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A new species of *Acronicta* Ochsenheimer, 1816 from Corsica: *Acronicta elsae* n. sp.

(Insecta: Lepidoptera: Noctuidae: Acronictinae)

Abstract

The examination of the genitalia of a small series of *Acronicta* specimens from Corsica combined with the barcoding analysis of a part of the same specimens made it possible to identify a new species closely related to *Acronicta aceris* which is described here: *Acronicta elsae* n. sp. endemic to Corsica.

Keywords: *Acronicta, aceris, elsae*, DNA barcoding, integrative taxonomy, noctuid moths, France, Corse, Corsica.

Riassunto

[Una nuova specie di Acronicta Ochsenheimer, 1816 della Corsica: Acronictya elsae n. sp. (Insecta: Lepidoptera: Noctuidae: Acronictinae)]

L'esame degli apparati genitali di una piccola serie di esemplari di *Acronicta* provenienti dalla Corsica, unita al DNA barcoding di una parte dei medesimi esemplari, ha permesso di identificare una nuova specie strettamente affine ad *Acronicta aceris* che viene qui descritta: *Acronicta elsae*. n. sp. endemica della Corsica.

Introduction

The genus *Acronicta* Ochsenheimer, 1816 contains more than 150 species distributed mainly in the arboreal zone of the Holarctic region (FIBIGER *et al.*, 2009). According to the same author the genus is subdivided into 9 subgenera, 5 of wich are represented in Europe.

The subgenus *Acronicta* was represented so far in Europe by three species: *A. aceris* (Linnaeus, 1758), *A. leporina* (Linnaeus, 1758), *A. vulpina* (Grote, 1883) supsp. *leporella* Staudinger, 1888.

Acronicta aceris it is a species with Eurasian diffusion widespread in Europe as well as in NW Africa, Turkey, Cyprus, Lebanon, Syria, Israel, Jordan, Caucasus, Transcaucasia, Iran, Central Asia, Western Siberia to Altai and West China (FIBIGER *et al.*, 2009). According to FIBIGER *et al.* (1.c.) a few subspecies are described,

some of them externally quite different, but all with unremarkable features of the genitalia, identical with other population of *Acronicta aceris*.

Acronicta aceris is not mentioned as present in Corsica in the Rungs list (RUNGS, 1988), while its presence on the island is reported in the distributional checklist of the Lepidoptera of Europe (KARSHOLT & RAZOWSKI, 1996) and in the distribution map of the species in Noctuidae Europaeae (FIBIGER *et al.*, 2009). In the revision of the Rungs list (BRUSSEAUX & NEL, 2004) the species is mentioned precisely on the basis of the presence reported in this latest map. At the Lepinet site (LEPINET, 2022) the presence of the species on the island is confirmed on the basis of a verbal communication from Jerome Barbut.

Acronicta aceris has never been reported from Sardinia.

Material and methods

Six specimens (all males) of *Acronicta* collected in Corsica were acquired by Robert Pagani. According to what he reported, the specimens were collected using light traps provided with 8 watt black light tubes or mixed-light lamps powered by batteries.

Three of this specimens of *Acronicta* collected in Corsica in 2019 have been submitted to barcoding analysis; all the specimens were successfully barcoded. DNA barcoding has been performed in the Canadian Centre for DNA Barcoding (CCDB) following standard protocols. Sequences are deposited in the public BOLD dataset *Acronicta elsae*.

In this study we used the 3 sequences obtained from our specimens; we added all the *Acronicta aceris* sequences (26) available on BOLD as common data from various European countries with the exception of the Iberian peninsula (Table 1). They were used for creating a Neighbor-joining tree after 1000 bootstrap replications using the Kimura2-parameter model running Mega 11 (KUMAR *et al.*, 2018).

All the 6 specimens collected in Corse have been dissected; several further specimens belonging to the *Acronicta aceris* species group have been dissected; all are embedded in DMHF and mounted on permanent microscope slides for any further comparison. The male genitalia illustrated in different volumes or sites were also examined (FIBIGER *et al.*, 2009; LEPIFORUM, 2022; MOTHDISSECTION, 2022).

For external characters several other specimens collected mainly in Italy were also examined as well as many others collected in Europe and visible in publications or on websites.

Studied specimens are preserved in the following collections:

Research collection of Guido Govi, Forlì, Italy; GG.

Research collection of Gabriele Fiumi, Forlì, Italy; GF.

Results

The examination of the genitalia of the series of *Acronicta* specimens collected in Corsica (all males) combined with the barcoding analysis of a part of the same specimens made it possible to identify a species new to science closely related to *Acronicta aceris* which is described here below as *Acronicta elsae* n. sp.

