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The genus *Apatema* Walsingham, 1900 in the Canary Islands and Madeira, with description of 13 new species (Lepidoptera: Autostichidae, Oegoconiinae)

P. Falck, O. Karsholt & T. J. Simonsen

Abstract

The genus *Apatema* Walsingham, 1900 in the Canary Islands and Madeira is revised based on external morphology, genitalia and DNA barcodes. We recognize 18 species, 13 of which are described as new: *Apatema confluellum* Falck & Karsholt, sp. n. (Spain: Tenerife), *Apatema minimum* Falck & Karsholt, sp. n. (Spain: Lanzarote and Fuerteventura), *Apatema lapalmae* Falck & Karsholt, sp. n. (Spain: La Palma), *Apatema sallyae* Falck & Karsholt, sp. n. (Spain: Gran Canaria), *Apatema lanzarotae* Falck & Karsholt, sp. n. (Spain: Lanzarote), *Apatema mixtum* Falck & Karsholt, sp. n. (Spain: Tenerife), *Apatema pseudolucidum* Falck & Karsholt, sp. n. (Spain: Gran Canaria), *Apatema griseum* Falck & Karsholt, sp. n. (Spain: Gran Canaria), *Apatema grancanariae* Falck & Karsholt, sp. n. (Spain: Gran Canaria), *Apatema brunneum* Falck & Karsholt, sp. n. (Spain: Tenerife), *Apatema transversum* Falck & Karsholt, sp. n. (Spain: Gran Canaria), *Apatema stadelii* Falck & Karsholt, sp. n. (Spain: Tenerife) and *Apatema skulei* Falck & Karsholt, sp. n. (Spain: Gran Canaria). The monotypic *Dysallomima* Gozmány, 2008, syn. n. is treated as a new synonym of *Apatema* and its type species *Lampros coarctella* Rebel, 1896 is transferred as *Apatema coarctella* (Rebel, 1896) comb. n. *Apatema helleri* (Rebel, 1910), comb. n. is transferred from the Blastobasidae. *A. mediopallidum* Walsingham, 1900 is removed from the list of Lepidoptera of the Canary Island. Morphology of all species is described and figured in detail. All species occurs in the Canary Islands and only one, *A. fasciata* (Stainton, 1859) occurs both in these islands and in the Madeiran archipelago. Records of *A. mediopallidum* Walsingham, 1900 from the Canary Islands are based on misidentifications. Analyses of DNA barcodes support the identification distinctiveness of the species as each species appear monophyletic, well-supported and genetically isolated in the analyses. The only exception is *A. coarctella*, which could not be rendered monophyletic with respect to a single *A. mediopallidum* specimen, when sequences from non-Canarian *Apatema* were included in the analysis. We argue that this result is an artefact.

KEY WORDS: Lepidoptera, Autostichidae, *Apatema*, new species, DNA barcoding, Canary Islands, Spain, Madeira, Portugal.

**El género *Apatema* Walsingham, 1900 en las Islas Canarias y Madeira, con descripción de 13 nuevas especies
(Lepidoptera: Autostichidae, Oegoconiinae)**

Resumen

Se revisa el género *Apatema* Walsingham, 1900 en las Islas Canarias y Madeira basado sobre la morfología externa, genitalia t ADN código de barras. Reconocemos 18 especies, 13 de las cuales se describen como nuevas: *Apatema confluellum* Falck & Karsholt, sp. n. (España: Tenerife), *Apatema minimum* Falck & Karsholt, sp. n.

(España: Lanzarote y Fuerteventura), *Apatema lapalmae* Falck & Karsholt, sp. n. (España: La Palma), *Apatema sallyae* Falck & Karsholt, sp. n. (España: Gran Canaria), *Apatema lanzarotae* Falck & Karsholt, sp. n. (España: Lanzarote), *Apatema mixtum* Falck & Karsholt, sp. n. (España: Tenerife), *Apatema pseudolucidum* Falck & Karsholt, sp. n. (España: Gran Canaria), *Apatema griseum* Falck & Karsholt, sp. n. (España: Gran Canaria), *Apatema grancanariae* Falck & Karsholt, sp. n. (España: Gran Canaria), *Apatema brunneum* Falck & Karsholt, sp. n. (España: Tenerife), *Apatema transversum* Falck & Karsholt, sp. n. (España: Gran Canaria), *Apatema stadelii* Falck & Karsholt, sp. n. (España: Tenerife) and *Apatema skulei* Falck & Karsholt, sp. n. (España: Gran Canaria). El monotípico *Dysallomima* Gozmány, 2008, syn. n. es tratado como una nueva sinonimia de *Apatema* y la especie tipo *Lampros coarctella* Rebel, 1896 es transferida como *Apatema coarctella* (Rebel, 1896) comb. n. *Apatema helleri* (Rebel, 1910), comb. n. es transferida desde los Blastobasidae. *A. mediopallidum* Walsingham, 1900 es removida de la lista de Lepidoptera de las Islas Canarias. Morfológicamente se describen y figuran en detalle, todas las especies. Todas las especies ocurren en las Islas Canarias y solo una, *A. fasciata* (Stainton, 1859) ocurre ambas en estas islas y en el Archipiélago de Madeira. Los registros de *A. mediopallidum* Walsingham, 1900 de las Islas Canarias están basados en malas identificaciones. El análisis del ADN código de barras soporta la identificación, separadamente, de cada una de las especies que aparecen monofiléticamente, bien soportadas y genéticamente aisladas en el análisis. La sola excepción es *A. coarctella*, la cual no puede ser tratada como monofilética con respecto a una sola muestra de un espécimen de *A. mediopallidum*, cuando las secuencias de los *Apatema* no canarios, fueron incluidos en el análisis. Argumentamos que este resultado es un artefacto.

