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New data on Noctuoidea from the Canary Islands, Spain (Lepidoptera: Noctuoidea)

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Abstract

We describe three new species: *Zebeeba orzolae* Falck & Karsholt, sp. n. (Erebidae: Rivulinae), *Nyctobrya vilfredi* Falck & Karsholt, sp. n. (Noctuidae: Bryophilinae) and *Agrotis corralejoi* Falck & Karsholt, sp. n. (Noctuidae: Noctuinae). The unknown female of *Mniotype loslobensis* (Fischer, Saldaitis & Ivinskis, 2007) (Noctuidae: Hadeninae) and its genitalia are described and illustrated. Twelve species are recorded as new to the fauna of the Canary Islands: *Epharmottomena eremophila* (Rebel, 1895), *Eublemma thermobasis* Hampson, 1910, *Eublemma candidana* (Fabricius, 1794), *Araeopteron ecphaea* (Hampson, 1914), *Gnamptonyx innexa* (Walker, 1858) and *Rhabdophera acrosticta* (Püngeler, 1904) (Erebidae), *Nycteola columbana* (Turner, 1925) (Nolidae), *Amyna axis* Guenée, 1852, *Polymixis aurora commixta* (Rungs, 1943), *Nonagria typhae* (Thunberg, 1784), *Mythimna languida* (Walker, 1858) and *Leucania zeae* (Duponchel, 1828) (Noctuidae). Five species are, because of different errors, removed from the list of Lepidoptera found in the Canary Islands: *Schrankia taenialis* (Hübner, [1809]), *Cosmia affinis* (Linnaeus, 1767), *Hecatera sancta* (Staudinger, 1859), *Agrotis boeticus* (Boisduval, 1837) and *A. aistleitneri* Behounek & Speidel, 2009. The genus *Gerarctia* Hampson, 1905 is, based on personal information from H. Hacker, synonymised with *Zebeeba* Kirby, 1892, syn. n., and *Gerarctia poliotis* Hampson, 1905 is transferred to *Zebeeba* as *Z. poliotis* (Hampson, 1905), comb. n. DNA barcodes of *Caradrina rebeli* Staudinger, 1901 from different Canary Islands are compared, and it is concluded that the species occurs in two subspecies: *C. rebeli rebeli* Staudinger, 1901 and *C. rebeli lanzarotensis* Pinker, 1962.
KEY WORDS: Lepidoptera, Erebidae, Nolidae, Noctuidae, new species, DNA barcodes, Canary Islands, Spain.

Nuevos datos sobre Noctuoidea de las Islas Canarias, España (Lepidoptera: Noctuoidea)

Resumen

Describimos tres nuevas especies: *Zebeeba orzolae* Falck & Karsholt, sp. n. (Erebidae: Rivulinae), *Nyctobrya vilfredi* Falck & Karsholt, sp. n. (Noctuidae: Bryophilinae) and *Agrotis corralejoi* Falck & Karsholt, sp. n. (Noctuidae: Noctuinae). Se describe e ilustra la desconocida hembra y genitalia de *Mniotype loslobensis* (Fischer, Saldaitis & Ivinskis, 2007) (Noctuidae: Hadeninae). Doce especies se registran como nuevas para las Islas Canarias: *Epharmottomena eremophila* (Rebel, 1895), *Eublemma thermobasis* Hampson, 1910, *Eublemma candidana* (Fabricius, 1794), *Araeopteron ecphaea* (Hampson, 1914), *Gnamptonyx innexa* (Walker, 1858) and *Rhabdophera acrosticta* (Püngeler, 1904) (Erebidae), *Nycteola columbana* (Turner, 1925) (Nolidae), *Amyna axis* Guenée, 1852, *Polymixis aurora commixta* (Rungs, 1943), *Nonagria typhae* (Thunberg, 1784), *Mythimna languida* (Walker, 1858) y *Leucania zeae* (Duponchel, 1828) (Noctuidae). Cinco especies son, debido a diferentes errores, removidas de la lista de Lepidoptera encontradas en las Islas Canarias: *Schrankia taenialis* (Hübner, [1809]), *Cosmia affinis* (Linnaeus, 1767), *Hecatera sancta* (Staudinger, 1859), *Agrotis boeticus* (Boisduval, 1837) y *A. aistleitneri* Behounek & Speidel, 2009. El género *Gerarctia* Hampson, 1905 es, basado sobre información personal de H. Hacker, sinonimizado con *Zebeeba* Kirby, 1892, syn. n. y *Gerarctia poliotis* Hampson, 1905 es transferido a *Zebeeba* como *Z. poliotis* (Hampson, 1905), comb. n. Se compara el ADN código de barras de *Caradrina rebeli*

Staudinger, 1901 de diferentes Islas Canarias y se concluye que la especie ocurre en dos subespecies: *C. rebeli rebeli* Staudinger, 1901 y *C. rebeli lanzarotensis* Pinker, 1962.
PALABRAS CLAVE: Lepidoptera, Erebidae, Nolidae, Noctuidae, nuevas especies, ADN código de barras, Islas Canarias, España.

Introduction

Fieldwork undertaken in the Canary Islands since 2016 by the first author has revealed a number of new and partly undescribed species of Lepidoptera for these islands. It may not be surprising that several species of smaller, so-called Microlepidoptera have been overlooked by previous researchers, but an increase of 15 % of the relatively large Pyraloidea species (FALCK *et al.*, 2019) shows that the Lepidoptera fauna of the Canary Islands is probably not as well investigated as one might have expected.

The Noctuoidea is a mega-diverse group of larger moths. During the last decade, family level classification has undergone a number of changes (ZAHIRI *et al.*, 2010, 2012, 2013). In the most recent list to include Canary Island Lepidoptera VIVES MORENO (2014) listed 2 species of Notodontidae, 2 Nolidae, 29 Erebidae, 1 Euteliidae and 99 Noctuidae. Here we describe 1 new Erebidae and 2 new Noctuidae. Moreover, we record 6 species of Erebidae, 1 Nolidae and 5 Noctuidae as new to the fauna of the Canary Islands, and we suggest that five species are removed from the list of Canary Islands, for various reasons.

Material and methods

Most of the specimens were attracted to an 8 watts super actinic light. Genitalia were dissected following ROBINSON (1976). Whole specimens were photographed with a Canon EOS 700D camera equipped with a Canon EF 100 mm objective. The genitalia slides were photographed using a Soptop CX40T Trinocular microscope in conjunction with a Toup Tek P10500A-E3 / E3ISPM05000KPA-E3 / 5.0MP USB3 camera.

DNA samples were prepared from dried legs according to the prescribed standards and processed at the Canadian Centre for DNA Barcoding (CCDB, Biodiversity Institute of Ontario, University of Guelph) to obtain the 658 base-pair long barcode fragment of the mitochondrial COI gene (cytochrome c oxidase I). Intra- and interspecific distances of DNA barcode fragment were calculated using analytic tools of BOLD with the Kimura 2-parameter model of nucleotide substitution. Neighbour-joining trees were constructed using MEGA 6 (TAMURA *et al.*, 2013) under the Kimura 2-parameter model for nucleotide substitutions with the closest European species in BOLD as outgroups. Genetic clusters are presented with their barcode index number (BIN; cf. RATMNASINGHAM & HERBERT, 2013).

We examined the morphology from all species and the DNA Barcode from new and cryptic species.

Abbreviations used

GP	Genitalia preparation
PF	Collection of Per Falck, Neksø, Denmark
MNCN	Collection of Antonio Vives, Museo Nacional de Ciencias Naturales, Madrid, Spain
NHMUK	Natural History Museum, London, United Kingdom
ZMUC	Zoological Museum, Natural History Museum of Denmark, Copenhagen, Denmark

Results

EREBIDAE
Rivulinae

The genus *Zebeeba* Kirby, 1892 = *Gerarctia* Hampson, 1905, **syn. n**., is originally a South African

genus and includes, besides the Mediterranean species *Z. falsalis* (Herrich-Schäffer, 1839), several East African and a number of South African species, several of which are still undescribed (HACKER, 2021: 80 and pers.com. 15-II-2021). Until now, about 20 species have been described.

Zebeeba poliotis (Hampson, 1905), **comb. n.**
Ingura poliotis Hampson, 1905. *Ann. Mag. Nat. Hist*., (7) **15**(89): 449

***Zebeeba orzolae* Falck & Karsholt, sp. n.** (Fig. 1)

Holotype ♂: SPAIN, Lanzarote, Mojón Blanco, Orzolá, 20 m, 21-X-10-XI-2019, leg. P. Falck, genitalia slide 3473PF, DNA sample Lepid Phyl 0601PF/CILEP0600-20 (PF).

