

Anne Maenurm, Matteo De Luca, Marco Luca, Stefano Zanini, Sandra Bellomo & Luca Lapini

Preliminary observation about a mixed breeding roost of *Nyctalus lasiopterus* and *Nyctalus noctula* in north-eastern Italy (Friuli Venezia Giulia Region)

Abstract: The Authors present some observations on a mixed breeding roost of giant (*Nyctalus lasiopterus*) and common noctule (*Nyctalus noctula*) in a lowland wood of the Friulian flood-plain. This maternal aggregation is the only known Italian breeding roost of *Nyctalus lasiopterus*. After a short synthesis of the present knowledge about the local situation of this rare bat, the Authors outline a provisional list of the local bat-community.

Key words: mixed breeding nursery, *Nyctalus lasiopterus*, *Nyctalus noctula*, north-eastern Italy, Friuli Venezia Giulia Region, forest management, nature conservation.

Osservazioni preliminari su una nursery mista di *Nyctalus lasiopterus* e *Nyctalus noctula* nell'Italia nord-orientale (Regione Friuli Venezia Giulia)

Riassunto breve: *Gli Autori segnalano una nursery riproduttiva di *Nyctalus lasiopterus* in un bosco planiziaro della bassa pianura friulana. L'assemblamento riproduttivo è misto, condiviso con molti esemplari di *Nyctalus noctula*, come si evince dalle misurazioni di alcuni animali e dallo studio bio-acustico della loro emergenza serale. I conteggi degli animali effettuati prima dei parti indicano la presenza di più di duecento esemplari, ma non è stato ancora possibile studiare la proporzione fra le due specie. Vista l'estrema rarità di *Nyctalus lasiopterus* in Italia e in Europa, gli Autori svolgono alcune considerazioni di tipo conservazionistico con particolare riferimento alla situazione italiana della specie. Limitate survey bio-acustiche e l'esame della bibliografia infine consentono di comporre un quadro complessivo della locale comunità di chirotteri.*

Parole chiave: *nursery riproduttiva mista, *Nyctalus lasiopterus*, *Nyctalus noctula*, Italia nord-orientale, Regione Friuli Venezia Giulia, gestione forestale, conservazione della natura.*

Authors Addresses:

-Anne Maenurm (hereinafter A. M.), Torviscosa, I-33050, Udine - annemaenurm@gmail.com; www.annemaenurm.com

-Matteo De Luca (hereinafter M. D. L.), Via Venezuela 31, I-33100, Udine - teto8@libero.it

-Marco Luca (hereinafter M. L.), Regional Forestry Corp of the Autonomous Region Friuli Venezia Giulia, Forestry Section of Cervignano del Friuli, Via Mons. A. Ramazzotti, 16, I-33052, Cervignano del Friuli, Udine - marco.luca@regione.fvg.it

-Stefano Zanini (hereinafter S. Z.), Regional Forestry Corp of the Autonomous Region Friuli Venezia Giulia, Forestry Section of Coseano, vis Caporiacco, I-33034, Fagagna, Udine - stefano.zanini@regione.fvg.it

-Sandra Bellomo (hereinafter S. B.), ODV (Organizzazione di Volontariato) NGO "Pronto Soccorso Pipistrelli", Via Bosco dell'Arneret 17, I-33080 Fiume Veneto, Pordenone - sannyfly68@gmail.com

-Luca Lapini (L. L.), Sezione Zoologica del Museo Friulano di Storia Naturale, via C. Gradenigo Sabbadini, 22-32, I-33100 Udine - lucalapini1@gmail.com

Introduction

The giant noctule bat (*Nyctalus lasiopterus*) is a big arboreal species very rare both in Europe (Dietz et al., 2009) and in Italy (Lanza 2012), where it has been signalled only in about 20 localities (Lapini et al., 2019; Agnelli et al., 2019; Agnelli & Lapini, in press).

The casual discovery of a mixed maternal roost of this arboreal bat in north-eastern Italy is particularly interesting. The preliminary results of the studies conducted on this roost in 2021 and 2022 constitute the matter of this paper.

The communication of georeferenced observations about this roost is a first unavoidable step to impose the legal protection of the little lowland wood used by bats. A wrong forest-management of this wood-patch, indeed, could easily harm the breeding roost studied.