PALABRAS CLAVE: Lepidoptera, Autostichidae, *Apatema*, nuevas especies, ADN código de barras, Islas Canarias, España, Madeira, Portugal.

Introduction

Oegoconiinae are a small group of Gelechioidea, most of which are distributed in the Western Palearctic region. They were included by GOZMÁNY (2008) in his revision of the Palearctic Symmocidae. According to recent molecular studies, e. g. HEIKKILÄ *et al.* (2013) Oegoconiinae should be regarded as a subfamily of Autostichidae.

WALSINGHAM (1900: 220) erected the genus *Apatema* for a new species, *A. mediopallidum*, which he described from France: Corse. In a treatment of Microlepidoptera of the Canary Islands he subsequently transferred *Gelechia fasciata* Stainton, 1859 and *Lampros coarctella* Rebel, 1896 (as a synonym of *fasciata*) to *Apatema* and described a new species, *A. lucidum* (Walsingham, 1908: 945). During most of the 20th century most specimens from outside of the Macaronesia Islands were referred to *A. mediopallidum*. *Apatema* species are rather small Gelechioidea having blackish forewings with whitish or yellowish markings, their genitalia are rather simple and similar between the species, and it has only slowly become evident that the genus is more diverse than hitherto suspected.

The Lepidoptera of the Canary Islands are considered well-known. Similar to other oceanic islands the fauna of the Canary Islands is less diverse than that of the adjacent continental countries (Morocco, Portugal), but includes a number of endemic species. Recent field work by the first author (e. g. FALCK *et al.*, 2019; FALCK & KARSHOLT, 2019) has revealed a number of hitherto unrecorded or even undescribed species of Lepidoptera occurring in these islands. In the present paper we revise the genus *Apatema* in the Canary Island and the Madeiran Archipelago.

Many Canarian *Apatema* species are quite easily identified based on adult habitus (e. g. *A. sallyae* Falck & Karsholt, sp. n. and *A. lucidum* Walsingham), while others are difficult to identify without genitalia dissections (e. g. *A. mixtum* Falck & Karsholt, sp. n. and *A. fasciata* (Stainton)). When dissecting the male genitalia it is very important to separate the cornuti groups (Fig. 28) to ensure correct identification. In the female genitalia (Fig. 48) some species (e. g. *A. stadelii* Falck & Karsholt, sp. n.) have a slightly twisted ductus bursae. This gives the impression of a longitudinal fold of the anterior part of ductus bursae in the genital-slide, despite being an artefact, which we will refer to as “a longitudinal fold”.

Here we revise the Canarian *Apatema* species based on adult morphology and DNA barcodes (a 658 bp fragment of the mitochondrial COI gene). We provide detailed descriptions and diagnoses for all species and discuss their molecular diversity and potential phylogenetic relationships.

Material and methods

Most of the specimens were attracted to an 8 watt super actinic light. Some of the specimens especially from forest localities were obtained by netting in the afternoon sunshine and a few specimens were disturbed from the vegetation during daytime. 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.

The so-called DNA barcode fragment (a 658 bp fragment of the mitochondrial COI gene) was sequenced from all known *Apatema* species from the Canary Islands to detect genetically distinct clusters, and to obtain molecular data for new species. DNA samples (dried legs) were prepared according to the accepted standards and were processed at the Canadian Centre for DNA Barcoding (CCDB, Biodiversity Institute of Ontario, University of Guelph). Genetic clusters are presented with their barcode index number (BIN; cf. RATMNASINGHAM & HERBERT, 2013).

To assess overall DNA diversity and relationships within the Canary Island *Apatema* we analysed the DNA barcodes under a Bayesian framework in MrBayes 3.2. (RONQUIST *et al.*, 2011). The analysis was done utilising the model-jumping option (nst=mixed) allowing MrBayes to assess the best evolutionary model for the dataset. The rates were set to GAMMA, all other priors were left as default. The analysis was run for 10 million generations with sampling every 1000 generation, and the first 25% were used as burnin. The run files were subsequently assessed in Tracer 1.7.1 (part of the BEAST package, BOUCKAERT *et al.*, 2019) to confirm that the two parallel analyses had converged and reached stationarity. The majority rule consensus tree was visualised in FigTree 1.4.4. (RAMBAUT, 2014). We analysed the dataset in BEAST in conjunction with BEAUti (BOUCKAERT *et al.*, 2019) under the GTR model for molecular evolution (the model found by MrBayes) with rates set to GAMMA and all other priors left as default. The analysis was run for 10 million generations with sampling every 5000 generations. The resultant trees were then imported into DensiTree (BOUCKAERT & HELED, 2014), with the first 25% used as burnin, to visualise potential conflict areas in the data. To test whether the *Apatema* species found on the Canary Island and Madeira potentially comprise a monophyletic group, we augmented our DNA barcode dataset with publicly available barcode sequences from four additional species of *Apatema* (16 sequences) and three species of the closely related genus *Oegoconia* (six sequences). The new dataset was analysed under a Bayesian framework in MrBayes 3.2. utilising the model-jumping option with rates set to GAMMA. The analysis was run for 20 million generations with sampling every 1000 generations, and the first 25% were used as burnin. The run files were subsequently assessed in Tracer 1.7.1, and the majority rule consensus tree was visualised in FigTree 1.4.4. In all Bayesian analyses a single specimen of each of the three species *Epanastatis sophroniella* (Rebel, 1894), *E. canariensis* (Rebel, 1906) and *Ambloma klimeschi* Gozmány, 1975 were used as outgroups. All specimens used in the molecular analyses are listed in Table 1. We explored the general genetic diversity in *Apatema* from the Canary Island by calculating uncorrected p distances in Mega X (KUMAR *et al.*, 2018). We calculated the average uncorrected p distance within as well as between each putative species (as listed in Table 1 and the Taxonomic section); the values are listed in Table 2. We further divided *A. coarctella* into populations from Fuerteventura, Gran Canaria, Lanzarote, La Palma and Tenerife and separately calculated the average uncorrected p distance within and between the four populations; the values are listed in Table 3. Similarly, we divided *A. fasciata* into populations from Gran Canaria, Fuerteventura and Lanzarote and separately calculated the average uncorrected p distance within and between the three populations; the values are listed in Table 4.