Description: Adult. Wingspan 14.5 mm. Labial palp porrect, segment 2 whitish grey with grey scale tuft, segment 3 grey, very short. Antenna pale grey, with indistinct grey rings, very shortly ciliate. Head and neck pale grey mottled with darker grey. Tegula and thorax grey. Forewing ground colour whitish grey mottled with grey, at dorsum before tornus an indistinct large reddish-brown spot, reniform stigma creamy white bordered distally by dark grey, postmedian fascia indistinct dark grey not reaching dorsum, apical streak indistinct, dark grey. Hindwing grey, paler towards base. Fringe yellowish white.

Male genitalia (Figs 29, 29a): Uncus long, relatively broad, pointed. Valva short, narrow and knob-shaped. Saccus very broad, anterior margin concave. Phallus large, longer than valva, distally slightly bent.

Female genitalia: Unknown.

Diagnosis: *Z. orzolae* resembles *Z. poliotis* (Fig. 2), the only other *Zebeeba* species known from the Canary Islands (Spain). Males can be distinguished by the shortly ciliate antenna, bipectinate in *Z. poliotis,* otherwise it can be distinguished by the whitish coloured forewing without wing pattern in the inner half and the smaller wingspan. *Z. orzolae* also resembles some South African species e. g. *Z. mediorufa* (Hampson, 1910) and *Z. fuscipars* (Hampson, 1910) (HACKER, 2021: 601). It can be distinguished by the lack of wing pattern in the inner half of forewing. In the genitalia the very short, narrow and knob-shaped valva and the broad concave saccus are characteristic. The genitalia of *Z. poliotis* are figured by PINKER (1965: pls. 23).

Molecular diagnosis: We obtained DNA barcode fragments of 601 bp. Barcode Index Number (BIN) BOLD: AEE6226.

Biology: Early stages unknown, but the larva probably feeds on Asparagaceae (HACKER, 2021: 80). The specimen was attracted to an 8 watts super actinic light in a sandy area near the coast.

Distribution: Known only with certainty from the northern part of the island of Lanzarote, but probably also from Fuerteventura - see remarks. The species is probably endemic to the Canary Islands (Spain).

Etymology: The species is named after the small town Orzolá placed nearby the type-locality.

Remarks: HACKER & SCHMITZ (1996: 180) mention a Noctuidae species from Fuerteventura *"Auf dieser Insel konnte jedoch eine kleinere, Phycitinae-ähnliche Noktuide nachgewiesen werden, die habituell poliotis ähnelt, jedoch einen anderen Fühler- und Genitalbau aufweist und vermutlich eine unbeschriebene Art darstellt*", the specimen is also figured (Tafel M: 1). It has not been possible to study this specimen, but it most likely belongs to *Z. orzolae.*

Hypenodinae

Schrankia taenialis (Hübner, [1809])
Pyralis taenialis Hübner, [1809]. *Samml. Eur. Schmett*.: pl. 23, fig. 151

The species is mentioned by REBEL & ROGENHOFER (1894: 67) from The Canary Islands (La Palma) on the basis of two specimens *"Zwei geflogene, auffallend kleine (Exp. 14-16 mm) und schmalflügelige Exemplare durch Prof. Simony am 26 August 1889 an einer mit Juncus und*

Petroselinum bewachsenen feuchten Stelle…". The specimens are most likely confused with *S. costaestrigalis* (Stephens, 1834), a quite common species from Gran Canaria, La Palma and Tenerife. HACKER & SCHMITZ (1996: 170) also doubted the La Palma record of *S. taenialis*, and it is not mentioned by BÁEZ *et al*. (2010: 312). The species should be removed from the list of Lepidoptera occurring in the Canary Islands (VIVES MORENO, 2014: 614).

Calpinae

Epharmottomena eremophila (Rebel, 1895) (Fig. 3)
Armada eremophila Rebel, 1895. *Verh. Zool.-bot. Ges. Wien*, **45**: 350

Material examined: SPAIN, Fuerteventura, Corralejo, 10 m, 1 ♀, 1-27-XI-2017, leg. P. Falck; Caldereta, 120 m, 1 ♂, 27-II-19-III-2018, leg. P. Falck (PF). **New to the Canary Islands**.

Distribution: North Africa and the Middle East, Ghana (FREINA & BEHOUNEK, 1996: 16).

Biology: Early-stage unknown. The adult flies during winter.

Remarks: *E. eremophila* is probably a migrant from Africa.

Boletobiinae

Eublemma thermobasis Hampson, 1910 (Fig. 4)
Eublemma thermobasis Hampson, 1910. *Cat. Lep. Phal*., **10**: 135, pl. 152, fig. 27

Material examined: SPAIN, Gran Canaria, Puerto Rico, 50 m, 1 ♂, 11-24-VI-2018, leg. P. Falck; San Filipe, 25 m, 2 ♂♂, 24-X-13-XI-2020, leg. P. Falck; Lanzarote, Mojón Blanco, Orzolá, 20 m, 1 ♀, 21-X-10-XI-2019, leg. P. Falck, DNA sample Lepid Phyl 0603PF/CILEP602-20; Tenerife, El Médano, 15 m, 12 ♂♂, 4 ♀♀, 1-20-III-2017, genitalia slide 2499PF, same data but 6 ♂♂, 1 ♀, 18-XI-8-XII-2018, same data but 6 ♂♂, 1 ♀, 21-V-3-VI-2019, leg. P. Falck, DNA sample Lepid Phyl 0602PF/CILEP601-20 (all PF). **New to the Canary Islands**.

Distribution: Morocco (one record from 1994), East Africa from Sudan to Ethiopia and the Arabian Peninsula from Yemen to Jordan (HACKER, 2019: 335). The species is considered to be resident in the Canary Islands (Spain).

Biology: Unknown.

Remarks: We obtained DNA barcode from two specimens. Barcode Index Number (BIN) BOLD: ACL6036.

Eublemma candidana (Fabricius, 1794) (Fig. 5)
Pyralis candidana Fabricius, 1794. *Ent. Syst*., **3**(2): 245

Material examined: SPAIN, Tenerife, La Cuesta, 1 ♀, III-1924, leg. H. P. Duurloo, genitalia slide 3818 M. Fibiger (ZMUC). **New to the Canary Islands**.

Distribution: Europe (Mediterranean countries), Turkey, Middle East, Caucasus, Trans-Caucasus and Central Asia (FIBIGER *et al*., 2010: 68).

Biology: The larvae feed in April-May and again in July on flowers of *Helichrysum* (FIBIGER *et al*., 2010: 68).

Remarks: The record of *E. candidana* from the Canary Islands is probably due to accidental introduction or migration, as the species has not been found on the islands for almost a hundred years.

The collector of the specimen, Hans Peter Duurloo was a Danish lepidopterist who travelled and collected Lepidoptera in the Canary Island during 1924-1926 (HENRIKSEN, 1936: 413).

Araeopteron ecphaea (Hampson, 1914) (Fig. 6)
Araeoptera ecphaea Hampson, 1914. *Ann. Nat. Hist*., **13**: 167

Material examined: SPAIN, Gran Canaria, Maspalomas, 10 m, 1 ♂, 1 ♀, 17-30-IX-2018, leg. P. Falck (PF). **New to the Canary Islands**.

Distribution: Central Africa, North Africa (Morocco, Tunisia), Middle East and Europe (the southern Mediterranean from Greece to Spain) (FIBIGER *et al.*, 2010: 52; HACKER, 2019: 243).

Biology: Early stages undescribed. *E. ecphaea* inhabits moist areas with *Phragmites* (FIBIGER *et al.*, 2010: 52).

Remarks: *E. ecphaea* is probably a resident of the Canary Islands.

Erebinae

Gnamptonyx innexa (Walker, 1858) (Fig. 7)

Alamis innexa Walker, 1858. *List Specimens lepid. Insects Colln Br. Mus*., **15**: 1797

Material examined: SPAIN, Gran Canaria, Carreteria, 455 m, 1 ♂, 8-20-VIII-2020, leg. P. Falck; Pie de la Cuesta, 500 m, 1 ♂, 1 ♀, 21-VIII-4-IX-2020, leg. P. Falck (PF). **New to the Canary Islands**.