The area of researches

The lowland-wood theatre of the observations is the so called “Bosco di Pradiziolo” (Municipality of Cervignano, Udine), a private 20 hectares relict of the ancient pristine wood named “Silva lupanica” (Sguazzin, 2004; Maenurm, 2021).

This last was a wet oak and ash forest [*Asparago tenuifolii-Quercetum roboris* (Lausi 1996) Marinček 1994] that once completely covered the upper Adriatic coasts between the Catchments of River Livenza and River Isonzo, today fragmented in a lot of scattered little patches of woods dispersed in the lowlands of the Region Friuli Venezia Giulia (Sguazzin, 2004). Complexively they reach an extension of about 500 hectares, at present increased by various experiences of habitat restoration up to about 700 hectares.

Botanic and floristic details about these relict woods have been gathered by a lot of authors and a complexive synthesis of their observation have been published by Sguazzin (2004).

The facts

During the realization of a photo-naturalistic book on the lowland woods of the Friulian flood-plain it was possible to observe and photograph a lot of big bats fly away from a tree-hole of an aspen (*Populus tremula*), located at about 8 meters high. These bats were then visually determined by L. L. on the base of various photos published by Maenurm (2021: 92: fig. 4).

It was therefore possible to reconstruct the first data collected on these bats:

-On April, 30th, 2021, 20:16 the phone-video recording of a part of this nursery emerging allows to count at least 88 large bats (A. M. obs.);

-On May, 1th, 2021, 20:13 hours, evening emergence of the same bats, lasted till 20:22 (A. M. obs.);

-On May, 5th, 2021, 20:41 hours, evening emergence of bats, lasted till 20:47 (A. M. obs.) (Fig. 4);

-On May, 21th, 2021, 20:46 hours, first bat exit from the tree hole (A. M. obs.);

-On May, 21th, 2021, 20:49:15 *Picus viridis* arrives at the entrance entering in the tree hole; it flies immediately away from the hole with at least two large bats cling to the body, entangled in a short flying fight (A. M. obs.);

-On May, 21th, 20:49:27 *Picus viridis* returns at the entrance of the tree hole after the short fight with the bats (A. M. obs.)

These first observations were the starting point of further observation conducted both in 2021 and 2022 particularly focused on:

- 1-to determine the bat-species syntopic in the same arboreal roost;
- 2-to determine the species of trees used as roost by these forestal bats;
- 3-To determine the number of trees used as maternal roosts by bats;
- 4-To determine the internal structure of some roosts used by bats.

Methods

The main objective of the field monitoring was to avoid any kind of disturbance, both in the reproductive and in any other phenetic period of the studied bats. For this reason photos of flying and resting bats have been obtained by using digital cameras with small teleobjectives, both by hands or activated by photocells with motion sensors.

Localization of the trees used by breeding bats:

-Noctules are very vociferous in their breeding aggregations, and the low-frequency calls emitted in their reproductive tree shelter can be heard by some persons also without bat-detector. The frequent inspection of the wood permits to A. M. to take a census of various trees used by breeding bats. Fifty-five (55) field sampling days (about 550 hours) were complexively employed for this census, contemporary with other various photo-naturalistic activities.

Species determination from photos:

-the visual determination of flying bats from photos allows to distinguish hairy-winged noctules (*Nyctalus lasiopterus*: ventral side of the wings hairy at least up to the elbow: Fig. 2) from bare-winged ones (*Nyctalus noctula* and/or *Nyctalus leisleri*: almost bare ventral side of the wings).

-some specimens were photographed resting in high tree-holes, in some cases with forearms well exposed on the border of the hole (1). With the same angulation were then taken photos of the same tree-hole cavity with a physically superimposed meter (2). The overlapping of 1 and 2 allows a precise measurement of the bat-forearms well exposed on the border of the same tree-hole (Fig. 6).

Bats count:

-A provisional bat estimation numbers has been based on their count at the evening emergency, particularly performed by A. M. and S. Z. Sometimes they where video-recorded to obtain more precise numerical estimates.

