonies of *Plecotus* species in Sardinia that we know were found thanks to such interviews.

Table 2 shows a list of all new roost with more than 10 animals (exception of *P. sardus)* that we found. We excluded new roosts with few animals or new species in known roosts to make the table more clear.

Tab 2: Most important new roosts found in 2016.

Town	**Roost**	**Kind of roost**	**Species**
Austis	Gutter	Nursery	*Pipistrellus sp*.
Austis	Country house	Nursery	*R. hipposideros*
Busachi	**Courtyard**	**Night roost**	***P. sardus*** **1 individual**
Busachi	Gutter	Nursery	*Pipistrellus sp*.
Belvì	Attic of the priest's house	Nursery	*R. hipposideros*
Belvì	Public bathroom	Nursery	*R. hipposideros*
Bortigiadas	Railway tunnel (still partially used)	Nursery	*M. punicus* 500 individuals
Fordongianus	House	Not assessed	*Pipistrellus sp*.
Nuoro	Rooms underneath the swimming pool	Nursery	*R. hipposideros*
Orgosolo	**Garage**	**Not assessed**	***P. austriacus*** **and** ***M. punicus***
Tadasuni	Gutter	Not assessed	*Pipistrellus sp*.
Tadasuni	Abandoned hotel	Not assessed	*R. hipposideros*
Sorradile	Former Elementary	Nursery	*P. pygmaeus,* *P pipistrellus*

	school		*T. teniotis*
Sorgono	A house in the country	Nursery and temporal roost	*R. hipposideros* and *R. ferrumequinum*
Sorgono	Gutter in the hospital	Nursery	*Pipistrellus* sp./ *Hypsugo* sp.

Mist netting

In 2014, and before EPI, the field season was focused on the collection of DNA samples and data of presence/abundance of all *Plecotus* species in Sardinia. Our preliminary results of the DNA analyses showed that there are at least two mitochondrial haplogroups of *P. sardus* on Sardinia. This may be a result of the ongoing separation of two populations, or it is a result of historic separation. Further molecular analyses are needed, including nuclear data, to prove the occurrence of two separated populations.

This year we perform more than 60 nights of mist netting in 45 places, catching more than 600 bats of 18 species. In overall of our project we collected 76 DNA (from 2014 on) samples of *P. sardus*, 48 of *P. austriacus* and 29 of *P. auritus* (Tab. 3).

Table 3: Number of samples of the three *Plecotus* species

Species	**Number of samples**	**Number of localities**
P. sardus	73	14
P. austriacus	48	13
P. auritus	29	7

We finally updated and improved the distribution map of the three *Plecotus* species on Sardinia (fig. 7, 8 and 9)