Distribution: Spain (FIBIGER *et al*., 2010: 233), Cape Verde Islands, North Africa, through the Middle East to Afghanistan and India (FREINA & BEHOUNEK, 1996: 19; HACKER, 2016).

Biology: The larva feeds on *Acacia* species. It is continuously brooded, and the adults are migratory (FIBIGER *et al.,* op. cit.).

Remarks: *G. innexa* is probably a migrant from Africa.

Rhabdophera acrosticta (Püngeler, 1904) (Fig. 8)

Pericyma acrosticta Püngeler, 1904. *Iris*, **16**: 290, pl. 6, fig. 6

Material examined: SPAIN, Fuerteventura, Corralejo, 10 m, 1 ♀, 7-27-XI-2017, leg. P. Falck (PF). **New to the Canary Islands**.

Distribution: From North Africa to the Middle. East Distribution map cf. HACKER (2016: 327). In Europe one specimen from Malta (LEPIFORUM, 2021).

Biology: Early stages are probably undescribed.

Remarks: *R. acrosticta* is probably a migrant from Africa.

NOLIDAE

Chloephorinae

Nycteola columbana (Turner, 1925) (Fig. 9)

Sarrothripus columbana Turner, 1925. *Entomologist's Rec. J. Var*., **37**: 77

Material examined: SPAIN, Fuerteventura, Corralejo, 10 m, 1 ♂, 7-27-XI-2017, leg. P. Falck, genitalia slide 3472PF (PF). **New to the Canary Islands**.

Distribution: South Europe, Turkey, North Africa (Morocco, Algeria, Tunisia) and the Middle East (FIBIGER *et al.*, 2009: 138).

Biology: Early stages are probably undescribed. The larva feeds on *Quercus*.

Remarks: The genitalia of both sexes are figured by FIBIGER *et al.* (2009: figs 81, 245).

NOCTUIDAE

Bagisarinae

Amyna axis Guenée, 1852 (Fig. 10)

Amyna axis Guenée, 1852. *Hist. Nat. Insc. Spec. Gen. Lep. Noct*., **5**(1): 407

SPAIN, La Gomera, Valle Gran Rey, 1 larva, 25-II-2013, leg. J. Köhler (KÖHLER, 2014).

Material examined: SPAIN, Lanzarote, Puerto del Carmen, 25 m, 1 ♂, 21-X-10-XI-2019, leg. P. Falck; Mojón Blanco, Orzolá, 20 m, 3 ♂♂, 1 ♀, 21-X-10-XI-2019, leg. P. Falck; El Bosquecillo, 610 m, 4 ♂♂, 21-X-10-XI-2019, leg. P. Falck (all PF). **New to the Canary Islands**.

Distribution: *A. axis* is described from Tahiti and is widely distributed in the tropics around the world. In Africa from the south to Sudan, Mauretania and Saudi-Arabia in the north.

Biology: The larva from La Gomera was found sitting on *Rumex vesicarius* L. without eating

(KÖHLER, 2014: 179). The larva is reported feeding from several plants e. g. *Arachis hypogaea* L., *Beta vulgaris* L., *Celosia sp.*, *Chenopodium album* L. Bosc ex Moq., *Corchorus capsularis* L., *Hibiscus cannabinus* L., *Spinacia oleracea* L. often as a pest (LEPIFORUM, 2008-2021).

Remarks: *A. axis* has probably become a resident of the Island of Lanzarote due to either migration or accidental importation.

Bryophilinae

The subgenus *Nyctobrya* Boursin, 1957 is treated in two relatively new articles BEHOUNEK & SPEIDEL (2013) and FISCHER & FREINA (2014) with description of two new species. Hitherto, five species and one subspecies are known: *N. simonyi* (Rogenhofer, 1889), *N. simonyi debilis* (Rebel, 1894), *N. canaria* (Alphéraky, 1890), *N. maderensis* (Bethune-Baker, 1891), *N. pinkeri* Behounek & Speidel, 2013 and *N. hierroana* Fischer & Freina, 2014. Until recently it was assumed that the subgenus was endemic to the Macaronesian region, but *N. simonyi* is now recorded from Morocco (LEPIFORUM, 2008-2021).

Nyctobrya vilfredi Falck & Karsholt, sp. n. (Figs 11, 12)

Holotype ♀: SPAIN, Gran Canaria, Ayacata, 1400 m, 17-30-IX-2018, leg. P. Falck, DNA sample Lepid Phyl 0572PF/CILEP571-20 (ZMUC).

Paratypes: SPAIN, Gran Canaria, Los Tilos, 600 m, 1 ♀, 5-VIII-1979, leg. & P. Stadel Nielsen; Barranco de la Virgen, Moya, 400 m, 1 ♀, 20-VII-1984, leg. P. Olsen, B. Skule & P. Stadel Nielsen; Pinos de Galdar, 1200 m, 15 ♂♂, 46 ♀♀, 24-VII-1984, 14 ♂♂, 45 ♀♀, 31-VII-1984, genitalia slides 3653, 3836 M. Fibiger, leg. P. Olsen, B. Skule & P. Stadel Nielsen (all ZMUC); Ayacata, 1400 m, 1 ♂, 2 ♀♀, 17-30-IX-2018, genitalia slide 3294PF, DNA sample Lepid Phyl 0574PF/CILEP573-20, leg. P. Falck (PF); Pie de la Cuesta, 500 m, 1 ♀, 17-30-IX-2018, genitalia slide 3300PF, DNA sample Lepid Phyl 0573PF/CILEP572-20, leg. P. Falck (PF); Carreteria, 455 m, 14 ♂♂, 23 ♀♀, 8-20-VIII-2020, leg. P. Falck, genitalia slides 3462PF, 3463PF, DNA sample Lepid Phyl 0758PF/CILEP757-20 (MNCN, PF); Fontanales, 1100 m, 7 ♀♀, 8-20-VIII-2020, leg. P. Falck (PF); Barranco de Moya, 80 m, 3 ♂♂, 3 ♀♀, 8-20-VIII-2020, leg. P. Falck (PF); Barranco de Azuaje, 270 m, 1 ♂, 7 ♀♀, 8-20-VIII-2020, leg. P. Falck, DNA sample Lepid Phyl 0757PF/CILEP756-20 (PF); Barranco de Guayadeque, 700 m, 5 ♀♀, 21-VIII-4-IX-2020, leg. P. Falck (PF).

Description: Male adult. Wingspan 23.5-29 mm. Labial palp upturned, segment 2 with black and creamy white scale-tuft, segment 3 as long as segment 2, slender, black mottled with creamy white and with creamy white tip. Antenna black, cilia in male having length of antenna diameter, in female very short. Head and neck blackish grey, neck with yellowish tipped scales towards thorax; tegula and thorax blackish grey. Forewing ground colour dark grey-brown; basal patch and claviform stigmata darker, orbicular and reniform stigmata brownish distinctly bordered with black; antemedian fascia black; postmedian fascia jagged, black, irregularly bordered distally with white; fringe dark grey. Hindwing of the same concolorous with forewing, paler at base; postmedian fascia indistinct, discal spot clearly recognizable; fringe dark grey.

Female adult: Wing pattern as in male, but with black ground colour, heavily mottled with white between subbasal- and antemedian fasciae; postmedian fascia distinct, bordered with white.

Male genitalia (Figs 30, 30a): Uncus long and spatulate. Tegumen sub-triangular. Valva short, very broad at the base, slightly narrowing distally; apical process at the end of costa small and triangular, ventral edge apically pointed. Ampulla long, fairly robust and evenly curved. Juxta trapezoid, anteriorly acute. Phallus relatively short and broad, vesica with large group of small cornuti.

Female genitalia: (Fig. 36): Ostium membranous, narrow and rounded. Ductus bursae relatively long and broad, sclerotized, transition to ostium short, constricted and membranous. Corpus bursae membranous, pear-shaped, posterior apex pronounced, rounded and slightly sclerotized.

Molecular diagnosis (Fig. 39): We obtained full length DNA barcodes (658 bp) from three

specimens and DNA barcode fragments of 607 bp and 528 bp from two specimens all from the island of Gran Canaria. All the barcodes fall within Barcode Index Number (BIN) BOLD: AEE9804. The maximum intraspecific distance is 0.17% (mean 0.05%, n=5). The minimum p-distance to nearest neighbour *N. canaria* is 3.03%, with the Barcode Index Number (BIN) BOLD: AEE9801. The result supports the status of *N. vilfredi* sp. n. as a separate species.

