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Dataset paper

# Dataset of nocturnal moths in reforested and natural pine stands of the Sila Massif, South Italy

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**ABSTRACT** The dataset we provide depicts the abundance and diversity of nocturnal Lepidoptera sampled using light traps within reforested and natural pine stands of the Sila Massif. Nocturnal Lepidoptera are widely recognised as a good ecological indicator of forest ecosystems, modifying their community composition as ecosystem changes. Sampled sites are located in the Sila National Park on the Sila Plateau, where the length of the flying season depends on the weather conditions, but usually is very short due to the cold winter temperatures. Samplings were carried out from May to June and from August to October 2022. Six sites were selected within reforested areas and four within natural and managed old forests. Moth data includes a total of 17,233 individuals belonging to 308 species, further data concern information on sampling events and sampling sites.

**KEYWORDS**: Lepidoptera, dataset, monitoring, forest management, silviculture.

## Introduction

Reforestations represent a large surface of pine forests in South Italy. In the Sila Massif there was a large reforestation program started in the 1950 following specific State laws (Proto et al. 2020). Most of these reforested areas were not managed from their plantation, being their naturalisation could make a good contribution to biodiversity, especially in protected areas such as the Sila National Park. Thinning is the main silvicultural practice adopted to naturalise pine plantations and how biodiversity respond to such practice is of great importance to re-establish natural ecosystem dynamics.

A major effort is required to gather data on bioindicators mostly due to the taxonomic impediment for species rich taxa (Ritter 2018). For this reason, the availability of public datasets are of strategic importance to test models and to study the consequences of certain management strategies that can have a significant impact on biodiversity and ecosystem functioning, especially when planning activities in reforested areas, the most abundant forested areas in many countries (FAO 2007, Griscom et al. 2017).

Moths are among the most diverse insect taxon in forested habitats (Horváth et al. 2023) and their biological stages perform more than one important ecosystem service. They are defoliators, decomposers, and preys at larval stage (Galante E. 2008, Medina and Barbosa 2002, Myers and Cory 2013), and prey and pollinators during the imaginal stage (Hahn and Brühl 2016, Hammond and Miller 1998, Wickramasinghe et al. 2004) occupying a rich variety of functional niches and microhabitat (Kremen et al. 1993). For this reason, nocturnal Lepidoptera are also excellent habitat disturbance indicators (Kitching et al. 2000, Summerville et al. 2004). Despite their importance, very few standardised quantitative samplings have been carried out in South Europe (La Cava et al. 2023, Piccini et al. 2023, Zucco et al. 2024) as many studies have been carried out by "pure" taxonomists. During a field survey involving a tenth of sampling points as in this study, it is easy to collect 300 species, some of which having cryptic habitus. Moreover, moths should be worked out as soon as possible because fresh material is easier to be identified because wing patterns are still preserved.

Clearcutting, logging and thinning of forests affect the moth's community in different ways (Newbery et al. 1999, Summerville 2011, Summerville and Crist 2002). Other factors affecting diversity and community composition of moths are the scale of disturbance (Hamer and Hill 2000), the forest size (Usher and Keiller 1998), and the forest type (Horváth et al. 2023), and other environmental factors (Axmacher et al. 2004, Brehm et al. 2007).

In order to carry out a complete study, it is therefore necessary to collect a large amount of data. The dataset we provide contains information on the abundance and diversity of moth communities present in different pine stands subjected to a diachronic thinning. It could be particularly useful to help to depict the ecosystem dynamics starting from a thinning event.

## Material and methods

### *Study area*

Three sampling areas in *Pinus nigra* J.F.Arnold subsp. *laricio* Palib. ex-Maire forests were selected in the Sila National Park, Calabria, South Italy (Fig. 1). They include a 30 years-old plantation, one stand of natural old forest and one stand of old forest subjected to selective logging (Fig.1). The 30-years old plantation was partly unthinned, partly with thinning in progress, and partly thinned out from two years. Then, in total we selected five sampling sites of which one in the old natural forest,