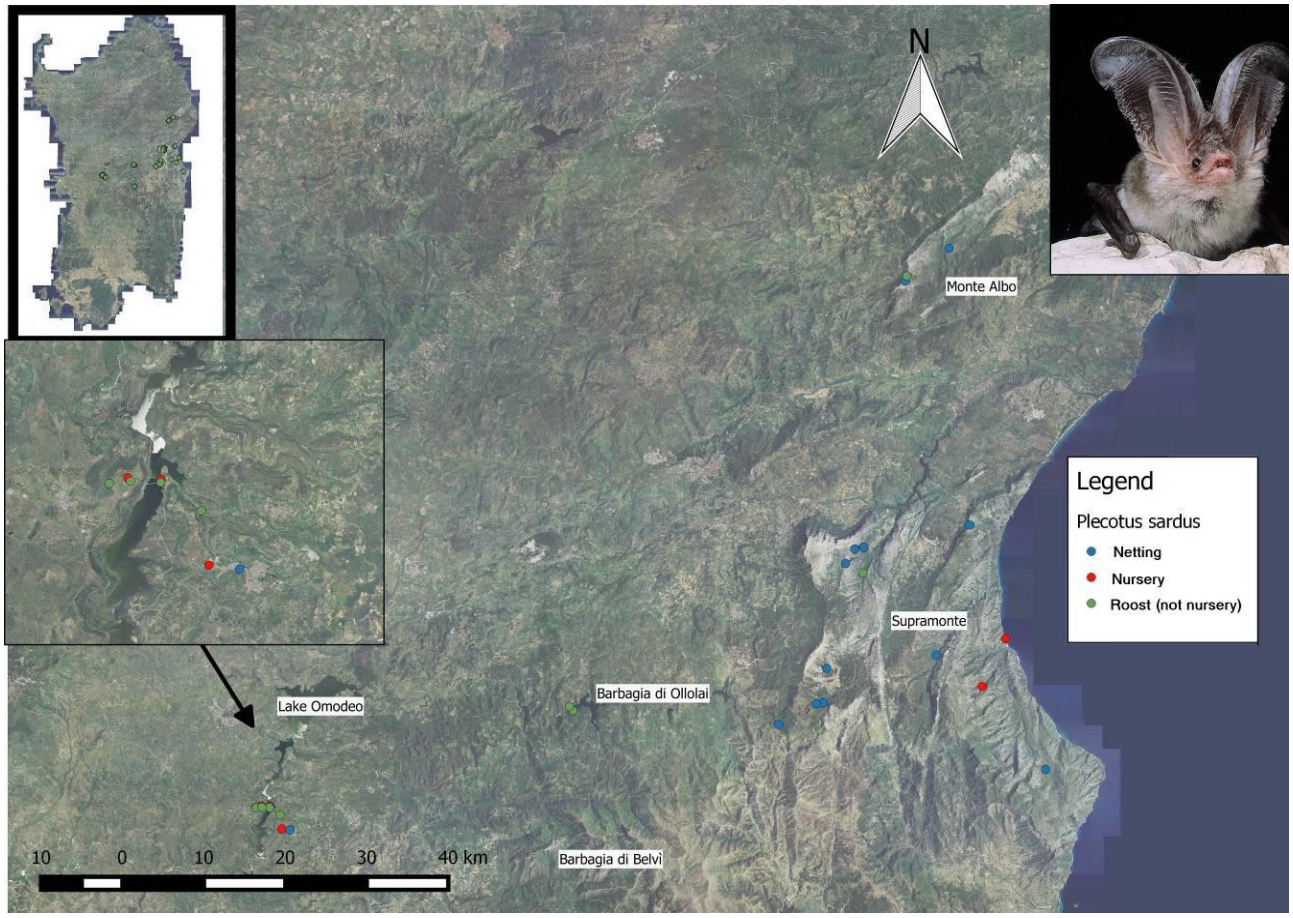

Figure 7: Presence of *P. sardus* updating from 2016; the species is present just in Omodeo lake, in Supramonte area and in Monte Albo, Barbagia di Belvì and Barbagia di Ollolai.