Diagnosis: *N. vilfredi* is closely related to *N. canaria* (Figs 13, 14). It can often be distinguished by the light tipped apex of labial palps, and females are normally more contrasting and with strong white admixture in basal part of the forewing, but a safe determination requires dissection of the genitalia. It can be distinguished from *N. simonyi* and *N. pinkeri* (Figs 15, 16) by the longer segment 3 of the labial palps (Figs 17, 18). In the male genitalia *N. vilfredi* differs from *N. canaria* (Figs 31, 31a) by the short and broad valva without projection of the ventral edge, and the cornuti are larger. From *N. simonyi*, *N. pinkeri*, *N. hierroana* and *N. maderensis* it differs by the lack of the large and robust cornutus. In the female genitalia it differs from all other members of the genus by the long and broad ductus bursae and by the anterior rounded, sclerotized apex of corpus bursae.

Biology: Early stages unknown. The specimens were attracted to light during July to late September at altitudes ranging from 80-1400 m.

Distribution: Only known from the central and northern part of the island of Gran Canaria.

Etymology: The species name is dedicated to the first author`s youngest grandson Vilfred.

Remarks: In the island of Gran Canaria, *N. pinkeri* is widespread in mountainous regions, but in the northern part of the island the species is found in ravines near sea level in a much smaller and a greyer form, with a wingspan of 19-21 mm (usually 24-30mm), very similar to the difference between *N. simonyi simonyi* and *N. simonyi debilis*

In the present study we also compared the DNA barcodes of the two forms of *N. pinkeri*, and *N. simonyi simonyi* with of *N. simonyi debilis*.

The result of the molecular analysis of *N. pinkeri* is that all barcodes (n=6) fall within the same Barcode Index Number (BIN) BOLD: AEE9803, with maximum intraspecific variation of 0.8%, this supports the presumption of only one highly variable species.

The result of the molecular analysis of *N. simonyi simonyi* (n=3) from Tenerife and *N. simonyi debilis* (n=3) from Lanzarote is that all barcodes (n=6) fall within the same Barcode Index Number (BIN) BOLD: AEE9802. The maximum intraspecific variation in *N. simonyi simonyi* is 0.14%, and the maximum intraspecific variation in *N. simonyi debilis* is 0.17%. Diverging (minimum p-distance) by 0.82% between the two populations. This supports the assumption by BEHOUNEK & SPEIDEL (2013: 163) that the status of *N. debilis* as a separate species is unlikely.

Xyleninae

Caradrina rebeli Staudinger, 1901 (Figs 19, 20)

Caradrina rebeli Staudinger, 1901. *Cat. Lep. Pal.*: 196

The species is widespread in all of the larger Canary Islands and is often very common from sea level to mountain regions. It is highly variable both in adult appearance and in the genitalia. Males from La Palma, Tenerife and Gran Canaria have greyish brown ground colour of the forewing and almost solid dark grey hindwing with discal spot visible, whereas males from Lanzarote and Fuerteventura are more whitish grey in ground colour of the forewing and the hindwing is dark grey becoming almost white towards base, with discal spot and postmedian fascia visible, there are no clear differences in adult females from different islands. It is not surprising that more subspecies and one additional species have been described: *Caradrina lanzarotensis* Pinker, 1962, *C. rebeli grancanariae* Pinker, 1962, *C. rebeli lapalmae* Pinker, 1962, *C. rebeli hierrensis* Pinker, 1969 and *C. lanzarotensis fuerteventurensis* Pinker & Bacallado, 1975. In the revision of the genus *Caradrina* Ochsenheimer, 1816 the subspecies of *C. rebeli* and *C. lanzarotensis* were synonymized (HACKER, 2004: 380-384, figs 426-428, pls. 22). In this study we have examined the DNA barcode of specimens from La Palma, Tenerife, Gran Canaria, Lanzarote and Fuerteventura.

Molecular results (Fig. 39): We obtained DNA barcode fragments of 592 bp from one specimen from the island of La Palma, 587 bp and 586 bp from two specimens from the island of Tenerife, 598 bp and 622 bp from two specimens of the island of Gran Canaria, 598 bp and 688 bp from two specimens from the island of Lanzarote and 633 bp and 632 bp from two specimens from the island of Fuerteventura. The result of the molecular analysis is that all barcodes (n=5) from specimens from La Palma, Tenerife and Gran Canaria fall within the same Barcode Index Number (BIN) BOLD: AEE7063. The maximum intraspecific divergence in BIN (p-distance) is 0.52%, and it is between populations from La Palma and Tenerife. The barcode from the specimens (n=4) from Lanzarote and Fuerteventura fall within Barcode Index Number (BIN) BOLD: AEE7064. The maximum intraspecific divergence in BIN (p-distance) is 0%. Diverging (minimum p-distance) by 1.87% between the two populations from La Palma, Tenerife, Gran Canaria and Lanzarote, Fuerteventura. The results support the assumption by HACKER (2004: 383) that at least the subspecies *C. rebeli grancanariae* and *C. rebeli lapalmae* are synonyms of *C. rebeli rebeli* and *C. lanzarotensis fuerteventurensis* is a synonym of *C. rebeli lanzarotensis.* Based on adult appearance and DNA results it is concluded that the species occurs in two subspecies: *C. rebeli rebeli* Staudinger, 1901 and *C. rebeli lanzarotensis* Pinker, 1962.

Cosmia affinis (Linnaeus, 1767)
Noctua affinis Linnaeus, 1767. *Syst. Nat., ed.,* **12**: 848

The species is mentioned by VIVES MORENO (2014) as *Cosmia affinis canaria* (Pinker, 1974) by mistake, but it refers to *Cardepia affinis antinea* Rungs, 1972 (= *deserticola canaria* Pinker, 1974).

Cosmia affinis (Linnaeus, 1767) should be removed from the list of Lepidoptera found in the Canary Islands.

Polymixis aurora (Turati, 1924) (Fig. 21)
Pseudopolia aurora Turati, 1924. *Atti Soc. ital. Sci. nat*., **63**: 83

Material examined: SPAIN, Fuerteventura, Corralejo, 10 m, 13 ♂♂, 7-27-XI-2017, leg. P. Falck (PF). **New to the Canary Islands.**

Distribution: North Africa from Morocco to Egypt (FREINA & BEHOUNEK, 1996: 29).

Biology: Early stages unknown.

Remarks: The specimens from Fuerteventura belong to *P. aurora commixta* (Rungs, 1943). It is probably a migrant from Africa.

Nonagria typhae (Thunberg, 1784) (Fig. 22)
Noctua typhae Thunberg, 1784. *Diss. Ent. sistens Insecta Suecica*, (1): 3

Material examined: SPAIN, Gran Canaria, Barranco de Azuaje, 270 m, 1 ♂, 1 ♀, 8-20-VIII-2020, leg. P. Falck, genitalia slide 3486PF (PF). **New to the Canary Islands**.

Distribution: Europe, Turkey, Russia, Middle East, Iraq, Iran and Central Asia.

Biology: The larvae feeds on *Typha* sp. and *Schoenoplectus* sp. (ZILLI *et al.*, 2005: 86).

Remarks: *N. typha* is probably a resident of the Island of Gran Canaria.

Hadeninae

Mniotype loslobensis (Fischer, Saldaitis & Ivinskis, 2007) (Fig. 23)
Eremobastis loslobensis Fischer, Saldaitis & Ivinskis, 2007. *Atalanta*, **38**(3/4): 377, figs 1-2, pl. 21, fig. 1

Material examined: SPAIN, Lanzarote, Mojón Blanco, Orzolá, 20 m, 2 ♂♂, 5-XI-2018, leg. and coll. B. Skule and C. Hviid, same data but 10 ♂♂, 4 ♀♀, 21-X-10-XI-2019, leg. P. Falck, genitalia slide 3287PF, 3394PF, 3478PF, DNA samples Lepid Phyl 0596PF/CILEP595-20, 0596PF/CILEP595-20 (PF).

The species was described on the basis of three males from the island of Los Lobos 2 km NE of Fuerteventura (FISCHER *et al.*, 2007). *M. loslobensis* is very similar to *M. dimorpha* (Rungs, 1948)

from Morocco both in the appearance of the adults and in the male genitalia. It can be distinguished by the lack of the prominent basal streak in the forewing, and in the male genitalia by the lack of several small triangular spines in the phallus diverticulum.

Female genitalia (Fig. 38): Ostium narrow, funnel-shaped, membranous, laterally sclerotized. Ductus bursae relatively long, heavily spinulated and with longitudinal folds. Corpus bursae membranous and oval.