Species determination of handled bats:

-The study and recovery of each specimen fell to the ground or injured in the research zone during the years 2021 and 2022 gathers integrative data both on the studied maternal roosts and on other sympatric bats. They were determined by L. L., treated from a health point of view by the ODV (NGO) “*Pronto Soccorso Pipistrelli*” managed by S. B. and after released in the original recovery

point of each animal. The determination of handled bats has been performed by using the canonic diagnostic characters indicated by Dietz et al. (2009), Lanza (2012), Dietz & Kiefer (2014).

Observation of the internal structure of some breeding roost

-The study of the internal structure of some breeding roost at present was very limited to avoid any disturbance to breeding bats. Up to now it has been performed only by visual inspection of the first cavity individuated by A. M. on May, 5th, 2021, observing from the same exit hole used by bats.

Bio-acoustic bat surveys

-A provisional bio-acoustic survey was performed both in the wood and in its surroundings by using the Pettersson D1000x bat-detector, after integrated by a short night-by night ultrasonic survey performed by using the Pettersson D500x bat-detector. The recorded bat sounds were then analyzed by using the software BatSound 4.2 Pettersson, as already done in the Bats 2013-2014 monitoring project recently funded by Friuli Venezia Giulia Regional Administration (Lapini & Dorigo, 2015).

Results

-Up to now it has been possible to take a census of 12 trees utilized by breeding bats.

-The photographic identification of flying bats allows a first determination of *Nyctalus lasiopterus* and *N. noctula*, after confirmed by bio-acoustic techniques. The measurement of the forearm of various specimens allowed to confirm previous photographic and bio-acoustic identifications.

-The breeding bats use at least 12 trees of various species (*Populus tremula*, *Fraxinus angustifolia* and *Quercus pedunculata*) originally excavated by various woodpeckers (*Picus viridis*, *Dryocopus martius*, *Dendrocopos major*). Nevertheless, only one of these trees appears to be dead.

-Up to now only one of the cavities used by bats, located in a *Populus tremula*, has been partially explored by M. L. and S. Z. This cavity seems to be particularly extended, developing for several meters inside the tree.

-The contemporary presence of *Nyctalus leisleri* was verified by the late-summer recovery of an injured reproductive female from a locality very near to the studied roost. This female have been collected on September, 15th, 2021 by the Forestry Service of the Friuli Venezia Giulia Public Administration [CFR-FVG] in a locality that is about 2,4 km N-NE far from to the studied nursery and then recovered from a health point of view by the NGO “*Pronto Soccorso Pipistrelli*”. At its release (May, 24th, 2022) this bat made two or three circular self-orientation flights around to the local highway bridge, then pointing directly towards the studied nursery which are about 300 meters away.

Noteworthy remarks and perspectives

-The studied nursery is the only known Italian breeding roost of *Nyctalus lasiopterus*. In this maternal aggregation during the summer 2022 the species gave birth on June, 13th (Fig. 7 and 8). This is the only available datum about the birth period of the giant noctule in Italy.

-Our preliminary observations confirm that also in Italy the species constitutes mixed nurseries with *Nyctalus noctula*. The contemporary presence of *Nyctalus leisleri* in the area of researches indicate the possibility that in this lowland zone *Nyctalus lasiopterus*, *N. noctula* and *N. leisleri* can share the same breeding roost. Further studies are needed to confirm the local breeding of *Nyctalus leisleri*, that in Italy up to now seems to breed only in three localities of central Italy (Ancillotto & Russo, 2015).

-The studied nursery has been settled in at least four arboreal species (*Populus tremula*, *Fraxinus angustifolia*, *Quercus pedunculata*), using tree holes excavated by various woodpeckers (*Picus viridis*, *Dryocopus martius*, *Dendrocopos major*). In one *Populus tremula* the original *Dryocopus martius* cavity seems to be vertically extended to all the trunk, being probably used by bats also in cold season. Around to this tree, anyway, there are at least other eleven trees used by breeding bats, all enclosed in a wood patch of about 150-300 meters of diameter.

-From our preliminary observations seem to be clear that breeding bats are very mobile, constantly moving from one cavity to another. On the base of these observation we hypothesize that all the trees locally used by bats may be parts of a single large mixed maternal roost of *Nyctalus noctula* / *N. lasiopterus*.