Acronicta elsae n. sp. Fiumi & Govi

Material examined:

Type material. Holotype: male, France, Corse, Haut Asco m 1100, 8.VII.2019, dissected by Gabriele Fiumi, BOLD ID: BC ZSM Lep 113024 (temporaly in coll. G. Govi, will be deposited in a public museum). Paratypes: 5 males, Haut Asco m 1100 8.VII.2019, Haut Asco m 1100 7.VII.2019, Asco m 1100 27.V.2012, Asco m 530 27.V.2012, Asco m 750 11.VII.2001: all in coll. G. Fiumi and G. Govi.

Etymology: the species is named for Elsa Gatta, the beloved mother of the first author.

Differential description:

Imago (male): Fig. 5. Wingspan 39 - 42 mm with an average of 40 mm. Gray head with rounded, gnarled *frons*; labial *palpi* moderately pressed laterally: the second segment is partially covered by black scales, the dark color thins distally while in *A. aceris* the same segment is almost completely black and the spot appears quadrangular in shape. *Antennae* with white basal tuft, dorsally with white scales up to the middle, very scarcely ciliated. Gray chest. Forewing rather narrow of dark gray color; in the basal area there is a narrow black stripe well marked; black, double, jagged postmedial line; well defined rounded orbicular stigma; reniform stigma interrupted or evanescent in most of the specimens; light gray fringes, with thin interneural streaks.

Hindwing white: the veins at the subterminal line marked by thin black lines; white fringes. Underside of wings whitish, that of the forewings darker gray; both wings with postmedial line and disc spot. In *A. elsae* the apex of the underside of forewing is always light while it is very often darker in *A. aceris*.

Male genitalia: Fig. 5. Uncus curved, flattened laterally, hooked at the extremity to a more evident extent than in *A. aceris*; uncus appears in *A. elsae* with a more elongated and thin tip than in *A.aceris*. Long tapered gnatos, more sclerified than in *A. aceris*; oval shaped valve, without crown as in *A.aceris*; ampulla long tapered and more rectilinear than in *A. aceris*; as in *A. aceris* juxta shield-like, widest dorsally, with a short light sclerotisation medially from dorsal edge towards ventral part (FIBIGER, 2009). Aedeagus short, four times shorter than the width at the apex; in the vesica a long strip of thorny cornuti which appears thinner than in *A. aceris*.

Female: unknown.

Immature stages: unknown.

Distribution: known only from the Asco valley (Gorges de l'Asco), Corse, France.

Biology and ecology: the six examined specimens of *Acronicta elsae* n. sp. were found in three different years in the Gorges de L'Asco, in the northern part of Corsica, in the massif of Monte Cinto, at an altitude between 530 and 1,100 meters a.s.l.. The flight habitat is made by rocky slopes with mediterranean vegetation in the lower part of the valley and forests of *Pinus nigra laricio* in the upper part of the valley.

The larval food plant is unknown but most likely the larva could feed on *Acer* sp. like *A. aceris*.

The examined specimens were collected from the end of May to the mid July and probably belong to a single prolonged generation.

Morphology of genitalia

Examination of the male genitalia of all six specimens studied shows constant differences compared to specimens from different European countries (Fig. 1). The most evident character in *andropygium* is the form of the *uncus* which in Corsican specimens is more elongated and thin at the tip compared to specimens of *A. aceris* of European origin. Other differential characters are in the *gnatos* that is more sclerified in *A. elsae* and the *ampulla* that in *A. elsae* is on average more rectilinear. Also the series of long strip of thorny *cornuti* in the *vesica* of the *aedeagus* appears thinner than than in *A. aceris*.

External morphology

In our opinion, due to the great variability of the external morphological characters of *A. aceris*, strong differential characters between *Acronicta elsae* and *A. aceris* are not identifiable (Fig. 2).

According to FIBIGER *et al.* (2009) wingspan of *A. aceris* is 41 - 49 mm. The six known males of *Acronicta elsae* have a wingspan of 39 - 42 mm with an average wingspan of 40 mm.

Moreover, the specimens of *Acronicta elsae* are darker than the average of *A. aceris* even if we do not think this can be considered a differential character as also *A. aceris* has populations with dark specimens.

Other characters are the reniform stigma interrupted or evanescent in most of the specimens.

The more costant external character seems to reside in the labial *palpi* of the head (Fig. 3): the second segment of the labial *palpi* of *A. elsae* is partially covered with

black scales, the dark color tapers distally. In *A. aceris* the same segment is almost completely black and the spot appears quadrangular in shape.