Remarks: We obtained DNA barcode fragments of 633bp and 635pb from two specimens, the barcodes fall within Barcode Index Number (BIN) BOLD: AEE1222. The p-distance to nearest neighbour *Mniotype fulva* (Rothschild, 1914) is 4.33%, with the Barcode Index Number (BIN) BOLD: AEC7959. It was not possible to compare the DNA barcode with *Mniotype dimorpha* as no barcode seems to exist so far.

The genus *Eremobastis* Pérez-López & Morente-Benítez, 1996 was synonymised with *Mniotype* Franclemont, 1941 by FIBIGER & HACKER (2007: 230).

Hecatera sancta (Staudinger, 1859)
Hadena sancta Staudinger, 1859. *Stettin. ent. Ztg*., **20**(7-9): 213

This species is mentioned by VIVES MORENO (2014) as *Hecatera sancta canaria* (Pinker, 1974) but by mistake, it actually refers to *Clytie sancta canaria* Pinker, 1974 (= *Clytie illunaris* (Hübner, [1816])).

Hecatera sancta (Staudinger, 1859) should be removed from the list of Lepidoptera found in the Canary Islands.

Mythimna languida (Walker, 1858) (Fig. 24)
Hadena languida Walker, 1858. *List. Spec. Lepid. Insects Colln Br. Mus*., **15**: 1728

Material examined: SPAIN, Gran Canaria, Los Tilos de Moya, 500 m, 3 ♂♂, 11-24-VI-2018, leg. P. Falck, same data but 1 ♀, 17-30-IX-2018; Carreteria, 455 m, 1 ♂, 2 ♀♀, 8-20-VIII-2020, leg. P. Falck; Barranco de Azuaje, 270 m, 5 ♂♂, 2 ♀♀, 8-20-VIII-2020, leg. P. Falck; San Filipe, 25 m, 1 ♂, 24-X-13-XI-2020, leg. P. Falck; Tenerife, Las Americas, 40 m, 1 ♀, 21-V-3-VI-2019, leg. P. Falck (all PF). **New to the Canary Islands**.

Distribution: Europe, Africa, Cape Verde, and along the southern border zone of the Palaearctic and the Oriental Regions eastwards to Nepal (HACKER *et al*., 2002: 188).

Biology: The larva and pupa are figured in LEPIFORUM (2008-2021).

Remarks. *M. languida* is a resident of the Canary Islands.

Leucania zeae (Duponchel, 1828) (Fig. 25)
Noctua zeae Duponchel, 1828. *Hist. nat. Lépid. Fr*., **7**(1): 363, pl. 122, fig. 4

Material examined: SPAIN, Fuerteventura, Caldereta, 120 m, 1 ♀, 27-II-19-III-2018, leg. P. Falck; Vega de Rio Palmas, 245 m, 3 ♀ ♂, 6-26-I-2020 leg. P. Falck; Gran Canaria, Pie de la Cuesta, 500 m, 1 ♀, 17-30-IX-2018, leg. P. Falck (all PF). **New to the Canary Islands**.

Distribution: Europe (surroundings of the Mediterranean Sea) and from North Africa through the south-western part of the Palaearctic region to Mongolia and Northwest China (HACKER *et al*., 2002: 201).

Biology: The larva feeds on *Phragmites* but is also regarded as a pest of *Zea mays* L. (HACKER *et al*., 2002: 201).

Remarks: *L. zeae* is a resident of the Canary Islands.

Agrotis corralejoi Falck & Karsholt, sp. n. (Fig. 26)

Holotype ♂: SPAIN, Fuerteventura, Corralejo, 10 m, 7-27-XI-2017, leg. P. Falck, genitalia slide 3479PF, DNA sample Lepid Phyl 0763PF/CILEP762-21 (ZMUC).

Paratypes: SPAIN, Fuerteventura, Corralejo, 10 m, 3 ♂♂, 12-23-XI-1997, leg. N. M. Hall

(NHMUK), same data but 25 ♂♂, 29-XI-11-XII-2000, leg. N. M. Hall (NHMUK), same data but 23 ♂♂, 7-27-XI-2017, leg. P. Falck, genitalia slide 3477PF, 3480PF, 3481PF, DNA samples Lepid Phyl0764PF/CILEP763-21, 0765PF/CILEP764-21 (PF, MNCN).

Description: Wingspan 26.5-34 mm. Labial palp porrect, segment 2 whitish mottled with grey and with large, bushy scale tuft, segment 3 short, white. Antenna creamy white, strongly bipectinate. Head, neck, tegula and thorax light grey mottled with white and darker grey. Forewing ground colour pale grey mottled with white, especially along dorsum and costa, and with reddish brown between postmedian fascia and subterminal fascia and around the stigmae; orbicular-, reniform- and claviform stigma quite distinct creamy white, often more or less bordered with black, discal spot diffuse grey; postmedian fascia jagged, sometimes indistinct, subterminal fascia distinct, jagged, distally white. Fringe light grey. Hindwing whitish often with a darker, diffuse subterminal fascia: discal spot small and indistinct. Fringe grey.

Female unknown

Male genitalia (Figs 34, 34a, 34b): Uncus long slightly spatulate. Valva parallel sided, ventral- and dorsal edge almost straight, apex rounded; harpe with a broad base, tapering distally, apex almost pointed, length of sacculus and harpe about 2/3 the length of valva. Saccus rounded. Phallus straight; vesical with a smaller basal swelling, tapering towards apex.

Female genitalia unknown.

Molecular diagnosis: We obtained full lenght DNA barcodes (658 bp) from one specimen and DNA barcode fragments of 632 bp and 621 bp from two specimens. The barcodes fall within Barcode Index Number (BIN) BOLD: AEI1694

The maximum intraspecific distance is 0.32% (mean xx5%, n=3). The p-distance to nearest neighbour *Agrotis venerabilis* Walker, 1857 is 3.55%, with the Barcode Index Number (BIN) BOLD: ABZ1938. The minimum p-distance to *A. aistleitneri* is 7.94%, with the Barcode Index Number (BIN) BOLD: AEW1944 and the minimum p-distance to *A. boeticus* is 4.26%, with the Barcode Index Number (BIN) BOLD: AEF1653.

Diagnosis: Externally, *A. corralejoi* resembles *A. boeticus* (Boisduval, 1837) (Fig. 27) and *A. aistleitneri* Behounek & Speidel, 2009 (Fig. 28). It is distinguished by the pale grey ground colour, the distinct subterminal fascia and the white area distally; furthermore, it differs from *A. aistleitneri* by the much more strongly pectinate antenna. In the male genitalia *A. corralejoi* is distinguished from *A. boeticus* (Figs 35, 35a, 35b) by the slender and pointed harpe and by the lack of the small plate with cornuti in the phallus, and from *A. aistleitneri* by the longer and broader harpe and by the straight ventral and dorsal margin of the valva. The genitalia of *A. aistleitneri* are figured by BEHOUNEK & SEIDEL (2009: 127).

Biology: Early stages unknown. The adult is recorded from October to the beginning of February at light (HACKER *et al*., 1996: 207).

Distribution: *A. corralejoi* is only known from the island of Fuerteventura (Jandia, Costa Calma and Corralejo) (HACKER *et al*., 1996: 207; LEPIFORUM, 2021).

Etymology: The species is named after the town of Corralejo, situated at the northern tip of the island of Fuerteventura. The name was originally suggested by Michael Fibiger and Martin Honey.

Remarks: FIBIGER & SKULE (2004-2021) listed *Agrotis corralejoi* Fibiger & Honey, 2004 (a misspelling of *A. corralejoi*) as a valid species. In 2009 *A. aistleitneri* Behounek & Speidel, 2009 was described from the Cape Verde Islands and *A. corralejoi* was at that time erroneously regarded as conspecific with *A. aistleitneri* (LEPIFORUM, 2008-2021), so the taxon was never described or published in a scientific publication. *A. corralejoi* has also been confused with *A. boeticus*, due to misidentification (LEPIFORUM, 2008-2021).

Numerous males of *A. corralejoi* were attracted to light in the sand-dunes south of Corralejo, but no females were found, in spite of searching for it in the surroundings. We assume that the female is brachypterous, and it may hide in the loose sand, as it is known also from other species of Noctuidae occurring in deserts. Females of *A. aistleitneri* and *A. boeticus* (Boisduval, 1837) are fully winged.

