

# ***Erebia flavofasciata* (Insecta, Nymphalidae), an endangered endemic Alpine butterfly newly recorded in South Tyrol, Italy.**

## **Abstract**

The butterfly species *Erebia flavofasciata* Heyne, 1895 was recorded for the first time in South Tyrol. This record extends the known species distribution area to the east and enriches the already very butterfly-diverse Venosta/Vinschgau valley. An updated distribution map is provided. Further investigations are needed for a more precise delimitation of this new population, that potentially extends over the border between South Tyrol (IT) and Lower Engadin in the Canton of the Grisons (CH), in an area where the species has never been reported before.

Keywords: biodiversity monitoring, alpine endemism

## **Introduction**

*Erebia flavofasciata* is an Alpine endemic species with a limited occurrence in the European Alps. The species inhabits subalpine and alpine meadows and steep grassy slopes between 1700 m (BATTISTI et al. 2019) and 2500 m, oriented south or southwest (MERIT et al. 2010). The hitherto reported occurrence of *E. flavofasciata* is defined by a mean annual temperature of approximately 4 C° and mean annual precipitation of approximately 1300 mm/y (SCHWEIGER et al. 2014) making it a rather cold-adapted alpine butterfly species. It appears to have a biannual development cycle, with the larvae potentially overwintering for two winters before emerging as an imago between early June and August (MERIT et al. 2010). The larvae feeding niche is described as monophagous feeding on Fescues of the *Festuca ovina* aggregate, a grass group widely distributed in this environment, however some report a broader feeding niche with different grass species used facultatively, like *F. rubra* and *F. violacea* (PAOLUCCI 2013). In an interesting work relating wing patterns and geographic occurrences, CUPEDO (2000) described three different subspecies.

The species, main centre of distribution is in southern Switzerland, where it occurs only in the cantons of the Grisons and Ticino. However, some populations were discovered in the Italian Ossola Valleys of Piedmont (MERIT et al. 2010; BATTISTI et al. 2019). A single isolated population was also reported from Paznauntal in the western-most part of North Tyrol (Austria) close to the Swiss border (PFEIFER & BURMANN 1986).

Because of the limited distribution of *Erebia flavofasciata* and the main occurrence in an alpine habitat, the species is considered particularly vulnerable to climate change and is therefore listed by the IUCN as near threatened (NT) at global scale and vulnerable (VU) in Italy (VAN SWAAY et al. 2010, 2011; BALLETO et al. 2016). The countries hosting populations have consequently a great responsibility to preserve their habitat and the populations of this European Alpine endemic butterfly also in the newly recorded population of South Tyrol.

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Fig. 1: Pictures of the location where *Erebia flavofasciata* was recorded for the first time in South Tyrol (Elia Guariento 02.08.2023).

## Methods and Results

The species was recorded during surveys for the Biodiversity Monitoring South Tyrol (HILPOLD et al. 2023). Within this project, the alpine sites are selected to represent the average alpine meadow and scree sites of different bedrock origins. Butterflies are surveyed by combining a transect walk limited to 50 m and 5 minutes of survey with a time area count of 25 minutes on an area of 1000 m<sup>2</sup> surrounding the initial transect (HILPOLD et al. 2023). The identification keys of PAOLUCCI (2013) and BAUDRAZ & BAUDRAZ (2020) were used.

The precise site of record is omitted for conservation reasons but will be communicated to the Museum of Nature South Tyrol and the regional nature conservation entities. The site is located on the south-western facing slope of the Avinga valley at an altitude of ca. 2600 m a. s. l. The habitat is characterized by a grassy, flower-rich and steep slope on siliceous metamorphic bedrock and with a deep (30 cm) skeleton-rich brown earth surrounded by scree areas (Fig. 1). The plant species recorded at the site define the area as an alpine grassy vegetation on siliceous bedrock, dominated by *Fescues* and *Carex sempervirens*, with *Juniperus communis* subsp. *nana* in a south-exposed orientation (the recorded vegetation is provided in the attachments; Table S2).