DNA Barcoding

Barcoding analysis of all the *Acronicta aceris* sequences (26) available on BOLD as common data showed that *Acronicta elsae* and *A. aceris* share the same barcode index number (BINs: AAC1168) (Fig. 4).

Acronicta aceris shows low intraspecific variability (in the examined group about 0.8 %). The three *Acronicta elsae* specimens examined have zero intraspecific variability and a distance from *A. aceris* of about 2.4 %. In the opinion of the authors the hypothesis that this distance is interspecific is supported by the existence of a similar interspecific distance in other pairs of well differentiated European species of the genus *Acronicta* such as:

Acronicta (Triaena) tridens ([Denis & Schiffermüller], 1775) - *Acronicta (Triaena) psi* (Linnaeus, 1758): interspecific distance ~2.8 %.

Acronicta (Triaena) tridens ([Denis & Schiffermüller], 1775) - *Acronicta (Triaena) cuspis* (Hübner, [1813]): interspecific distance ~3.2 %.

The correct systematic classification of allopatric populations is one of the major themes of taxonomy because there is no standardized method for establishing whether allopatric populations represent single or different species (MUTANEN *et al.*, 2012). For the same Authors, a solution to delineate the allopatric populations could be to reserve the status of species for cases in which the divergence is evident for two or more independent characters.

Following this criterion, on the basis of the differences in the male genitalia and the genetic divergence in the authors' opinion, the taxon *elsae* is valid at species level.

Taxonomy

Morphological and genetic data support the existence in Europe of two different allopatric taxa at the species level: *Acronicta aceris* which is present in most of the European countries but not in Corsica, while Corsican populations belong to *Acronicta elsae* n. sp..

Taxon	Sequence page	Country, region, place	Collection	Specimen ID
Acronicta aceris	ABOLA005-14	Austria, Lassendorf, 21.v.2014	Landes Museum	KLM Lep 01525
Acronicta aceris	ABOLC053-16	Austria, Poechlarn, 10.vi.2015	Landes Museum	TLMF Lep 20086
Acronicta aceris	CGUKA302-09	U K, Bishops Stortford, 23.vi.2007	NHM London	UKLB4B09 CWP 2279-b
Acronicta aceris	CGUKA312-09	U K, Bishops Stortford, 10.vi.2007	NHM London	UKLB4C08 CWP 2279-a
Acronicta aceris	CGUKA323-09	U K, Bishops Stortford, 5.vii.2007	NHM London	UKLB4D07 CWP 2279
Acronicta aceris	CGUKA352-09	England, Wincanton, 8.vii.2007	NHM London	UKLB4F12 RAB 504
Acronicta aceris	CGUKA578-09	United Kingdom, S.Croydon, 23.v.2007	NHM London	UKLB7B03 GAC 0103
Acronicta aceris	CGUKC221-09	England Kent, Dymchurch,	NHM London	UKLB24E11 JEO 306
Acronicta aceris	CGUKC441-09	England Kent, N. Ronney, 17.vii.2007	NHM London	UKLB26H07 SPC 268
Acronicta aceris	FBLMV419-09	Germany, Bavaria, Landshut, 27.v.2007	Coll Gruenewald	BC ZSM Lep 28399
Acronicta aceris	FBLMW115-10	Germany, Schneizlreuth, 27.vi.2005	Coll. Haslberger	BC ZSM Lep 29045
Acronicta aceris	FBLMZ140-12	Germany, Regensburg, 04.vii.10	ZS Muenchen	BC ZSM Lep 51396
Acronicta aceris	FBLMZ155-12	Germany, Bavaria, Kelheim, 26.vi.2010	ZS Muenchen	BC ZSM Lep 51411
Acronicta aceris	GBLAA1695-15	Germany, Koenigswinter, 25.v.2014	ZS Muenchen	BC ZSM Lep 80076
Acronicta aceris	GBLAA283-14	Germany, Arkebek, 24.v.1992	ZS Muenchen	BC ZSM Lep 80279
Acronicta aceris	GBLAF471-14	Germany, Barnim, 16.vi.2013	ZS Muenchen	BC ZSM Lep 82177
Acronicta aceris	LASTS162-14	Austria, Tyrol, Ellbachtal, 21.v.2014	Tiroler LandM	TLMF Lep 14614
Acronicta aceris	LASTS163-14	Austria, Tyrol, Ellbachtal, 21.v.2014	Tiroler LandM	TLMF Lep 14615
Acronicta aceris	LEFIC984-10	Finland, Uusimaa, ex l. 2006	NOZM	MM05390

TABLE 1. List of specimens with DNA barcodes (COI).