A. boeticus (Boisduval, 1837) and *A. aistleitneri* Behounek & Speidel, 2009 should be removed from the list of Lepidoptera found in the Canary Islands.

Discussion

The Noctuidae are among the most popular groups of nocturnal Lepidoptera. This is both because of their relatively large size, their often-concealed way of life and the diversity of the group. With more than 40,000 species worldwide, the Noctuoidea are the most diverse superfamily of Lepidoptera. As it is often seen the diversity in oceanic islands is much lower and the most recent list of Canary Island Lepidoptera (VIVES MORENO, 2014) listed only 133 species of Noctuidae. This is certainly not due to under-sampling because the islands are, with their pleasant climate, a favourite holiday destination and lepidopterist from several European countries have undertaken fieldwork in the islands for more than 100 years.

In the present paper we add 15 species of Noctuoidea for the Canary Islands, three of which are described as new to science. The latter were previously found by other lepidopterists but were misidentified, and we regard all three to be endemic to the Canary Islands. Some of the newly recorded species are resident in the islands, and the occurrence of others are most likely the result of migration. It is assumed that some species arriving the Canary Islands as migrants, or introduced due to human activities, can establish temporary populations in the islands (sometimes for longer periods of time).

It is of course of high interest to record additions to the fauna of a certain area (here the Canary Islands), but it is also very important to keep the list of taxa occurring there updated. We have therefore critically assessed the current list of Canary Island Lepidoptera (VIVES MORENO, 2014), and we suggest that five species are removed from the list: 3 of them due to misidentifications and 2 of them due to nomenclatorial confusion. The list of Noctuoidea of the Canary Islands thus includes 143 species.

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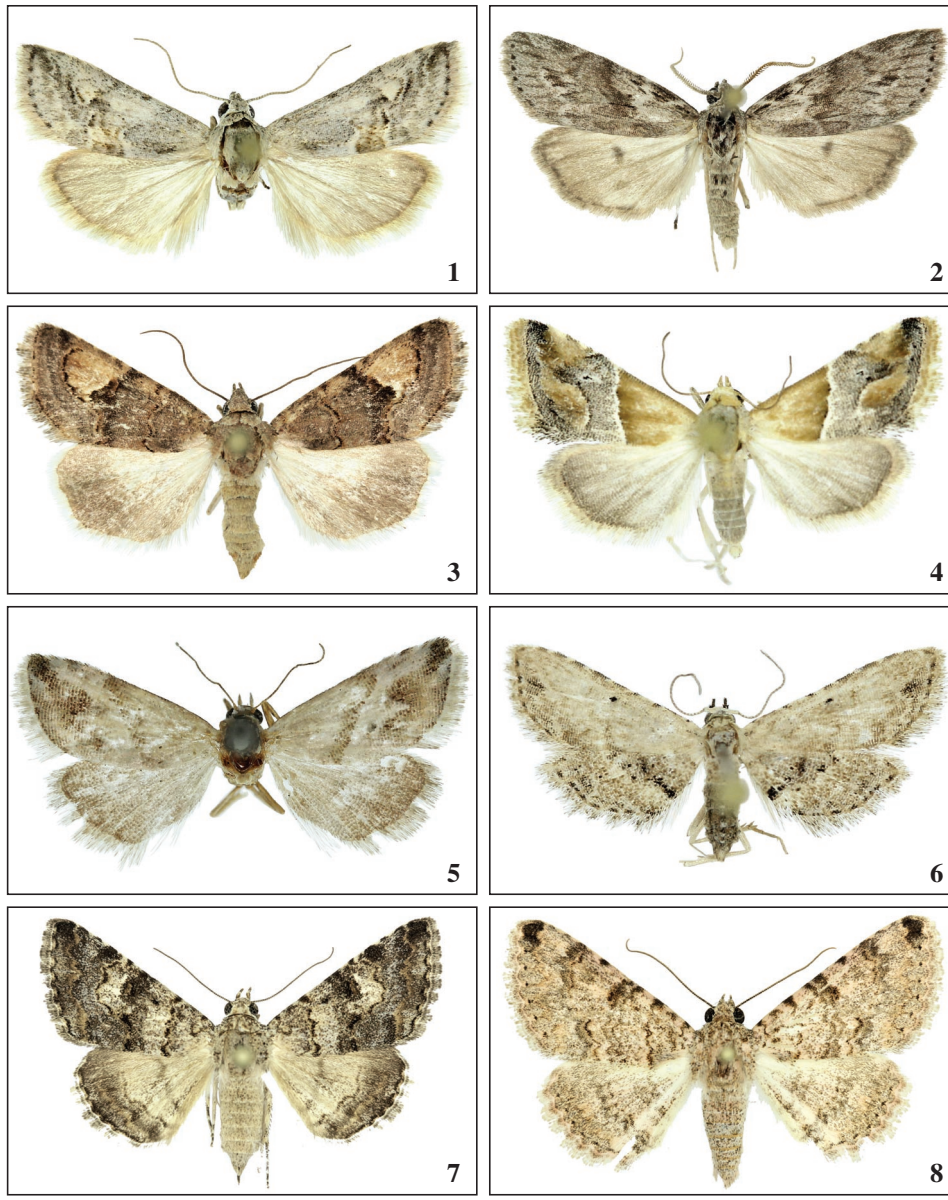
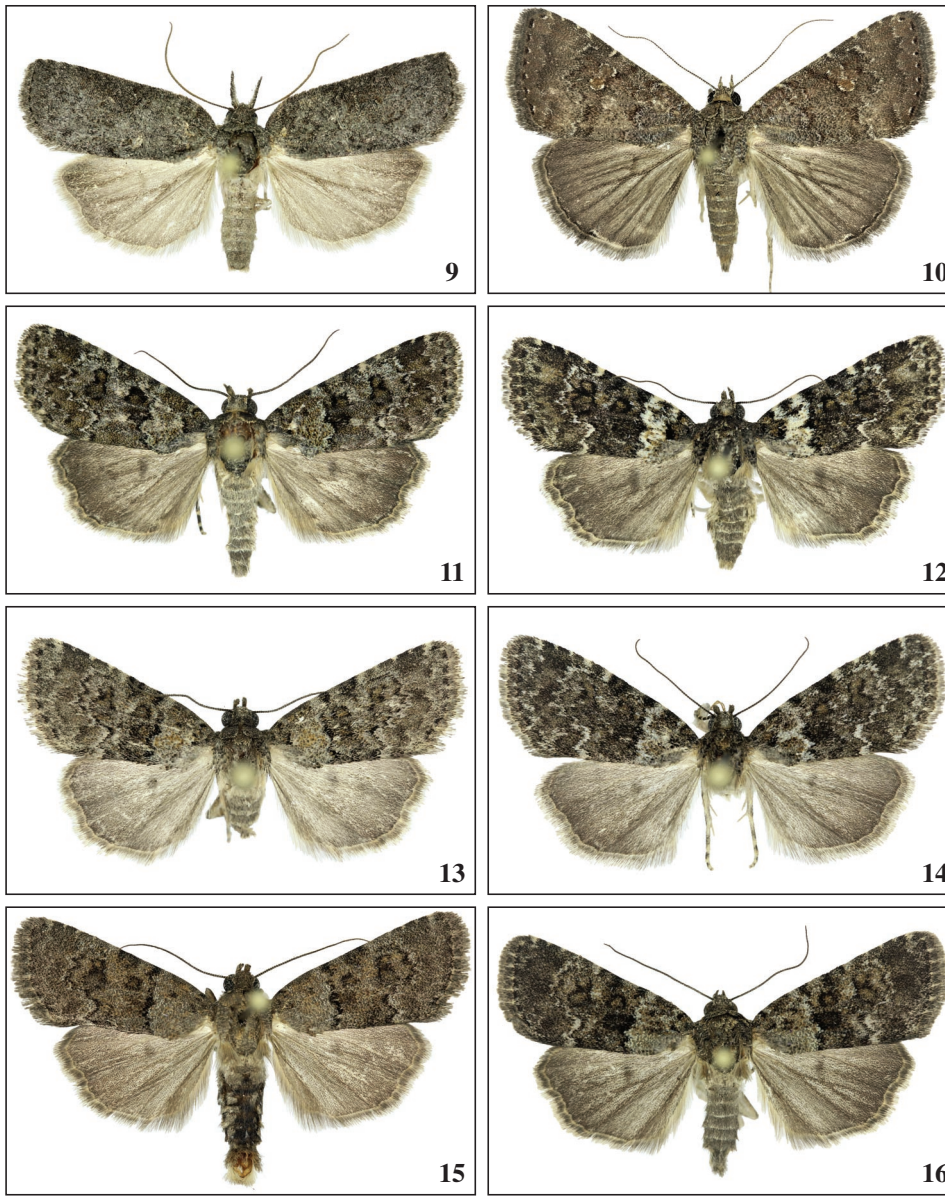
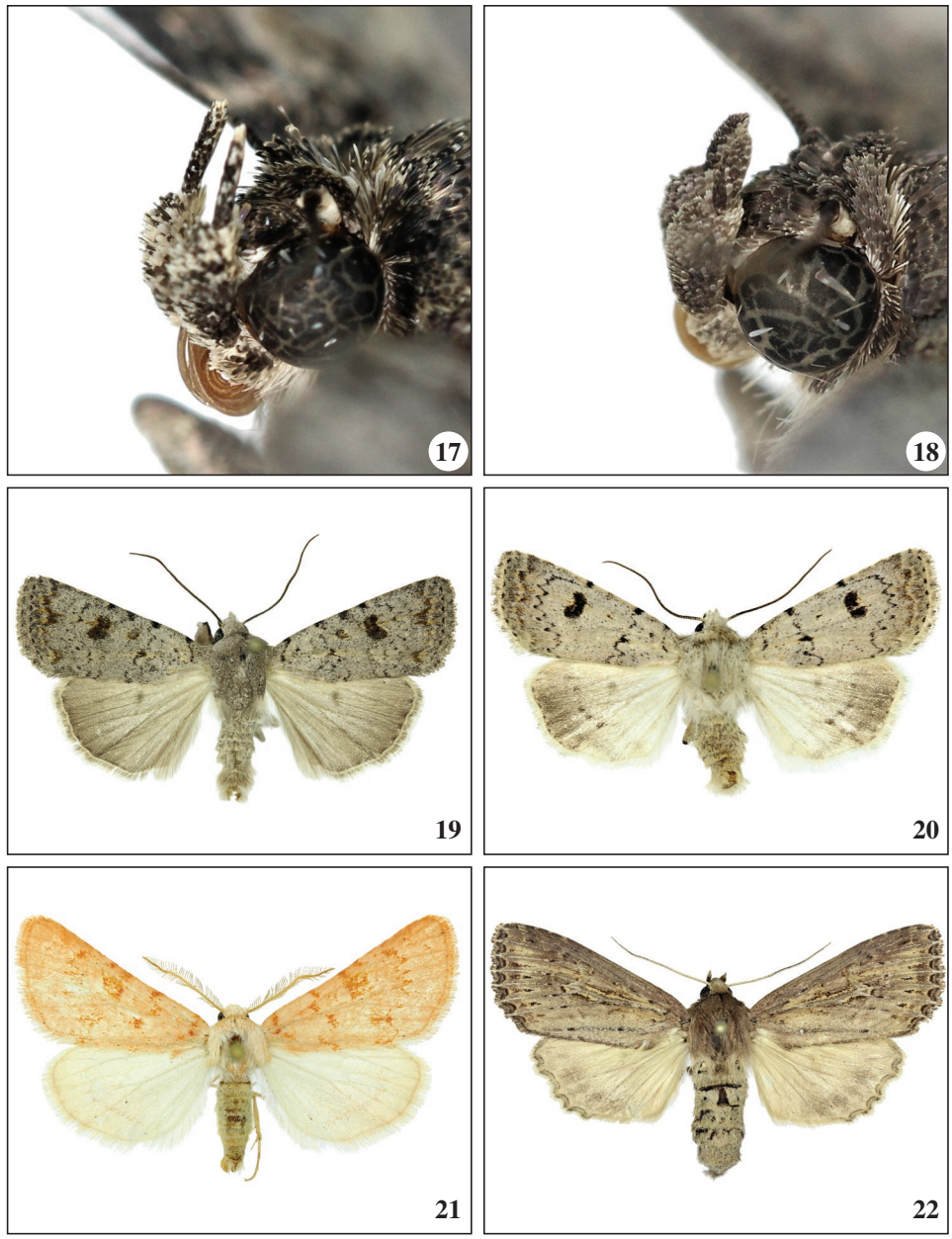