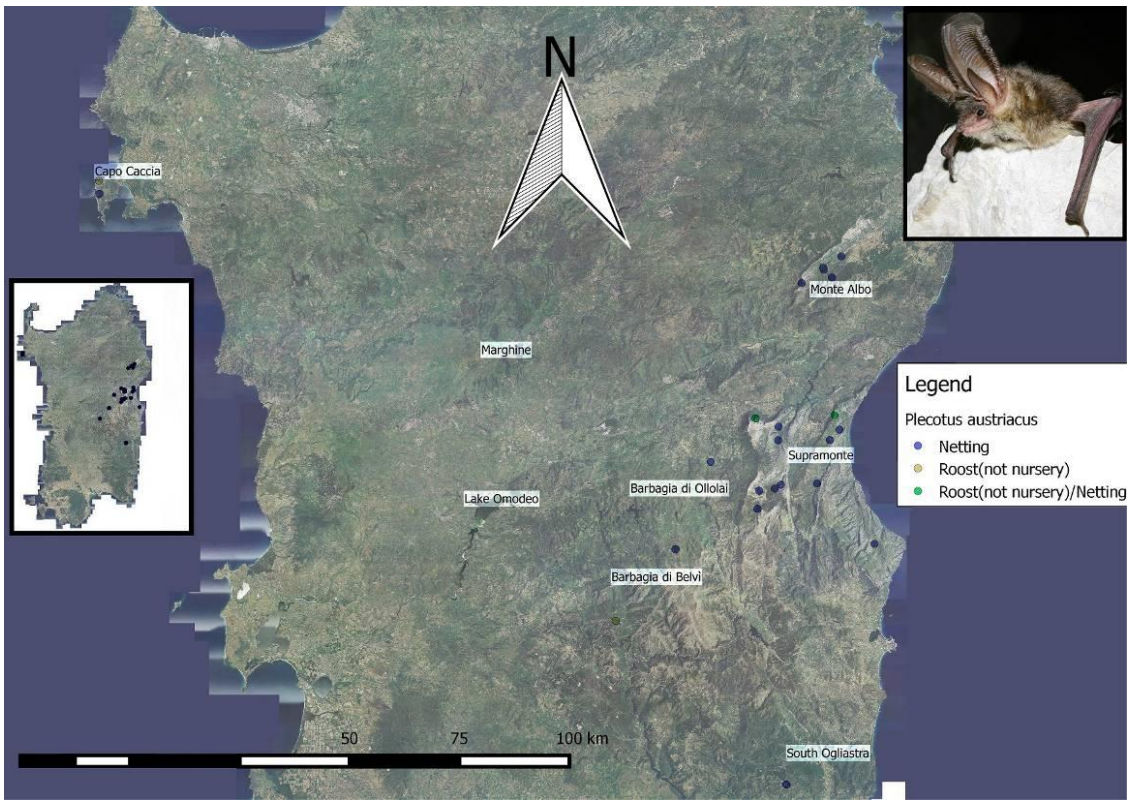

Figure 8: Presence of *P. austriacus* update to 2016. This is the most spread species, which is present in the Supramonte, Monte Albo Capo Caccia, Barbagia di Belvì, Barbagia di Ollolai.