Table 3.– Average uncorrected p distance within and between populations of *Apatema coarctella* as described in the text.

	Tenerife	Gran Canaria + Fuerteventura	La Palma	Lanzarote
Tenerife	0			
Gran Canaria + Fuerteventura	0.0463	0.0034		
La Palma	0.0295	0.0534	0.0013	
Lanzarote	0.0447	0.0022	0.0540	0.0014

Table 4.– Average uncorrected p distance within and between populations of *Apatema fasciata* as described in the text.

	Gran Canaria	Fuerteventura	Lanzarote
Gran Canaria	0.0005		
Fuerteventura	0.0295	0.0046	
Lanzarote	0.0335	0.0290	n/c

Abbreviations used

GP Genitalia preparation

JJ Collection of Jari Junnilainen, Vantaa, Finland

PF Collection of Per Falck, Nexsø, Denmark

MNCN Collection of Antonio Vives, Museo Nacional de Ciencias Naturales, Madrid, Spain

NHMUK The Natural History Museum, London, UK

TL Type locality

ZMUC Zoological Museum, Natural History Museum of Denmark, Copenhagen, Denmark

Results

Apatema Walsingham, 1900

Apatema Walsingham, 1900. *Entomologist's mon. Mag.*, **36**: 219.

Type species: *Apatema mediopallidum* Walsingham, 1900. *Entomologist's mon. Mag.*, **36**: 220.

= *Microgonia* Popescu-Gorj & Căpușe, 1965. *Revue rom. Biol. Série Zool.*, **10**: 400, nec *Microgonia* Herrich-Schäffer, 1855. *Samml. ausseurer. Schmett.*: 41.

Type species: *Microgonia whalleyi* Popescu-Gorj & Căpușe, 1965. *Revue rom. Biol. Série Zool.*, **10**: 401–403.

= *Dysallomima* Gozmány, 2008. *Microlepid. Palaeart.*, **13**: 62, **syn. n.**

Type species *Lampros coarctella* Rebel, 1896. *Annln naturh. Mus. Wien*, **11**: 129.

Remark: WALSINGHAM (1900: 219) gave the meaning of *Apatema* as “a deceit” (meaning untrustworthy) without explaining it further. He was, however, quite foresighted as the taxonomy of *Apatema* has proved far more complicated to unravel than one would initially expect.

The monotypic genus *Dysallomima* was erected by GOZMÁNY (2008: 62) for *Lampros coarctella*, which differs from other *Apatema* species by details of the genitalia in both sexes. In our analyses of the DNA barcodes *coarctella* is nested deeply within the genus *Apatema*, and we consider it as a specialized representative of this genus.

Biology: Almost nothing is known about the biology and the early stages are unknown. The first author reared one species from a piece of dead wood overgrown with fungi.

Distribution: Western Palaearctic region.

Checklist of *Apatema*

- Apatema parodia* Gozmány, 1988 - TL: Morocco
Apatema apolausticum Gozmány, 1996 - TL: Romania
Apatema impunctella Amsel, 1940 - TL: Italy (Sardinia)
Apatema sutteri Gozmány, 1997 - TL: Greece
Apatema mediopallidum Walsingham, 1900 - TL: France (Corse)
 = *Oegoconia quadripuncta minor* Rebel, 1916 - TL: Greece (Crete)
 = *Apatema bifasciatum* Chrétien, 1922 - TL: Morocco
 = *Oegoconia phanerodoxa* Meyrick, 1926 - TL: Spain
 = *Oegoconia proterocline* Meyrick, 1939 - TL: France
 = *Apatema fasciata melitensis* Amsel, 1952 - TL: Malta
Apatema inexpectatum Gozmány, 1988 - TL: Morocco
Apatema apatemella (Amsel, 1958) - TL: Cyprus
Apatema acutivalva Gozmány, 2008 - TL: Cyprus
Apatema baixerasi Vives, 2001 - TL: Spain
Apatema whalleyi (Popescu-Gorj & Căpușe, 1965) - TL: Romania
Apatema confluellum Falck & Karsholt, sp. n. - TL: Spain (Tenerife)
Apatema minimum Falck & Karsholt, sp. n. - TL: Spain (Lanzarote)
Apatema lapalmae Falck & Karsholt, sp. n. - TL: Spain (La Palma)
Apatema helleri (Rebel, 1910) - TL: Spain (Gran Canaria)
Apatema sallyae Falck & Karsholt, sp. n. - TL: Spain (Gran Canaria)
Apatema lanzarotae Falck & Karsholt, sp. n. - TL: Spain (Lanzarote)
Apatema mixtum Falck & Karsholt, sp. n. - TL: Spain (Tenerife)
Apatema fasciata (Stainton, 1859) - TL: Portugal (Madeira)
Apatema coarctella (Rebel, 1896) - TL: Spain (Tenerife)
Apatema junnilaineni Vives, 2001 - TL: Spain (Gran Canaria)
Apatema pseudolucidum Falck & Karsholt, sp. n. - TL: Spain (Gran Canaria)
Apatema griseum Falck & Karsholt, sp. n. - TL: Spain (Gran Canaria)
Apatema lucidum Walsingham, 1908 - TL: Spain (Tenerife)
Apatema grancanariae Falck & Karsholt, sp. n. - TL: Spain (Gran Canaria)
Apatema brunneum Falck & Karsholt, sp. n. - TL: Spain (Tenerife)
Apatema transversum Falck & Karsholt, sp. n. - TL: Spain (Gran Canaria)
Apatema stadelii Falck & Karsholt, sp. n. - TL: Spain (Tenerife)
Apatema skulei Falck & Karsholt, sp. n. - TL: Spain (Gran Canaria)