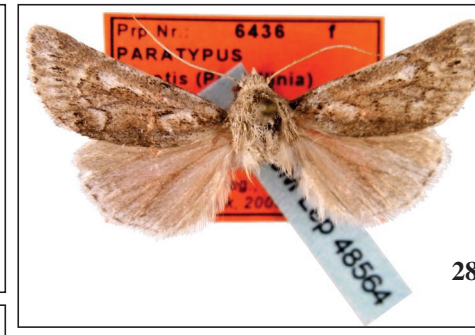
Figs 1-8.– 1. *Zebeeba orzolae* Falck & Karsholt, sp. n., ♂, Lanzarote, 14.5 mm. **2.** *Zebeeba poliotis* (Hampson, 1905), ♂, Tenerife, 22 mm. **3.** *Epharmottomena eremophila* (Rebel, 1895), ♀, Fuerteventura, 23 mm. **4.** *Eublemma thermobasis* Hampson, 1910, ♂, Gran Canaria, 11 mm. **5.** *Eublemma candidana* (Fabricius, 1794), ♀, Tenerife, 13.5 mm. **6.** *Araeopteron ecphaea* (Hampson, 1914), ♀, Gran Canaria, 11 mm. **7.** *Gnamptonyx innexa* (Walker, 1858), ♀, Gran Canaria, 28 mm. **8.** *Rhabdophera acrosticta* (Püngeler, 1904), ♂, Fuerteventura, 30 mm.

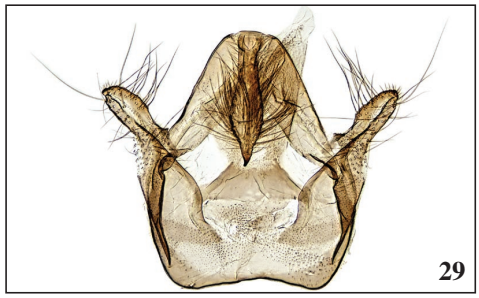


Figs 9-16.– 9. *Nycteola columbana* (Turner, 1925), ♂, Fuerteventura, 22 mm. **10.** *Amyna axis* Guenée, 1852, ♂, Lanzarote, 25 mm. **11.** *Nyctobrya vilfredi* Falck & Karsholt, sp. n., ♂, Gran Canaria, 28 mm. **12.** *Nyctobrya vilfredi* Falck & Karsholt, sp. n., ♀, Gran Canaria, 27 mm. **13.** *Nyctobrya canaria* (Alphéraky, 1890), ♂, Tenerife, 24 mm. **14.** *Nyctobrya canaria* (Alphéraky, 1890), ♀, Tenerife, 24 mm. **15.** *Nyctobrya pinkeri* Behounek & Speidel, 2013, ♂, Gran Canaria, 27 mm. **16.** *Nyctobrya pinkeri* Behounek & Speidel, 2013, ♀, Gran Canaria, 27 mm.



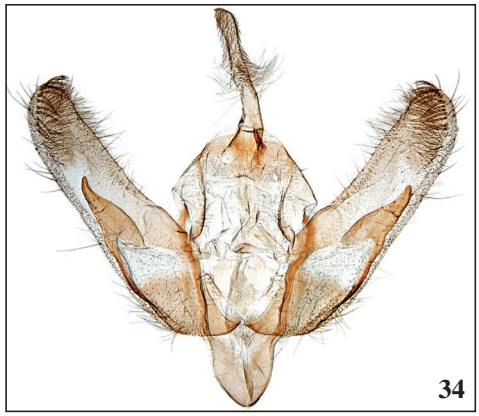
Figs 17-22.– 17. *Nyctobrya vilfredi* Falck & Karsholt, sp. n., palps, Gran Canaria. **18.** *Nyctobrya pinkeri* Behounek & Speidel, 2013, palps, Gran Canaria. **19.** *Caradrina rebeli rebeli* Staudinger, 1901, ♂, Tenerife, 31 mm. **20.** *Caradrina rebeli lanzarotensis* Pinker, 1962, ♂, Fuerteventura, 27.5 mm. **21.** *Polymixis aurora* (Turati, 1924), ♂, Fuerteventura, 31 mm. **22.** *Nonagria typhae* (Thunberg, 1784), ♀, Gran Canaria, 46 mm.