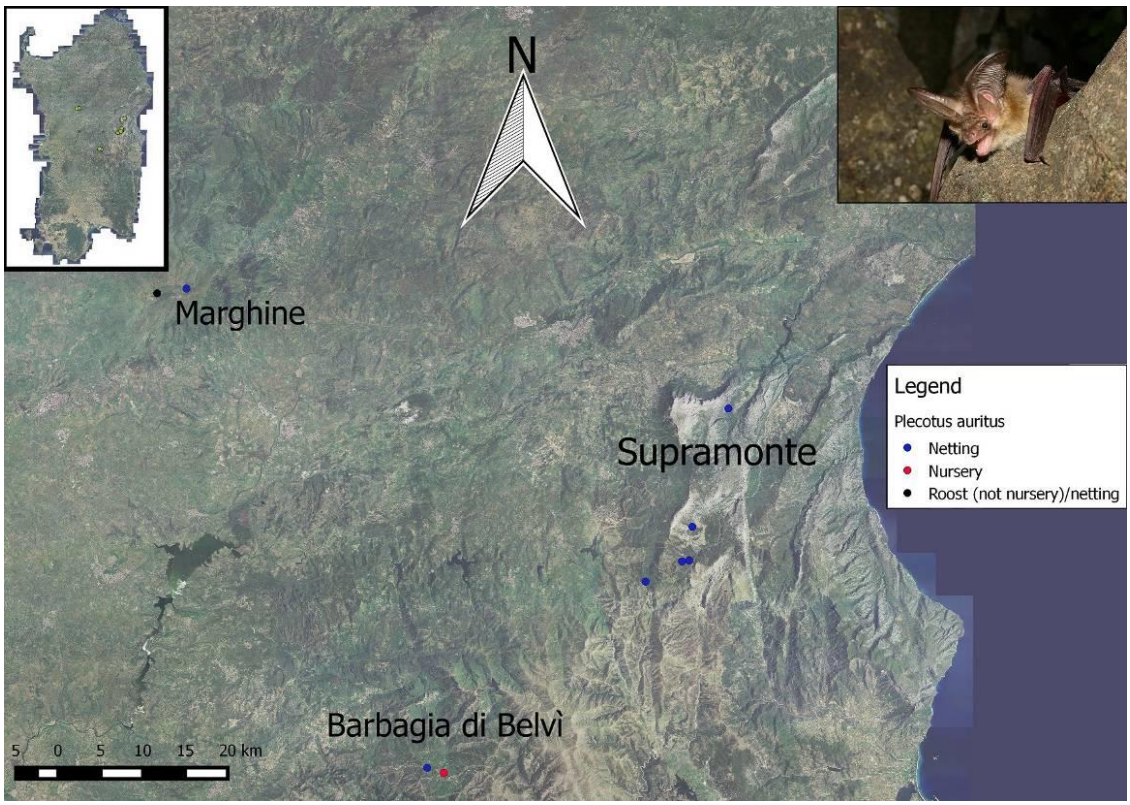

Figure 9: Presence of *P. auritus* update to 2016. This is the rarest species of the genus *Plecotus* in Sardina, it is present just in some part of Supramonte, Barbagia di Belvì and Marghine.

8. Problems occurred during the project, species concerned

The total number of nurseries of *P. sardus* is five: Two are hosted in caves and three in buildings. There are also other roosts that are used by males across the year and for hibernation, but no big hibernation site is known. Here we report a number of problems concerning the sensible roosts. The loss of roosts is now the most dangerous known threat to the species.

Supramonte Area

Grotta Myotis, Baunei, Nuoro

This colony lives in a cave without touristic and speleological value, in a cliff not so interesting for hiking because it is in a dangerous and harsh path. Despite the name, just a *P. sardus* colony is present inside. It is very difficult to count the number of animals inside the cave, but we assessed less that 10 individuals in this year. In 1996 there were at least 50 individuals, in another survey (2006) there were no individuals inside the cave. It is plausible that the animals switch from a cave to another cave completely or partially. Supramonte has a high number of known (more than thousand) and a lot of not yet discovered caves, and a complete survey of all caves in one season is impossible.

Figure 10 A picture from 1996 when the colony of *P. sardus* was at 7-8 meters high. In 2016 it was situated more than 15 meters high and it was impossible make good pictures.

The roof of the cave is very high (Fig. 10) and it is not easy to see the bats in the dome. We could assess the species from a dead specimen on the ground. It is not easy to put a net in the entrance of the cave with the entrance is very high (around 15 m).
The best solution could be to equip the cave with caving tools, to help during the survey the bat-researcher to climb up until it is possible to make a good picture of the colony.

Grotta della Madonna, Baunei, Nuoro
The biggest colony of *P. sardus* in the Supramonte area is hosted in a sea cave. The colony hosts roughly 50 individuals. They use different parts of the cave, not just the completely dark, but also parts that are just partial in the shadow In the 2003 survey the number of bats was roughly the same. The cave is situated in a part of the coast with a high pressure from summer tourists. A lot of motorboats from Cala Gonone, Santa Maria Navarese and Siniscola harbours are running along the coast and many go inside the cave in order to let visitor swimming there. Additional this on the motorboats music is played, so the acoustic disturbance is very high.
A solution could be to talk to all the competent authorities (the municipalities, law enforcement agencies: Guardia Costiera and Corpo forestale e di Vigilanza Ambientale and the managing authorities of the Natura 2000 area) and to close the access to the cave with buoys.

Grotta Sa oche (also “Sa ohe”, Oliena, Nuoro,
The holotype of *P. sardus* was found in this cave that was used by a few males across the year like roost. Now, in order to make the cave suitable for tourism, a big system of enlightenment was installed which disturbed the bats, so they are not present anymore.
One of the floodlights is pointed directly where one of the *P. sardus* specimens was used to hang.
This is one of the caves in Sardinia where it was possible to catch more species of bats, especially in late summer during the swarming season. All three *Plecotus* species are still netted in the night

coming from outside, and a refurbishment of the initial conditions would probably be followed by a re-occupation.
The conflict between tourism and conservation of suitable roosts could be easily solved with the exchange of light systems to the possibility to purchase helmets with lights that tourists can use. The number of tourists is still not high, so it is not a problem to change the system of using the cave and at the moment the low number of tourists is probably not a problem itself.