-Almost all the nursery of noctule-bats discovered in Friuli Venezia Giulia Region were located in monumental trees of parks and urban avenue (Lapini et al., 1996), as happens in many other Italian Regions (e. g. Giuntini et al., 2022). In Friuli Venezia Giulia, anyway, noctule-bats often breed also in buildings, chimneys, bridges and other anthropic structures (Lapini et al., 2019). The mixed breeding aggregation described in the present paper is the only one known located in a natural wood of the whole Friuli Venezia Giulia Region (Lapini et al., 2020). Its legal protection certainly constitutes a priority in Nature-conservation of the whole north-Adriatic hinterland.

-The ultrasound bat-detector studies performed in the study zone and surroundings has gathered various data about the local bat-assemblage. The bat community in and around to this little lowland wood seems to be composed at least by: *Pipistrellus kuhlii*, *Pipistrellus nathusii*, *Myotis daubentonii/capaccinii*, *Myotis myotis/blythii*, *Nyctalus noctula*, *Nyctalus leisleri*, *Nyctalus lasiopterus*, *Hypsugo savii* (Tab. I).

-The protection of this small lowland wood seems to be essential to preserve the studied nursery, particularly for its future conservation. At present the wood of Pradiziolo (Cervignano, Udine) is not legally protected, but its owner gathers a very high degree of tranquillity to the wood, which is a part of a bigger private hunting estate (a so called “Azienda Faunistico Venatoria”). For this reason it is protected by fences and metal gates with the aim to reduce the main anthropic pressures in the forest (generic tourists, photo-naturalists, mushroom pickers, hunters, etc.). Its legal protection, anyway, is very urgent particularly to avoid possible wrong practices of forest-management, often capable of eliminating all hollow trees. The *Biodiversity Service* of the Public Administration of the Region Friuli Venezia Giulia indicates that the art. 20 of the Regional Law 42/1996 could ensure the protection of this wood even by continuing the usual cynegetic and agro-silvopastoral low-impact activities.

-Our observations confirm that the respect of dead or diseased vertical trees perforated by woodpeckers is very important in forest-management from a conservation point of view (e. g.

Meschede, 2001; Marchesi et al., 2008; Jackson, 2018; Marchesi et al., 2020), allowing the reproduction of rare forestal bats (Russo et al., 2004). The noctule-bats studied, however, seem to select hollow trees still alive for their breeding activities, probably for the particularly favorable hygrothermic conditions found in their cavities.

-The field-researches will be continued with limited mist-netting sessions, handling and sampling authorized by law (Auct. 80811 released by Ital. Env. Min. for the years 2022-2024), but this paper already indicate that a correct and intensive use of photography can be an important tool to study elusive arboreal bats avoiding any disturbance.

-Considering the conservation status of *Nyctalus lasiopterus* both in Italy and in the whole Europe, anyway, the legal protection of the discovered roost must becomes a local conservation priority (Agnelli & Lapini, in press, see below).

Global IUCN status: **Vulnerable – VU**

Italian IUCN status: **Critically Endangered – CR**

Protection laws and International Conventions: **Berna Conv.**, All. II; **Bonn Conv.**, All. II; **EUROBATS Agreement**; **Habitat Directive 92/43 CEE**, All. IV; **Italian National Law on wild and game wildlife protection 157/92**.

In Italy the most binding of these protection laws and International Conventions surely are the Italian National Law on wild-game and wildlife protection (L. N. 157/92) and the Habitat Directive 92/43 CEE.

Aknowledgements

We would like to thank the present owner of the wood of Pradiziolo which kindly granted frequent night access to the research area, to Alessandro Di Giusto and Luca Dorigo for some pictures and measurations respectively, to Michele Cassol and Emiliano Mori for various bibliographic suggestions and to Bruno Sorato and Massimo Zucco for their kind assistance in the field. Special thanks to the Wild Animal Recovery Center and to the Biodiversity Office of the Public Administration of the Region Friuli Venezia Giulia for various aids and technical suggestions.

References

Agnelli P., Boga R., Dondini G., Lapini L., Simoncini I. & Vergari S., 2019. Nuovi record di nottola gigante in Italia. *Atti del IV Convegno Italiano sui Chiroteri, 17-18-19 ottobre 2019 organizzato dal GIRC e dall'ATit*, sezione Poster: 34, Padova.