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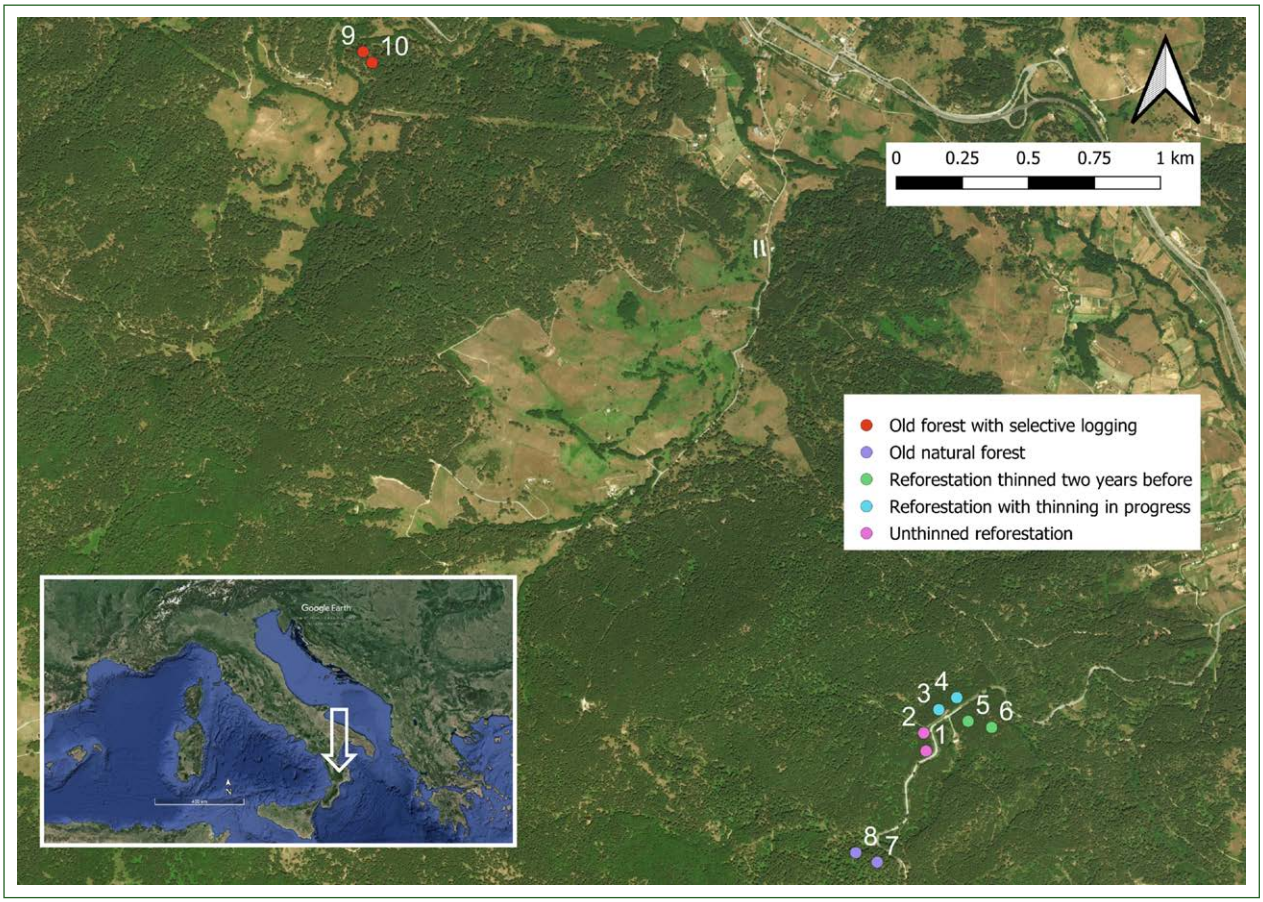
**Figure 1 -** Localisation of the study area in Italy (Map data 2024 © Google) and position of sampling sites within the Sila massif (raster base from: http://ecn.t3.tiles.virtualearth.net/tiles/a{q}.jpeg?g=1). Map realized with Qgis Desktop 3.34.12v.




one in the old semi-natural forest with selective logging, and three in the 30-years old plantation covering the observed thinning stages. For each site we have been settled two georeferenced light traps for a total of ten.