Grotta Su Bentu, "The wind", Oliena, Nuoro
Su Bentu is one of the most famous caves of Sardinia. It is very long (more than 20 km) and has very particular speleological highlights. In the last years it is used also from ESA for training. This year, netting in the entrance we caught 2 post-lactating females of *P. sardus*, it is the first time that we found a female in the northern area of Supramonte (Fig. 11).

Figure 11: In all this three areas we found lactating females of *P. austriacus P. auritus* was found only in the cave "Sa oche/sa ohe" *P. sardus* was found just this year in the cave "Su Bentu" close to previous cave, in the 'Supramonte of Oliena'.

The females were caught in September, so they can belong to other parts of Supramonte, but it is possible that a nursery colony is present also in this area of Supramonte. Inside the cave is a gate separating the long and huge entrance from the rest of the cave. The gate is not explicit made to allow bats to pass it and we don't know if they actually have a problem if they want to use the rest of the cave as roost.
We never found *P. sardus* in man-made structures in 'Supramonte area'. However, this year we found two roosts of *P. austriacus* in buildings, one in Supramonte and the others in Ogliastra. Despite we may assume that *P. sardus* is strictly cave-dwelling in the karstic area, and like house-dwelling bats in the non-karstic area this records of *P.austriacus* might indicate that also *P. sardus* could use man-made shelters.

Lake Omodeo Area

School of Busachí, Busachi

One of the few maternity roosts of *P. sardus* is inside of a school attic in Busachi town and it is used also as a hibernation site .The colony is threatened by the nesting of pigeons inside the attics where the colony is present. We are studying the best way how to get away the pigeon without disturbing the bats. Unfortunately, any action taken in the school can just be done in a working day and this makes it difficult for volunteers to monitor any change in the entrance to keep away the pigeons without locking out the bats.

About eleven years ago there was a restructure of the building that probably halved the size of this nursery colony (at that time it consisted of about 300 specimens). The building needs to be restructured again, and the mayor of Busachi is willing to do this. However, it seems that there will be no restoration in near future. We already talked with the technical office in charge in Busachi to explain how to carry out the restoration without harming the colony. The Ce.Pi.Sar. already sent a letter to all the authorities and agencies in charge. Ce.Pi.Sar. has done a project that involved Ce.Pi.Sar., Busachi town and the Italian Ministry of Environment (MATTM) for some action to protect the colony of Busachi School. We hope that this previous agreement will be a base to avoid future damage to the colony.

Santa Chiara Village, Ula Tirso

This is the other big nursery in the Lake Omodeo area, also this is used by few individuals in the winter for hibernation. This year we counted about 60 animals composed of mainly females and offspring. The attic is also used by *Rhinolophus hipposideros* a nursery roost. The locality belongs to the previous public Italian power company and the entire village is on sale. The buildings are abandoned and in continuous decay. It is threatened because buildings are falling apart and due to vandalism. In the future, the building which hosts the colony will have problem of the solidity. Moreover, the colony is disturbed by pigeons.

Since a long time we are trying to buy the building and restructure it; then it should be given to a competent Sardinian authority. Ce.Pi.Sar already wrote several letters to all the authorities and agencies in charge to avoid vandalism and disturbance inside the village.

Moreover, in the surrounding area of the village there is a big anthropic pressure. Beside the village, there is a photovoltaic power system, and some buildings are related with light pollutions. Not far from the village to the South is a small industrial area with light pollution and photovoltaic power system. Down the hill of the village (east direction) in the park of a restaurant is a bright light that is also dangerous for driving. In western direction in the junction of the street there is light in the quarry. It is very important to not add additional anthropic pressure like photovoltaic that could reduce the foraging area of the species (Fig. 12 and 13).