Agnelli P. & Lapini L., in press. *Nyctalus lasiopterus*. In: Loy A., Baisero D., Bon M., Di Febbraro M., Amori G. (Eds) *Atlante dei Mammiferi in Italia. Atlas of Italian Mammals. Edizioni Belvedere* (in press).

Ancillotto L., Russo D., 2015. Reassessing the breeding range limits for two long-distance migratory vespertilionid bats, *Pipistrellus nathusii* and *Nyctalus leisleri* in the Italian peninsula. *Mammalia*, 79(2): 245-248.

- Dietz C., Nill D., Helversen G. von, Lina P. H. C. & Hutson A. M., 2009. Bats of Britain, Europe and northwest Africa. *A&C Black ed.*, London: 1-400.
- Dietz C. & Kiefer A., 2014. Pipistrelli d'Europa. Conoscerli, identificarli, tutelarli. *Ricca ed.*, Roma: 1-399.
- Giuntini S., Ancillotto L., Falaschi M. Viviano A., Palagi E. & Mori E., 2022. Alien parakeets as a threat to the common noctule. *Atti XII Congresso Nazionale di Teriologia, ATit. Hystrix*, supp. 33: 89.
- Jackson D., 2018. Bats & Trees. *Bat Conservation Trust (BCT) ed.*, London: 1-8.
- Lanza B., 2012. Fauna d'Italia, Chiroptera. *Calderini*, Bologna.
- Lapini L. & Dorigo L. (a cura di), 2015. I Chiroterteri protetti dalla Direttiva Habitat 92/43 CEE nella Regione Autonoma Friuli Venezia Giulia. Monitoraggi 2013-2014. Relazione finale. Museo Friulano di Storia Naturale-Udine - *Relazione inedita presentata all'Ufficio Studi faunistici della Regione Friuli Venezia Giulia*, Udine: 1-140.
- Lapini L., Dorigo L., Luca M., Lapia M., Bufo P. & Urso G., 2019. Remarks about some noteworthy bats from northeastern Italy (Friuli Venezia Giulia Region: Chiroptera: Vespertilionidae: *Myotis bechsteinii*, *Myotis capaccinii*, *Myotis daubentonii*, *Nyctalus lasiopterus*, *Nyctalus noctula*). *Quaderni del Museo Civico di Storia Naturale di Ferrara*, 7 (2019): 61-139.
- Lapini L., Dorigo L., Luca M. & Pontarini R., 2020. Preliminary chorologic Atlas of the bats from Friuli Venezia Giulia Region (Mammalia, Chiroptera; north-eastern Italy). *GORTANIA Botanica, Zoologia*, 41 (2019), 7: 109-123.
- Marchesi L., Zanin M. & Zorer P., 2008. Lunga vita ai tronchi col buco! I picchi e la biodiversità forestale: i primi 580 alberi tutelati in Trentino. *Natura alpina*, 59, 1: 15-26.
- Marchesi L., Angeli F., Pedrini P., Pedrotti L., Rizzolli F., Tenan S. & Zorer P., 2020. La conservazione degli alberi con cavità nido realizzate dai picidi in provincia di Trento. *Dendronatura*, 1: 84-92.
- Meschede A., 2001. Bats in Forests - Information and recommendation for forest managers "Landschaft als Lebensraum". *German Association for Landcare Deutsche Vierband für Landschaftspflege (DVL)*, Ansbach, Germany, 4 (July 2001): 1-21.
- Maenurm A., 2021. Silva Lupanica. Anima di un bosco friulano - Soul of a Friulian Forest (Edizione bilingue). *Corvino ed.*, Fagagna, Udine.
- Russo D., Cistrone L., Jones G. & Mazzoleni S., 2004. Roost selection by barbastelle bats (*Barnastella barbastellus*, Chiroptera: Vespertilionidae) in beech woodlands of central Italy: consequences for conservation. *Biol. Cons.*, 117 (2004): 73-81.
- Sguazzin F., 2004. I boschi di latifoglie della bassa pianura friulana. In: Bini G. (curatore), 2004. I boschi della bassa friulana. *La Bassa ed.* (72): 17-77.