Our work demonstrates that the genus *Apatema* is much more diverse in the Canary Islands than hitherto believed. Field work by the first author has resulted in freshly collected material of both sexes from most species. This has enabled us to identify 18 separate species, which differ in both morphology and DNA. These are described in detail below.

Apatema confluellum Falck & Karsholt, sp. n. (Fig. 1)

Holotype ♀: SPAIN, TENERIFE, Los Cristianos, 29-XII-2003, leg. O. Karsholt (ZMUC).

Paratypes: SPAIN, TENERIFE, Los Cristianos, 1 ♂, 29-XII-2003, leg. O. Karsholt (ZMUC); Arona, 500 m, 1 ♂, 25-XI-2-XII-2012, leg. P. Falck (PF), genitalia slide 2796PF (PF); El Tanque, 500 m, 1 ♀, 2-9-III-2013, leg. P. Falck (PF); Armeñime, 100 m, 2 ♀♀, 3-9-III-2013, leg. P. Falck (PF); Los Gigantes, 150 m, 4 ♂♂, 4 ♀♀, 8-22-XI-2016, leg. P. Falck, genitalia slides 2792PF, 2794PF, DNA sample Lepid Phyl 0015PF/ CILEP015-19 (PF, MNCN); Playa Paraíso, 50 m, 2 ♀♀, 1-20-III-2017, leg. P. Falck (PF), DNA sample Lepid Phyl 0013PF/ CILEP013-19 (PF); Adeje, 300 m, 1 ♀, 1-20-III-2017, leg. P. Falck, DNA sample Lepid Phyl 0014PF/ CILEP014-19 (PF); El Médano, 10 m, 1 ♂, 1 ♀, 1-20-III-2017, leg. P. Falck (PF), same data but, 1 ♂, 21-V-3-VI-2019, leg. P. Falck (PF).

Description: Adult. Wingspan 7-11 mm. Labial palp slender, upturned, segment 2 pale-grey, laterally dark-grey at base and towards apex, medially near apex with a dark-grey spot, segment 3 black, dorsally pale-grey. Antenna black, with indistinct rings in females. Head and neck yellowish brown, thorax grey mottled with dark brown especially anteriorly; tegula pale brown. Forewing pale greyish brown mottled with brown, especially along costa and towards apex, base black; at 1/3 and 1/2 with two large, diffuse black spots; apical spot yellowish grey, indistinct; fringe grey. Hindwing pale-grey, with pale-grey fringe.

Variation: The black spot at 1/3 of the forewing is sometimes divided in two separate spots.

Male genitalia (Figs 29, 29a): Uncus long, slender rectangular, apex spatulate; gnathos almost as long as uncus, straight, apically hook-shaped, apex pointed; tegumen sub-triangular, anterior margin flatly U-shaped; valva simple, approximately 3.5 times longer than broad, margins almost parallel; apex rounded; sacculus 2/3 length of valva, apically hook-shaped; labis very short; juxta sub-triangular with apical protrusions; saccus sub-triangular, medium-sized; phallus straight, as long as tegumen, basal sclerite bent, length 1/3 of phallus, distally a group of thin microspines; cornuti group I a large plate with numerous broad-based triangular spines; cornuti group II with few (2-5) short thin spines; cornuti group III with 10-15 relatively short, needle-shaped spines; vesica without microspines.

Female genitalia (Fig. 49): Papilla analis long, distally pointed; posterior apophysis slender, as long as papilla analis; anterior apophysis slender, as long as posterior apophysis, base bifurcate; tergum VIII sub-rectangular, posterior margin U-shaped; antrum dorsally bilobed, slightly tapered to fold on ductus bursae, posteriorly with dorso-medial indentation, edge sclerotized; ductus bursae straight, anteriorly parallel-sided with a slight longitudinal fold, evenly sclerotized; ductus seminalis with few spinulae; corpus bursae membranous rounded; signum droplet-shape, laterally folded upwards, with 1-2 small spines.

DNA barcodes (Figs 64-66, Tables 1-2): Three specimens were barcoded with some internal variation in COI (uncorrected $p = 0.0061$). The specimens are placed as sister to *A. minimum*. *A. confluentum* is clearly differentiated from all other species with uncorrected p distance to other species ranging from 0.0935 and 0.0986 (*A. pseudolucidum* and *A. minimum*) to 0.1207 (*A. fasciata*). Barcode Index Number: ADS6252.

Diagnosis: The greyish brown colour and the two large spots in the forewing separate *A. confluentum* from all other known *Apatema* species. In the male genitalia the nearly straight valva, the relatively long sacculus and the few cornuti in cornuti group I and II are characteristic. In the female genitalia the parallel-sided anterior part of ductus bursae and the small longitudinal fold are characteristic.

Biology: Early stages unknown. The specimens were attracted to light during March, May-June and November-December at altitudes ranging from sea level to 500 m.

Distribution: Only known from the island of Tenerife, Spain.

Etymology: The name (a noun in opposition) is derived from combining the Latin word *confluus* (= confluent) with the diminutive suffix *-ellum*.