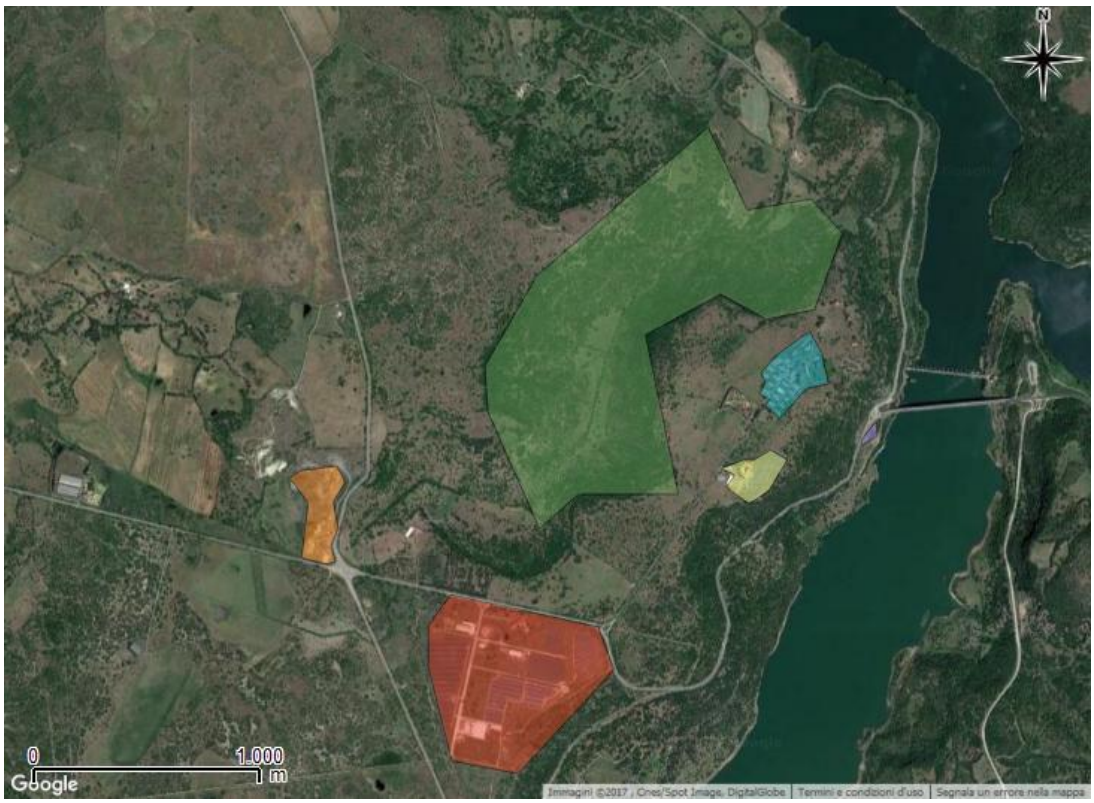

Figure 12: Overview of S.Chiara. S.Chiara village (light-blue), the quarry (orange), the industrial area (red), the photovoltaic area (yellow), the restaurant with the bright light (purple) and the green area is the hunting area of *P. sardus* according our last radio-tracking season**.**

Figure 13: Detail of S.Chiara. S.Chiara village (light blue) with the photovoltaic area (yellow) and the restaurant (purple) with the bright light and is the hunting area (green) according our last radio-tracking season.

Santa Chiara dam house, Busachi

The roost of the nursery colony of *P. sardus* in the house beside the old dam of Santa Chiara is falling apart, and just a few animals live (15).This year, we discovered that, the whole building was completely closed by bricks from the "ENAS", the Sardinian agency in charge for the dams and which is the owner of this building. Immediately the Ce.Pi.Sar asked the permission to open a space in the walls, and in April opened a space of 25 cm in the first line of bricks in the two entrance close. This summer we found that the building is still used by *P sardus* and other species, but we don't know if and how many bats died inside while the building was closed. If it could be possible to install a door in the closed wall it would avoid vandalism but however allow to go inside and continue the monitoring of the colony.