Fig. 2: Pictures of *Erebia flavofasciata* on site, left the first individual caught (Elia Guariento & Emanuele Repetto 10.07.2023 & 02.08.2023)

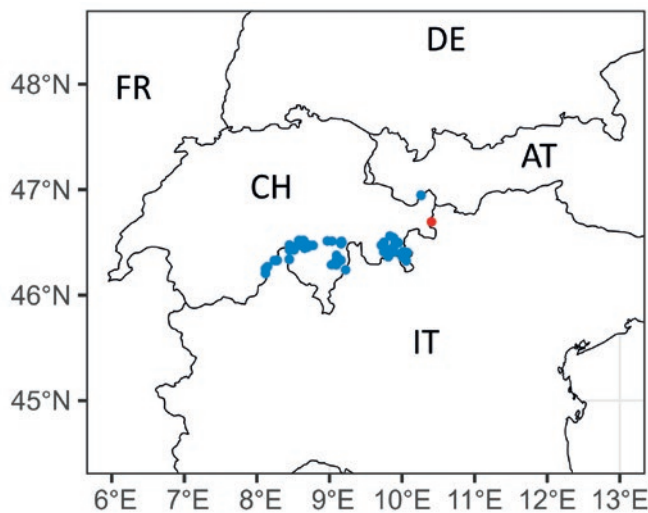


Fig. 3: *Erebia flavofasciata*: distribution map of all records retrieved from GBIF (blue dots; sites with coordinate precision > 1000 m excluded; GBIF.org 2023) and the new record (red dot).

The species was first recorded with 3 individuals on 10.07.2023 (Fig. 2). The first specimen was caught on the 50 m transect and the following two on the time area count within 1000 m<sup>2</sup> area of survey.

Two further individuals were recorded on 02.08.2023 (Fig. 2). Again, one specimen was recorded on the 50 m transect and another during the time area count. These two individuals were collected and are conserved in the collection of the Museum of Nature South Tyrol in Bolzano.

A list of all co-occurring butterfly species that were recorded along *Erebia flavofasciata* is provided in the attachment (Table S1).

## Discussion

This new population of *Erebia flavofasciata* is located 41 km from the closest known occurrences in Switzerland and 30 km from the isolated Austrian population. The discovery of this population increases the probability that other yet undiscovered populations might occur in the border area between Switzerland, Italy and Austria. Given the recent confirmation that the isolated Austrian population is still present (Kurt Lechner, personal communication), we hope that this newly discovered occurrence can also persist over time.

While this note reports the presence of the species in South Tyrol, the size and persistence of this population over time is to be assessed in the future. Considering that individuals were recorded with 24 days of distance between the records, we assume that a resident population occurs on site. Follow-up surveys are necessary to delineate the size and distribution of this population. Also, this population likely occurs on an area that crosses the border to Switzerland, in the area of Lower Engadin where the species has not yet been reported (BAUDRAZ & BAUDRAZ 2020). With this species recorded the new number of butterfly species reported for South Tyrol has risen to 186 (HUEMER 2004).

The species conservation status for South Tyrol was here defined following the indication used to estimate the conservation status of butterflies in South Tyrol (HUEMER 2004) and the IUCN criteria (IUCN 2012). Considering the intense sampling of butterflies in the upper Venosta/Vinschgau valley in the last century and the fact that the species has never been recorded, we assume that the distribution in South Tyrol is very limited. The potential habitat of the species seems not to be limited, however, the spread of dwarf shrubs and climate change are posing a concrete threat to this habitat type. Further, the Italian status of conservation is vulnerable (VU) (BALLETTTO et al. 2016) and the discovery of this single record is unlikely to change this classification.

Based on this consideration, we classify the species as endangered (EN) in South Tyrol, at least until more detailed information on population size and range is available. Considering the discovery of this species along with other noteworthy species, like *Phengaris arion* (Annex IV EU Habitats Directive, Annex II Bern Convention) in near site (authors, observation), we propose to consider natural protection measures for the Avinga valley.

## Riassunto

La rara *Erebia flavosciata* Heyne, 1895 viene segnalata per la prima volta in Alto Adige. Questo ritrovamento espande a est l'areale conosciuto di questa specie ed arricchisce di un'ulteriore specie l'hotspot di farfalle della Val Venosta. Proponiamo una nuova mappa di distribuzione, unendo il nuovo dato alla letteratura. Si rendono necessarie indagini future per valutare l'estensione della popolazione, che potenzialmente si estende tra l'Alto Adige (IT) e l'Engadina Bassa nel cantone dei Grigioni (CH), zona in cui la specie non era mai stata rilevata.

## Zusammenfassung

Der Gelbbinden-Mohrenfalter (*Erebia flavofasciata* Heyne, 1895) wurde das erste Mal in Südtirol nachgewiesen. Dieses Vorkommen erweitert das bekannte Verbreitungsgebiet der Art nach Osten und bereichert den Schmetterlings-Hotspot Vinschgau um eine weitere Art. Eine neue Verbreitungskarte wurde eingefügt. Weitere Erhebungen sind nötig, um das genaue Areal dieser neuen Population zu umgrenzen. Dieses reicht möglicherweise über die Grenze von Südtirol (IT) ins Unterengadin in den Kanton Graubünden (CH).