Apatema minimum Falck & Karsholt, sp. n. (Fig. 2)

Holotype ♂: SPAIN, LANZAROTE, Urb.[anización] Famara, 55 m, 2-8-XI-2018, leg. C. Hviid & B. Skule (ZMUC).

Paratypes: SPAIN, FUERTEVENTURA, Betancuria, 400 m, 1 ♂, 7-27-XI-2017, leg. P. Falck, Genitalia slide 2774PF, DNA sample Lepid Phyl 0024PF/ CILEP024-19 (PF); LANZAROTE, Urb. Famara, 55 m, 1 ♂, 2-8-XI-2018, leg. C. Hviid & B. Skule (ZMUC); El Bosquecillo, 600 m, 1 ♂, 6-XI-2018, leg. C. Hviid & B. Skule (ZMUC); Mala, 18 m, 3 ♂♂, 1 ♀, 21-X-10-XI-2019, leg. P. Falck, genitalia slide 3196PF, DNA sample Lepid Phyl 0675PF/ CILEP674-20 (PF, MNCN); Tabayesco, 280 m, 4 ♂♂, 21-X-10-XI-2019, leg. P. Falck, genitalia slides 3197PF, 3225PF, DNA samples Lepid Phyl 0313PF/ CILEP312-19, 0609PF/ CILEP608-20, 0674PF/ CILEP673-20 (PF); Caleta de Famara, 20 m, 1 ♂, 21-X-10-XI-2019, leg. P. Falck (PF).

Description: Adult. Wingspan 7-7.5 mm. Labial palp slender, upturned, segment 2 white, basally black, segment 3 white with few blackish scales ventrally. Antenna black. Head, neck and thorax creamy white; tegula creamy white, basally black. Forewing ground colour black, centrally a regular, slightly oblique creamy white fascia almost reaching dorsum; costal spot creamy white, merging with tornal spot, forming a distinct outer fascia; fringe grey. Hindwing grey with grey fringe.

Male genitalia (Figs 30, 30a): Uncus long, slender rectangular, apex spatulate; gnathos almost as long as uncus, straight, apically hook-shaped, apex pointed; tegumen sub-triangular, anterior margin flatly U-shaped; valva simple, approximately three times longer than broad, anterior margin slightly upturned; apex rounded, posterior margin medially slightly convex; sacculus 2/3 length of valva, broadening distally, apically hook-shaped; labis short; juxta sub-triangular with apical protrusions; saccus sub-triangular, small; phallus straight, as long as tegumen, basal sclerite bent, length less than half of phallus, distally a group of thin microspines; cornuti group I a large plate with numerous short triangular spines placed on an oval, lesser sclerotized base; cornuti group II with few (3-5) short spines; cornuti group III with 8-12 relatively short needle-shaped spines; vesica with few scattered microspines.

Female genitalia (Fig. 50): Papilla analis long, distally pointed; posterior apophysis slender, as long as papilla analis; anterior apophysis slender, as long as posterior apophysis, base bifurcate; tergum VIII sub-rectangular, posterior margin weakly U-shaped; antrum dorsally bilobed, slightly tapered to fold on ductus bursae, posterior end with dorso-medial indentation, edge sclerotized; ductus bursae straight, anteriorly slightly widening and more membranous; ductus seminalis with spinulae; corpus bursae membranous, rounded; signum droplet-shape, laterally with 3-4 small spines.

DNA barcodes (Figs 64-66, Tables 1-2): Five specimens were barcoded with very high internal variation in COI (uncorrected $p = 0.0317$). The specimens are sister to *A. confluellum*. *A. minimum* is clearly differentiated from all other species with uncorrected p distance to other species ranging from 0.0986 (*A. confluellum*) to 0.1352 (*A. gran Canariae*). In fact, *A. minimum* appears to be the genetically most isolated species displaying more than 10% COI divergence (uncorrected $p = 0.1$) to all species except *A. confluellum*. Barcode Index Numbers: ADS4524, AEC2840.

Diagnosis: *A. minimum* superficially resembles other black and white *Apatema* species, e. g. *A. sallyae* and *A. mediopallidum*. It can be distinguished from these by the very small size, and the two regular and distinct creamy white forewing fasciae; in *A. sallyae* the inner fascia is oval, clearly not reaching dorsum and the outer fascia is indistinct; in *A. mediopallidum* the inner fascia is irregular with black dots and outer fascia is absent. In the male genitalia the short labis, the shape of the cornuti in group I and the few short cornuti in group III are characteristic. In the female genitalia the anteriorly membranous part of ductus bursae is characteristic.

Biology: Unknown. The specimens were collected at light during late October and November at altitudes ranging from sea level to 600 m.

Distribution: Known only from the islands of Fuerteventura and Lanzarote, Spain.

Etymology: The species is named after its small size, from the Latin adjective *minimus* meaning smallest.

Remarks: KLIMESCH (1985: 137) mentions two specimens of *A. mediopallidum* from Lanzarote, Haria, 2 ♂♂, 3-5-III-1967, leg. F. Kasy, with a wingspan 7 mm. These two specimens most likely belong to *A. minimum* sp. n.

***Apatema lapalmae* Falck & Karsholt, sp. n. (Fig. 3)**

Holotype ♀: SPAIN, LA PALMA, La Galga, 400 m, 17-23-I-2019, larva on dead wood, leg. P. Falck (ZMUC).

Paratypes: SPAIN, LA PALMA, La Galga, 400 m, 1 ♂, 4 ♀♀, 17-23-I-2019, larva on dead wood, leg. P. Falck, genitalia slides 3204PF, 3205PF, DNA samples Lepid Phyl 0135PF CILEP134-19, 0136PF/CILEP135-19 (PF, MNCN).