Bridge rio siddu, Busachi

This roost was discovered in the last year thanks to a radio-tracked animal that changes its roost. The bat/s are probably in the crack of the bridge. It is not possible to count individuals from the bridge. We tried to record the bats flying out from the bridge with no success.

One way could be to count from under the bridge (a private property) using a very good infrared camera.

'Casa cantoniera di San Pietro', Ovodda

In this building there was a single *P. sardus* hibernating; afterwards this building was colonized by pigeons, and now this individual is not there anymore. Again pigeons can be a big problem for the roosts.

Hibernations places

The other hibernation place known are the caves Sa Conca e Sa Crapa and S'Abba Medica, and Grotta di Su Santuariu where 1-2 individuals are presents. Due to the difficulty of recognize the species its species identity is not sure. These two caves are used by cavers but they are not threatened by excessive use.

Overall conclusion:

Sardinia is one of the poorest and retarded areas of Western Europe. *P. sardus* occurrences are in places where species conservation has very low value. All this area has still a strong pastoralist background where from one side there is a high respect for the territory from the other side animal welfare and species conservation is not contemplated at all.

Italian slow bureaucracy and countless competent authorities with overlap in competence makes any kind of action on local or regional scale very hard and slow. Indispensable to the conservation of *P. sardus* is that all the competent authorities should be aware and interested in this species' conservation. Without this prerequisite any further actions will be very hard or impossible to be carried out. Unfortunately, in a lot of Natura 2000 sites management plans are made without any consideration of bats.

It is very important that the three colonies in buildings must belong and/or management from agencies or association that are interested and with the expertise to do so. The higher Sardinian agency for nature conservation (Servizio tutela della natura) is not interested in the purchase of the house.

No further action for the species can be carried out on just voluntary position, and one of the big reasons is not just the high number of fieldwork required to continue to the investigations on species occurrence and ecology, but also the need to interact with all agency and politicians for planning and lobbying.

Furthermore, is not possible, legally and morally, to let the bundle of conservation of one of the rarest mammal species of the world to be done by a voluntary association made up of just 3-4 people. With this project, we just scratched the surface of the knowledge of this species. Concerning the rank of the species, according to the IUCN criteria we conclude that the species should evaluated like Endangered, like it is already in the Italian red book of endangered species but not in the IUCN Red List.

Future action of research and monitoring that we suggest are:

- Continuing the monitoring of the known colonies and the area where the species is present.
- Divide Sardinia in 24 part of 1,000 km^2 squares and carry on, starting to the squares where it is more likelihood that the species occurrences, intensive data collection of one square every year.

1) Carry on radio-tracking of the colonies of Lake Omodeo in order to get more information on the basic ecology and how to protect the foraging area. This can only be done by a team of several people (at least 6) with adequate cars.
2) Radio-tracking in Supramonte area is harder or even impossible since one nursery is in a cliff and the other in a sea cave, here it will be better to carry on radio-tracking in order to find new roosts. It is also wise in this case to use a proper number of people (at least 10).
3) Radiotracking of other *Plecotu*s species is recommended. Sardinia is the only Island where three species of *Plecotus* are present. According to our data *P. auritus* occurs in temperate and fresh forest in Sardinia. The only nursery is at 645 meters a.s.l., the species is present between 645 meters and 1000 meters with one exception. *P. sardus* nurseries are from sea level to 470 meters. There is no overlap in nursery distributions. In contrast, *P. sardus* and *P. austriacus* show a huge overlap in distribution, but this is more karst-dependent and more spread. Our current information is few and biased since mist-netting was carried out in the most attractive areas like cave entrances or ponds that are very rare in Supramonte and can attract bats from very far distances. Despite this overlap according to abundance and sex, we can assume the *P. austriacus* prefers young woods, complex scrubs, and open land. Instead, *P. sardus* prefers Mediterranean complex forest. If *P. sardus* just avoids scrubland and open forest or if it is affected by competition from *P. austriacus* is not known. The answer to this question could be a key stone for *P. sardus* conservation.