## Acknowledgement

We thank the Autonomous Province of Bolzano-South Tyrol for financing the Biodiversity Monitoring program during which *Erebia flavofasciata* was discovered. We further thank Lisa Angelini and Luca Frattini for their help in the field and for providing the plant data and Julia Seeber for the soil type characterisation. Finally, we thank Kurt Lechner for information on the Austrian population and Peter Huemer for reviewing the manuscript.

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## Appendix

Table S1: Butterfly and burnet (*Zygaena*) species occurring on the same site as *Erebia flavofasciata*.

Species	10.7.23	2.8.23	23.8.23
<i>Argiades orbitulus</i>	18	10	0
<i>Coenonympha gardetta</i>	3	5	0
<i>Colias phicomone</i>	0	3	0
<i>Erebia ephron</i>	0	4	0
<b><i>Erebia flavofasciata</i></b>	<b>3</b>	<b>2</b>	<b>0</b>
<i>Erebia tyndarus</i>	0	23	23
<i>Pieris</i> sp.	1	0	0
<i>Boloria pales</i>	1	0	0
<i>Zygaena exulans</i>	0	7	0

Table S2: List of plant species (taxonomical reference: FISCHER et al. 2008) and their cover recorded by Lisa Angelini and Luca Frattini on 02.08.2023 on an area of 100 m<sup>2</sup> on the site of occurrence of *Erebia flavofasciata*.

Species	Cover (%/100 m <sup>2</sup> )	Species	Cover (%/100 m <sup>2</sup> )
<i>Achillea moschata</i>	0.07	<i>Gentianella rhaetica</i>	0.1
<i>Agrostis agrostiflora</i>	2	<i>Geum montanum</i>	1.5
<i>Agrostis alpina</i>	0.7	<i>Helictochloa versicolor</i>	8.5
<i>Agrostis capillaris</i>	0.5	<i>Hieracium pilosella</i>	4
<i>Ajuga pyramidalis</i>	0.1	<i>Jacobaea carniolica</i> (s. lat.)	0.2
<i>Androsace obtusifolia</i>	0.005	<i>Juncus jacquinii</i>	0.2
<i>Antennaria dioica</i>	8.5	<i>Juncus trifidus</i>	8
<i>Anthoxanthum alpinum</i>	4.5	<i>Juniperus communis</i> subsp. <i>nana</i>	6.5
<i>Arabis soyeri</i>	0.001	<i>Lotus corniculatus</i>	5.5
<i>Arenaria marschlinsii</i>	0.001	<i>Luzula campestris</i> agg.	0.1
<i>Atocion rupestre</i>	0.005	<i>Luzula lutea</i>	0.2
<i>Botrychium lunaria</i>	0.2	<i>Myosotis alpestris</i>	0.05
<i>Campanula barbata</i>	2	<i>Phyteuma hemisphaericum</i>	0.01
<i>Campanula scheuchzeri</i>	0.4	<i>Poa alpina</i>	0.01
<i>Cardamine resedifolia</i>	0.001	<i>Pulsatilla alpina</i>	1.5
<i>Carex sempervirens</i>	4	<i>Pulsatilla vernalis</i>	4.5
<i>Carlina acaulis</i>	2.5	<i>Ranunculus montanus</i> agg.	2
<i>Cerastium arvense</i>	0.01	<i>Saxifraga exarata</i>	0.005
<i>Coeloglossum viride</i>	0.001	<i>Scorzoneroides helvetica</i>	0.1
<i>Empetrum hermaphroditum</i>	0.01	<i>Sempervivum wulfenii</i>	0.15
<i>Erigeron uniflorus</i>	0.05	<i>Silene nutans</i>	0.02
<i>Euphrasia minima</i>	0.1	<i>Thesium alpinum</i>	0.01
<i>Festuca halleri</i>	2	<i>Thymus praecox</i>	0.4
<i>Festuca nigrescens</i>	7	<i>Trisetum spicatum</i>	0.15
<i>Galium anisophyllum</i>	0.05	<i>Vaccinium gaultherioides</i>	0.1
<i>Galium pumilum</i>	0.001	<i>Veronica alpina</i>	0.1
<i>Gentiana acaulis</i>	0.1	<i>Veronica bellidioides</i>	0.01
<i>Gentiana nivalis</i>	0.1		