Description: Adult. Wingspan 12-13 mm. Labial palp slender, upturned, segment 2 creamy

white, dark-grey laterally at base dark-grey, distally with a blackish ring, segment 3 black, distal 1/2 white. Antenna dark-grey. Head and neck creamy white, mottled with black, thorax creamy white mottled with black, towards thorax blackish brown; tegula creamy white, dark brown towards base. Forewing ground colour black with white markings; base white, at costa with a tiny white spot before an irregular oblique white fascia at 1/3, narrow at costa, widening towards dorsum; costal spot white, reaching half way towards tiny white tornal spot; diffuse white markings at dorsum between fascia and tornal spot, and one diffuse mark apically; fringe grey. Hindwing pale-grey, with grey fringe.

Variation: The colour of the head and neck may vary from almost creamy white to nearly black.

Male genitalia (Figs 31, 31a): Uncus long, slender rectangular, apex spatulate; gnathos almost as long as uncus, straight, apically hook-shaped, apex pointed; tegumen sub-triangular, anterior margin flatly U-shaped; valva simple, slender, margins almost parallel-sided, approximately 3.5 times longer than broad, anterior margin slightly upturned; apex rounded, posterior margin medially slightly convex; sacculus slightly longer than 1/2 length of valva, broader in distal third, apically hook-shaped; labis medium-sized; juxta sub-triangular with apical protrusions; saccus sub-triangular, small; phallus straight, as long as tegumen, basal sclerite straight, length less than half of phallus, distally a group of thin microspines; cornuti group I a narrow plate with numerous short spines; cornuti group II with 2-3 short spines and approximately 15 needle-shaped spines; cornuti group III with 20-25 long, needle-shaped spines; vesica with few scattered microspines.

Female genitalia (Fig. 51): Papilla analis long, distally pointed; posterior apophysis slender, as long as papilla analis; anterior apophysis slender, longer than posterior apophysis, base bifurcate; tergum VIII sub-rectangular, posterior margin U-shaped; antrum dorsally bilobed, slightly tapered to fold on ductus bursae, posterior end with dorso-medial indentation, edge heavily sclerotized; ductus bursae anterior half with longitudinal fold, left side of this fold less sclerotized, anteriorly slightly widening; ductus seminalis heavily spinulated; corpus bursae membranous, rounded; signum droplet-shape, laterally with 3-4 small spines.

DNA barcodes (Figs 64-66, Tables 1-2): Two specimens were barcoded with some internal variation in COI (uncorrected $p = 0.0049$). The two specimens are placed sister to *A. helleri*. *A. lapalmae* is clearly differentiated from all other species with an uncorrected p distance to other species ranging from 0.0563 (*A. helleri*) to 0.1264 (*A. minimum*). Barcode Index Number: ADY6666.

Diagnosis: *A. lapalmae* resembles *A. helleri*. It can be distinguished by the darker head and neck; the white fascia is narrow at costa, widening towards dorsum (broader at costa in *A. helleri*). In the male genitalia the relatively narrow plate with spines in cornuti group I and the on average difference in length of needle-shaped cornuti between cornuti group II and III – longest in group III are characteristic. In the female genitalia the longitudinal fold of the anterior half of ductus bursae is characteristic for *A. lapalmae* and *A. helleri*, and it is not possible to separate the two species based on the female genitalia.

Biology: The specimens were reared from a piece of dead wood overgrown with fungus, it was found in a dark part of a Laurisilva forest.

Distribution: Only known from the island of La Palma, Spain.

Etymology: The species is named after its place of occurrence, the island of La Palma. The name is an adjective.

Apatema helleri (Rebel, 1910) (Fig. 4), **comb. n.**

Blastobasis helleri Rebel, 1910. *Annln naturh. Mus. Wien*, **24**: 356

Type locality: SPAIN, GRAN CANARIA, Teror.

Material examined: SPAIN, GRAN CANARIA, Bañaderos, 200 m, 1 ♀, 25-III-1979, leg. P. Stadel Nielsen; Barranco de la Virgen, Moya, 400 m, 1 ♂, 4 ♀♀, 20-VII-1984, leg. P. Olsen, B. Skule, P. Stadel Nielsen, genitalia slides 5991LG, 6030LG, 6031LG, 6032LG; Barranco de Moya, 200 m, 1 ♂, 21-VII-1984, leg. P. Olsen, B. Skule, P. Stadel Nielsen, genitalia slide 5989LG (all ZMUC); Los Tilos de Moya, 500 m, 2 ♂♂, 3 ♀♀, 11-24-VI-2018, same data but, 2 ♂♂, 17-30-IX-2018, same data but, 1 ♀, 8-

20-VIII-2020, leg. P. Falck, genitalia slides 2779PF, 2812PF, DNA samples Lepid Phyl 0010PF/CILEP010-19, 0011PF/CILEP011-19 (PF); Barranco de Moya, 80 m, 4 ♀♀, 8-20-VIII-2020, leg. P. Falck (PF); Barranco de Azuaje, 270 m, 2 ♂♂, 3 ♀♀, 8-20-VIII-2020, leg. P. Falck (PF); Carretería, 455 m, 14 ♂♂, 9 ♀♀, 8-20-VIII-2020, leg. P. Falck (PF, MNCN); Teror, 500 m, 3 ♂♂, 5 ♀♀, 24-X-13-XI-2020, leg. P. Falck (PF).

Additional material: SPAIN, GRAN CANARIA, Tenoya W. of Las Palmas, 1 ♀, 11-III-1967, leg. Kasy (HNHM), genitalia slide 4987 Gozmány. The specimen is figured by GOZMÁNY (2008: 351, plate 115: 9a) under the name *Apatema fasciatum* (Stainton, 1859).