### *Moths sampling*

Sampling was performed during the 2022. We used light traps equipped with UV LEDs (315-400 nm, light angle 120°), as shown in Infusino et al. (2017). They were powered by a battery (15 A, 12 V), using ethyl acetate as the killing agent putting inside the collection bucket an exhalatory bottle from the beginning of sampling. Traps were settled and turned on before dusk during the same night and unsettled the morning after. Sampling nights were chosen when conditions were favourable for moths' flight: not too cold, low wind, little or no rain, and in the days around the new moon phase to maximise the light trapping effect. They worked for one night per months in late spring-early summer (May and June) and in late summer-early autumn (August-October). Only specimens within traps have been considered. Collected specimens were put in small jars with blotting paper and taken to the Wildlife Management and Forest Biodiversity laboratory (GFBF lab) in the Research Centre of Forestry and Wood, Rende, Italy. Specimens were sorted in laboratory, identifying and quantifying the specie belonging to the microlepidoptera families of Limacodidae and Hepialidae and to the macrolepidoptera *sensu strictu* superfamilies Drepanoidea, Geometroidea, Noctuoidea, Lasiocampoidea, and Bombycoidea. Some species needed the extraction of their genitalia for a correct identification. Voucher specimens have been stored in the scientific collection of Lepidoptera of the GFBF lab.

## Dataset content

The dataset is available at the following reference (Rijllo et al. 2024) at the Mendeley communal repository, DOI: 10.17632/55bhgpkhx2.1. The dataset is composed of three files, consisting in the dates of sampling nights ("sampling_nights.xlsx"), the data describing trap locations ("trap_locations.xlsx"), and the abundance data of nocturnal Lepidoptera ("abundance_Lepidoptera.xlsx"). The file sampling_nights.xlsx consists in a list of the day, month and year on which samplings were carried out and represent the days in which traps were turned on. The file trap_locations.xlsx consists in a table with information on the location of traps such as trap code, country, province, municipality, locality, altitude, latitude and longitude in decimal degrees, and a synthetic description of the sampled area. The file abundance_Lepidoptera.xlsx consists of taxonomic information such as family, species name and name of species' descriptors, and the number

of individuals collected for each species within each trap. In addition, the total number of species and individuals collected within each trap is reported, as well as the total number of individuals collected for each species (TOTAL) and the number of traps in which a given species was found (frequency).

The total number of collected individuals is 17,233 belonging to 308 species (Tab. 1).

**Table 1 -** List of sampled specimens divided by families.

| Family | Individuals | Species |
|---|---|---|
| Hepialidae | 1 | 1 |
| Limacodidae | 42 | 1 |
| Lasiocampidae | 58 | 2 |
| Endromidae | 1 | 1 |
| Brahmaeidae | 1 | 1 |
| Sphingidae | 35 | 4 |
| Drepanidae | 32 | 4 |
| Geometridae | 7421 | 115 |
| Notodontidae | 6776 | 11 |
| Noctuidae | 2385 | 136 |
| Erebidae | 474 | 28 |
| Nolidae | 7 | 4 |
| TOTAL INDIVIDUALS | 17233 | 308 |

## Reuse potential and limits

The dataset allows a variety of scientific works thanks to the georeferentiation of collected data. Through the dataset of sites, it will be possible to carry out analyses concerning the effect of forest management on biodiversity, but also the effect of the landscape composition and configuration on individual species and communities using the methods of the landscape ecology. Furthermore, these data, combined with other datasets produced with the same methodology, can be used to compare changes that will occur in the future in communities as a consequence of long-term dynamics such as climate change. Because in the dataset are also included defoliator species, our dataset can also be used to study population dynamics of such important species, e.g. *Thaumetopoea pityocampa* (Notodontidae).

We did not report data concerning the weather such as temperature, wind and so on, but this kind of information can be retrieved from climatic datasets thanks to the reporting of the exact day of sampling. Ecological requirements of species can also be studied using all the files composing the dataset. The autoecology of species can also be improved using this dataset in conjunction with others helping to delimitate phenology, habitat amplitude and so on. The limitations of this dataset are the lack of some environmental data collected directly in the field, as for example floristic data, the fact that it is a very specialised study covering only nocturnal lepidoptera associated with black pine forests, and the low number of replications performed. For this reason, certain types of studies can only be carried out through integration with other data.

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