Pastoralism is a pillar of Sardinian culture and economy. In the lake Omodeo sheep's pastoralism is wide-spread. We can not assess the effect on *P. sardus*, but it reasonable to assume that low pressure of pastoralism (especially when shepherds don't burn woods to create new meadows) allow the presence of open space and edge space that can be attractive for the species as foraging habitat.

Instead, in Supramonte the more present livestock is cows, horses, and pigs. Overgrazing by these animals don not allow woods or even scrublands to reestablish, with a loss of habitat for *P. sardus* and an advantage for *P. austriacus.*

In this area livestock is not bred for economic purpose, rather people from the village just have animals and let them graze in public meadows, sometime with some economic benefit from agriculture funds. This kind of traditions is very settled and it is not easy to remove. Similar

problems occurrences with the use of public woods, where is very hard stop the logging from the population.

9. Contribution of the project to the objectives of the EUROBATS agreement

a) Numbers and names of related EUROBATS Resolutions
6.7: Conservation and Management of Critical Feeding Areas, Core Areas around Colonies and Commuting Routes
6.8: Monitoring of Daily and Seasonal Movements of Bats
6.10: Synergies between the Agreement and Other European Treaties for Nature Conservation
6.11: Wind Turbines and Bat Populations
6.16. Implementation of Conservation and Management Plan
4.3: Guidelines for the Protection and Management of Important Underground Habitats
4.5: Guidelines for the Use of Remedial Timber Treatment
b) Related points of action of the Conservation and Management Plan;
• Population Survey and Monitoring
• Roosts
• Habitats
7. International co-operation

10. Products (e.g. publications, workshops, seminars) and other outcomes of the project

Bosso L., Mucedda M., Fichera G., Kiefer A. & Russo D. (2016) A gap analysis for threatened bat populations in Sardinia. Hystrix, 27 (2): 1-3. doi:10.4404/hystrix-27.2-11788

Other papers will be published in the next 2 years

11. Detailed financial report

Activity	Original Budget	Total Expenditures	Variance	Comments (if the expenditures were different from what was originally planned, please provide a short explanation)
	EUR	EUR	EUR	
Activity 1 -Fieldwork				
Staff and other personnel costs				
Travel	4.694	4.818		Employment of a motorboat was reduced whereas a number of car trips increased
Contractual services	300	176		see above
Supplies, commodities and materials				
Equipment, vehicle and furniture				
General operating and other direct costs				
Indirect support costs				
Sub-total	**4.994**	**4.994**		
Total Cost				

12. Summary (a short article with the most important outcomes to be put online on the EUROBATS website. The final report and the summary should contain acknowledgements to the donor countries that funded the project).

2015 was a successful year for the knowledge of *Plecotus sardus*. During our project we discovered two new roosts of this species; one of these potentially is the first hibernaculum of this species in the "Lago Omodeo Area".
We started radio-tracking and got the first data on foraging habitats of the species.
We continued our surveys of the most important roosts and our work in public awareness of the management of the species.
Our preliminary results on the DNA analyses show that there are at least two mitochondrial haplogroups of *P. sardus* on Sardinia. This may be a result of ongoing separation of two populations, or it is a result of historic separation. Further molecular analyses are needed, including nuclear data, to prove the occurrence of two separated populations.

2016 was also a successful year for the knowledge of *Plecotus sardus*. During our project we discovered a new roost in Busachi Town and we could survey the two roosts in Supramonte area after 20 years. We also found new presence points for *P. sardus* and *P. austriacus*.

For the latter species we found also two new roosts and we expanded our knowledge of the presence of the 3 *Plecotus* species in Sardinia. We could assess four of the colony of the species with all together less than 200 individuals counted.

We collect the first data of birth in the species.

We collected DNA samples that we will use for a gene flow study in the species.

We collect also ecological and behavior data that we will be used in the future paper(s) and are already usable for any future conservation action.

We started a path of lobby with public agencies to improve the conservation of bats in Sardinia

We are grateful to the German Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety and the Ministère du Développement durable et des Infrastructures - Administration de la nature et des forêts, Luxembourg to granted our project.

13. We are grateful to

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