Description Adult: Wingspan 10-12.5 mm. Labial palp slender, upturned, segment 2 white, laterally black at base, segment 3 with black basal half and white apical half. Antenna black, with indistinct dark-grey rings in female; male antenna uniformly dark-grey. Head, neck and thorax white, tegula white, basally black. Forewing black with white markings; base white, at costa with a tiny white spot and an irregular oblique white fascia at 1/3 of wing; costal spot white, extending half way towards a tiny white tornal spot; diffuse white markings at dorsum between fascia and tornal spot and one diffuse mark in apical area; fringe grey. Hindwing pale-grey, with pale-grey fringe.

Male genitalia (Figs 32, 32a): Uncus long, slender rectangular, apex spatulate; gnathos almost as long as uncus, straight, apically hook-shaped, apex pointed; tegumen sub-triangular, anterior margin flatly U-shaped; valva simple, slender, margins almost parallel-sided, approximately 3.5 times longer than broad, anterior margin slightly upturned; apex rounded, posterior margin medially slightly convex; sacculus slightly longer than 1/2 length of valva, broader in distal third, apically hook-shaped; labis slender, medium-sized; juxta sub-triangular with apical protrusions; saccus sub-triangular, small; phallus straight, as long as tegumen, distal edge heavily sclerotized, basal sclerite straight, length less than half of phallus, distally a group of thin microspines; cornuti group I a suboval plate with numerous short spines; cornuti group II with few (2-3) short spines and approximately 15 needle-shaped spines; cornuti group III with 15-20 needle-shaped spines; vesica with few scattered microspines.

Female genitalia (Fig. 52): Papilla analis long, distally pointed; posterior apophysis slender, as long as papilla analis; anterior apophysis slender, slightly longer than posterior apophysis, base bifurcate; tergum VIII sub-rectangular, posterior margin U-shaped; antrum dorsally bilobed, slightly tapered to fold on ductus bursae, posterior end with dorso-medial indentation, edge heavily sclerotized; anterior half of ductus bursae with longitudinal fold, left side of this fold less sclerotized, anteriorly slightly widening; ductus seminalis heavily spinulated; corpus bursae membranous rounded; signum droplet-shape, laterally with 3-4 small spines.

DNA barcodes (Figs 64-66, Tables 1-2): Two specimens were barcoded with some internal variation in COI (uncorrected $p = 0.0031$). The two specimens are placed on a long branch as sister to *A. lapalmae*. *A. helleri* is clearly differentiated from all other species with uncorrected p distance to other species ranging from 0.0563 (*A. lapalmae*) to 0.1316 (*A. minimum*). Barcode Index Number: ADS6251.

Diagnosis: *A. helleri* resembles *A. lapalmae*. It can be distinguished by the pure white head and thorax; the white fascia is as wide at costa as in the middle of the wing (more narrow at costa in *A. lapalmae*). In the male genitalia cornuti group I and II with needle-shaped spines of the same length and approximately the same number of spines is characteristic. In the female genitalia the longitudinal fold of the anterior half of ductus bursae is characteristic for *A. helleri* and *A. lapalmae*, and it is not possible to separate the two species based on the female genitalia.

Biology: Early stages unknown. The specimens were attracted to light during March and June-November at altitudes ranging from sea level to 500 m.

Distribution: Only known from the northern part of the island of Gran Canaria, Spain.

Remarks: REBEL (1910) described *A. helleri* from a single specimen collected by K. M. Heller in Teror on the northern part of Gran Canaria on the 25-V-1907. We have not been able to trace the type specimen and it is apparently lost. The species was placed in *Blastobasis*, but Rebel already then had his doubt "Mit Rücksicht darauf, daß mir nur ein einziges, einer fremden Sammlung angehöriges

Exemplar vorliegt, dessen Geäder sich ohne Gefährdung des Stückes nicht mit voller Sicherheit erkennen läßt, und auch ein Haarkamm am Basalglied der Fühler fehlt, erscheint die generische Stellung dieser schönen Blastobasine nicht vollständig geklärt". Recently collected specimens of this characteristic species fit Rebel's description and excellent figure (REBEL, 1910: 375, fig. 5), and their genitalia and DNA barcode definitely place *helleri* in the genus *Apatema*. We therefore transfer this species from the Blastobasidae to the Autostichidae.

***Apatema sallyae* Falck & Karsholt, sp. n. (Fig. 5)**

Holotype ♂: SPAIN, GRAN CANARIA, Puerto Rico, 100 m, 26-III-8-IV-1994, leg. F. Vilhelmsen, genitalia slide 2777PF (ZMUC).

Paratypes: SPAIN, GRAN CANARIA, Puerto Rico, 100 m, 2 ♂♂, 11-24-VI-2018, leg. P. Falck (PF); Maspalomas, 2 ♂♂, 19-III-1996, leg. K. Nupponen & J. Junnilainen (JJ); 6 km N Maspalomas, 400 m, 1 ♂, 28-III-2019, leg. J. Tabell (JJ); Bahia Feliz, 1 ♀, 6-7-V-2018, leg. K. Larsen (ZMUC); Pie de la Cuesta, 500 m, 5 ♂♂, 2 ♀♀, 11-24-VI-2018, leg. P. Falck, genitalia slides 2813PF, 3206PF, DNA samples Lepid Phyl 0022PF/CILEP022-19, 0023PF/CILEP023-19 (PF, MNCN); Barranquillo Andrés, 700 m, 1 ♂, 11-24-VI-2018, leg. P. Falck (PF); Playa del Cura, 30 m, 6 ♂♂, 4 ♀♀, 4-23-III-2019, leg. P. Falck, genitalia slide 3321PF (PF); 1 km NW Playa del Cura, 30 m, 1 ♂, 1 ♀, 22-III-2019, leg. J. Tabell (JJ); El Sao, 110 m, 1 ♂, 4-23-III-2019, leg. P. Falck (PF).