Acronicta aceris	LEFIC992-10	Finland, Uusimaa, ex l. 2006	NOZM	MM05405
Acronicta aceris	LEFIE628-10	Finland, Alandia, 19.vii.2008	NOZM	MM09566
Acronicta aceris	LENOA437-11	France, Normandie, 13.vii.1991	Coll. Dardenne	LN-BD0437
Acronicta aceris	LON3837-16	Sweden, Oeland, Borgholm, 06.vii.1996	NONHM	NHMO-DAR-9781
Acronicta aceris	MNMIS002-08	France, Isere, Mizoen, 18.vii.2007	NMHN Paris	BC-MNHN0121
Acronicta aceris	NOENO008-17	Austria, Hirschwang, 10.vi.2008	Coll.Wolfgang Stark	BC_LSNOE_Lep_00008
Acronicta aceris	PHLAA451-09	France, Saorge, 06.vi.2011	Provence ACA	TLMF Lep 00491
Acronicta aceris	PHLSA636-11	Italy, Abruzzo, Chieti, 20.vii.2011	Tiroler LandM	TLMF Lep 06091
Acronicta elsae	GWOUH108-21	France H. Asco leg. Robert Pagani	Coll. Govi	BC ZSM Lep 113024
Acronicta elsae	GWOUH098-21	France H. Asco leg. Robert Pagani	Coll. Fiumi	BC ZSM Lep 113014
Acronicta elsae	GWOUH109-21	France, H. Asco leg. Robert Pagani	Coll. Govi	BC ZSM Lep 113025

2	2	2
4	2	J



Fig. 1. Andropigi: 1, 2, 3, 4 - A. elsae Asco Corsica 08.VII.2019; 07.VII.2019; 27.V.2012; 11.VII.2001; 5 - A. aceris Italy, Sicily, Maniace (CT), 25.VI.2009; 6, A. aceris Italy, Romagna Civitella di R. (FC), 26.VII.2019; 7 - A. aceris Poland, Balice, Krakow, 15.VII.2019; 8 - A. aceris Italy, Marche, Fossato (PU), 6.VII.2018.



mm 40

Fig. 2. *Habitus*: 1, 2, 3, 4, 5 - *A. elsae* France, Corsica, Gorges de l'Asco; 6 - *A. aceris* Italy, Sicily, Maniace (CT), 25.vi.2009; 7 - *A. aceris*. Italy, Romagna, Tredozio (FC), 03.vii.2018; 8 - *A. aceris*. Fossato (PU) Marche, 06.vi.2018; 9 - *A. aceris*. Poland, Balice Krakow, 15.vii.2000; 10 - *A. aceris* Italy, Toscana, Lutirano (FI), 28.vi.1979.



Fig. 3. Labial *palpi* of *A. elsae* and *A.aceris*.



1%

Fig. 4. Neighbor-joining tree (Kimura 2-parameter distance model for COI-5P marker) for 29 specimens of the *Acronicta* species complex. Terminals with species name, country, region, and BOLD sequence ID. The percentage of replicate trees in which the associated taxa clustered together in the bootstrap test (1000 replicates) are shown next to the branches only when higher than 50%. Scale bar = 1.0%.



Fig. 5. Acronicta elsae Fiumi & Govi. Holotype: habitus and andropigium.

Conclusion

The examination of the male genitalia and the DNA barcoding of a small series of *Acronicta* specimens from Corsica demonstrated the existence of a new species closely related to *Acronicta aceris* and endemic to Corse: *Acronicta elsae*.

Despite the progress made in recent years in the knowledge of the Corsican Lepidoptera fauna, the study of the rarest and least distributed species has made it possible to discover a new taxon also in a group well known as the *Noctuidae*. This demonstrates on the one hand the need to continue the studies that may reveal other surprises and on the other hand the need to protect a heritage of biodiversity that is increasingly threatened by the tourist exploitation of the island, by fires, by urbanization and not least by the climate change.

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We are also grateful to Dr. Alessandro Floriani (Milan, Italy) who, following in his father's footsteps, has built one of the most important Italian collections of Palearctic Noctuidae, a collection that he always generously makes available to us for study.

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Sitography

https://lepiforum.org/wiki/page/Acronicta_aceris https://www.lepinet.fr/especes/nation/lep/index.php?id=43460 https://mothdissection.co.uk/species.php?Tx=Acronicta_aceris https://v4.boldsystems.org/index.php/Taxbrowser_Taxonpage?taxon=acronicta+aceris&s earchTax=Search+Taxonomy

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