Fig. 1. A pregnant female of *Nyctalus lasiopterus*, recovered on April, 29th, 2019 in Passons village (Udine), photographed during its release in the wild (Coda Manin wood, Muzzana del Turnano, Udine), June, 3th, 2019, photo M. L.-L. L. (from Lapini et al., 2019). The place of release of this bat is about 15 km far from the nursery studied in this paper.



Fig. 2. The hairy ventral sides of the wings of *Nyctalus lasiopterus* are diagnostic in the comparison with other syntopic species of Italian noctule-bats. Pregnant female, April, 30th, 2019, Passons village (Udine), photo by Alessandro Di Giusto.



Fig. 3. The area of the researches.



Fig. 4. Flying *Nyctalus lasiopterus* photographed in Pradiziolo wood (from Maenurm, 2021: 92).
Photo A. M., Maj, 5th, 2021.



Fig. 5. Flying pregnant *Nyctalus* -probably *N. lasiopterus*- photographed in the wood of Pradiziolo (Maj, 9th, 2022); clearly visible its breasts. Photo A. M.



Fig. 6. Measurement of the forearm of a giant noctule protruding from its arboreal shelter on June, 13th, 2022. The same measurement has been performed on various specimens and photographic sessions, always indicating about 68-70 mm, diagnostic of *Nyctalus lasiopterus*. In the same shelter these bats often take refuge together with *Nyctalus noctula*, with shorter diagnostic forearm measurements. Photos and elaboration by A. M.



Fig. 7. A giant noctule devours its placenta after the parturition in its arboreal shelter. On the right is clearly visible the head of a newborn. Photo A. M., June, 13th, 2022.



Fig. 8. A newborn of *Nyctalus lasiopterus* and its mother in the same tree-hole. Photo A. M., June, 13th, 2022.



Fig. 9. Two *Nyctalus* in the same tree-hole. On the left a smaller species -probably *Nyctalus noctula*- on the right *Nyctalus lasiopterus*. Photo A. M., June, 13th, 2022.



Fig. 10. Almost weaned but not flying young of *Nyctalus noctula* (forearm 51 mm, A. M. leg.) fell to the ground on July, 11th, 2022 in the mixed roost studied, then admitted to the NGO Pronto Soccorso Pipistrelli managed by S. B., photo by L. L.



Fig. 11. Flying *Nyctalus noctula* photographed during the evening emergency from the mixed roost studied. Photo by S. Zanini-M. Luca, July, 12th, 2022.



Fig. 12. *Nyctalus leisleri* (Forearm 44,5 mm), reproductive female collected on September, 15th, 2021, P. Polesello-M. Luca leg., in the railway yard of Cervignano, Udine, about 2,4 km far from the mixed roost studied in this paper. It was heavily injured because completely covered with lubricating grease used for railway switches. Admitted to the NGO Pronto Soccorso Pipistrelli, was cleaned, fed and rehabilitated by S. B. At the release (May, 24th, 2022) this bat made two or three self-orientation flights around to the local highway bridge, then pointing directly towards the studied nursery, which was about 300 meters far from the release location. Photo by S. B.

Tab. I. Provisional overview of the bat-community studied. Bats present around to the study area: from a 10x10 km cell of the UTM grid Cartographic System (Lapini et al., 2020; present paper); bats present within the study area: from original bio-acoustic 2022 summer surveys conducted by L. L., M. D. L. and M. L.

	Lapini et al., 2020; present paper	Bio-acoustic survey 2022
<i>Hypsugo savii</i>	Yes <i>hard</i>	Yes
<i>Myotis daubentonii/capaccinii</i>		Yes
<i>Myotis myotis/blythii</i>		Yes
<i>Nyctalus lasiopterus</i>	Yes <i>hard</i>	Yes
<i>Nyctalus leisleri</i>	Yes <i>hard</i>	
<i>Nyctalus noctula</i>	Yes <i>hard</i>	Yes
<i>Pipistrellus kuhlii</i>	Yes <i>hard</i>	Yes <i>social calls</i>
<i>Pipistrellus nathusii</i>		Yes <i>social calls</i>

Abbreviations: *hard*= *hard data*; *social calls*= *recordings of diagnostic social calls*