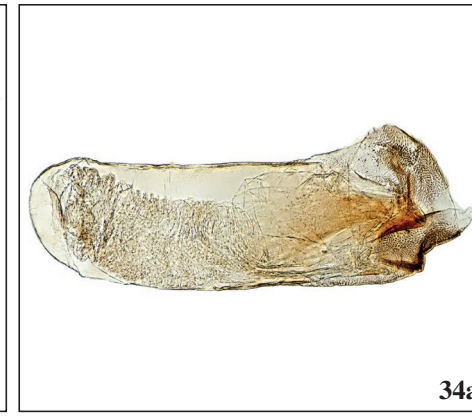


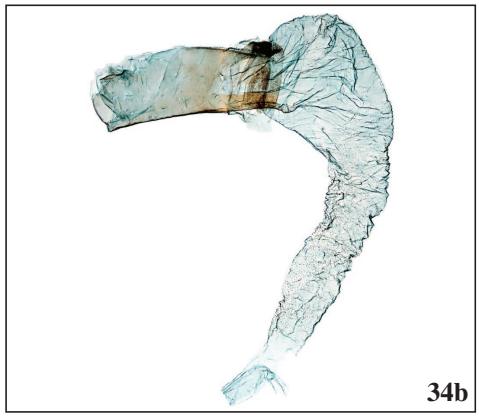


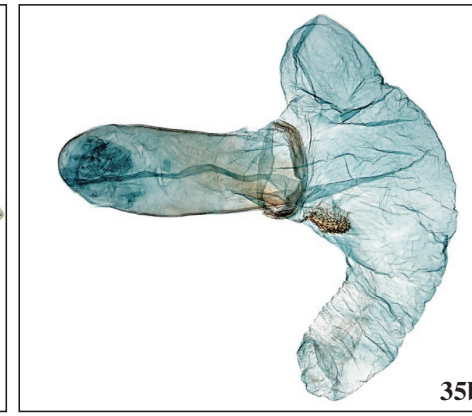
Figs 23-29.– 23. *Mniotype loslobensis* (Fischer, Salditis & Ivinskis, 2007), ♀, Lanzarote, 33.5 mm. **24.** *Mythimna languida* (Walker, 1858), ♂, Gran Canaria, 29 mm. **25.** *Leucania zeae* (Duponchel, 1828), ♂, Fuerteventura, 35 mm. **26.** *Agrotis corralejoi* Falck & Karsholt sp. n., ♂, Fuerteventura, 30 mm. **27.** *Agrotis boeticus* (Boisduval, 1837), ♂, Algarve, Portugal, 30 mm. **28.** *Agrotis aistleitneri* Behounek & Speidel, 2009, ♀, Cape Verde Islands. **29.** *Zebeeba orzolae* Falck & Karsholt, sp. n., ♂, Lanzarote, GP3473PF. **29a.** Phallus, Lanzarote, GP3473PF.

Figs 30-33.– 30. *Nyctobrya vilfredi* Falck & Karsholt, sp. n., ♂, Gran Canaria, GP3294PF. **30a.** Phallus, Gran Canaria, GP3462PF. **31.** *Nyctobrya canaria* (Alphéraky, 1890), ♂, Tenerife, GP3292PF. **31a.** Phallus, Tenerife, GP3292PF. **32.** *Mniotype loslobensis* (Fischer, Salditis & Ivinskis, 2007), phallus, Lanzarote, GP3287PF. **33.** *Mniotype dimorpha* (Rungs, 1948), phallus, Morocco, GP3385aPF.









Figs 34-35.– 34. *Agrotis corralejoi* Falck & Karsholt sp. n., ♂, Fuerteventura, GP3481PF. **34a.** Phallus, Fuerteventura, GP3481PF. **34b.** Phallus with everted vesica, GP3477PF. **35.** *Agrotis boeticus* (Boisduval, 1837), ♂, Algarve, Portugal, GP3484aPF. **35a.** Phallus, Algarve, Portugal, GP3484aPF. **35b.** Phallus with everted vesical, Algarve, Portugal, GP3475aPF.

Figs 36-38.– 36. *Nyctobrya vilfredi* Falck & Karsholt, sp. n., ♀, Gran Canaria, GP3300PF. **37.** *Nyctobrya canaria* (Alphéraky, 1890), ♀, Tenerife, GP3304PF. **38.** *Mniotype loslobensis* (Fischer, Salditis & Ivinskis, 2007), ♀, Lanzarote, GP3478PF.

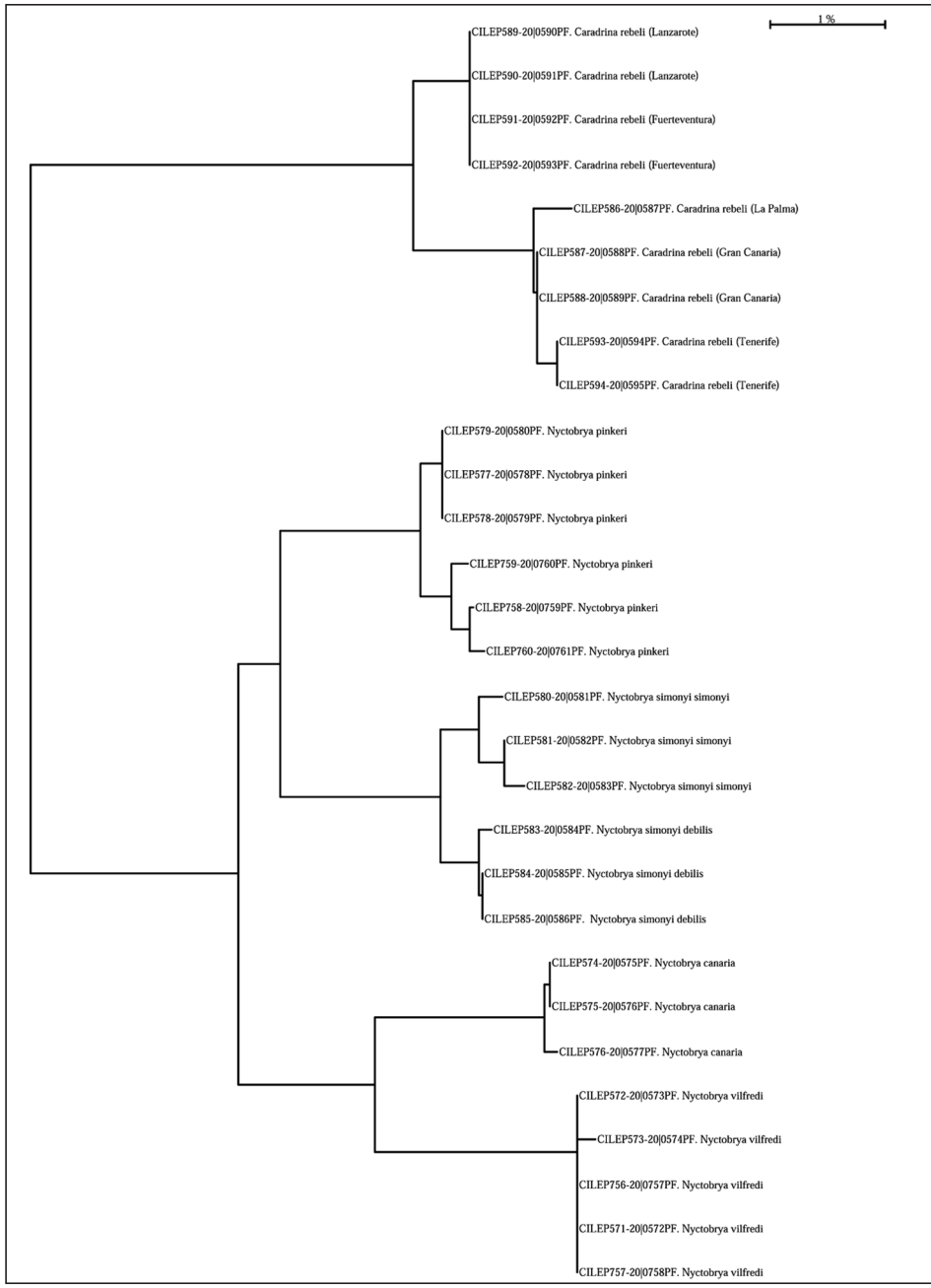


Fig. 39.– Neighbour-joining tree of *Nyctobrya vilfredi* Falck & Karsholt, sp. n., related *Nyctobrya* species and *Caradrina rebeli.*