Description Adult: Wingspan 10-14 mm. Labial palp slender, upturned, segment 2 creamy white, laterally dark-grey at base, segment 3 creamy white, dorsally greyish. Antenna dark-grey, with indistinct pale-grey rings in female. Head and neck creamy white, thorax creamy white, dark-grey towards neck; tegula creamy white, dark-grey towards base. Forewing ground colour uniform blackish grey with distinct creamy white markings; base at dorsum creamy white, at costa with a tiny spot followed by an almost oval irregular fascia at 1/3 not reaching dorsum; apical costal spot creamy white, narrowing, almost reaching dorsum; fringe grey. Hindwing pale-grey, with pale-grey fringe.

Male genitalia (Figs 33, 33a): Uncus long, slender rectangular, apex spatulate; gnathos almost as long as uncus, straight, apically hook-shaped, apex pointed; tegumen sub-triangular, anterior margin flatly U-shaped; valva simple, approximately three times longer than broad, anterior margin slightly upturned; apex rounded, posterior margin medially slightly convex; sacculus slightly longer than 1/2 length of valva, broader in distal third, apically hook-shaped; labis slender, medium-sized; juxta sub-triangular with apical protrusions; saccus sub-triangular, small; phallus straight, as long as tegumen, basal sclerite bent, length less than half of phallus, distally a group of thin microspines; cornuti group I a large plate with numerous broad-based triangular spines; cornuti group II with 3-5 short needle-shaped spines and 6-14 short spines; cornuti group III with 15-20 needle-shaped spines; vesica with few scattered microspines.

Female genitalia (Fig. 53): Papilla analis long, distally pointed; posterior apophysis slender, as long as papilla analis; anterior apophysis slender, as long as posterior apophysis, base bifurcate; tergum VIII sub-rectangular, posterior margin U-shaped; antrum dorsally bilobed, slightly tapered to fold on ductus bursae, posterior end with dorso-medial indentation, edge heavily sclerotized; ductus bursae straight, anteriorly slightly widening, evenly sclerotized; ductus seminalis with few spinulae; corpus bursae membranous round; signum droplet-shape, laterally with 3-4 small spines.

DNA barcodes. (Figs 64-66, Tables 1-2): Two specimens were barcoded with no internal variation in COI. The two specimens appear rather isolated on a long branch without clear affiliation to any other species. *A. sallyae* is clearly differentiated from all other species with uncorrected p distance to other species ranging from *ca* 0.074 (*A. helleri*, *A. lapalmae* and *A. skulei*) to 0.1208 (*A. minimum*). Barcode Index Number: ADS4523.

Diagnosis: *A. sallyae* resembles no other *Apatema* species known from the Canary Islands. However, it resembles *A. mediopallidum* Walsingham, 1900, with which it has been confused in the past. It can be distinguished by the creamy white head, neck and thorax and the large oval creamy white spot in the middle of the forewing. In the male genitalia the broad-based triangular spines in

group I, and the short needle-shaped cornuti in group II are characteristic. In the female genitalia the anteriorly widening and evenly sclerotized ductus bursae are characteristic.

Biology: Early stages unknown. All the specimens were attracted to light during March-June at altitudes ranging from sea level to 1100 m.

Distribution: Only known from the southern part of the island of Gran Canaria.

Etymology: The species name (a noun in the genitive case) is dedicated to the first author's oldest daughter Sally.

Remarks: *A. sallyae* is figured by KLIMESCH (1985: 147, figs. 15, 17) under the name *Apatema mediopallidum* Walsingham, 1901, with the collecting data: Gran Canaria, San Bartolomé de Tirajana, 1100 m, 1 ♂, 8-22-VI-1965, leg. J. Klimesch.

Apatema lanzarotae Falck & Karsholt, sp. n. (Fig. 6)

Holotype ♂: SPAIN, LANZAROTE, Mojón Blanco, Órzola, 20 m, 21-X-10-XI-2019, leg. P. Falck, genitalia slide 3221PF, DNA sample Lepid Phyl, 0326PF/CILEP325-19 (ZMUC).

Paratypes: SPAIN, LANZAROTE, Mojón Blanco, Órzola, 20 m, 1 ♂, 21-X-10-XI-2019, leg. P. Falck, genitalia slide 3220PF, DNA sample Lepid Phyl 0315PF/CILEP314-19 (PF); El Bosquecillo, 610 m, 1 ♂, 21-X-10-XI-2019, leg. P. Falck, genitalia slide 3222PF (PF); Caleta de Famara, 20 m, 1 ♂, 21-X-10-XI-2019, leg. P. Falck, genitalia slide 3223PF (MNCN).

Description Adult: Wingspan 10 mm. Labial palp slender, upturned, segment 2 white, laterally dark-grey at base, segment 3 white, with few dark-grey scales ventrally. Antenna dark-grey, with indistinct pale-grey rings. Head, neck and thorax creamy white, mottled with brown; tegula creamy white, brownish towards base. Forewing ground colour white, mottled with dark-grey and brown, especially in basal and apical areas; centrally with a very indistinct, oblique light grey fascia, bordered by four indistinct black spots; fringe grey. Hindwing light grey with grey fringe.

Male genitalia (Figs 34, 34a): Uncus long, slender rectangular, apex spatulate; gnathos almost as long as uncus, straight, apically hook-shaped, apex pointed; tegumen sub-triangular, anterior margin flatly U-shaped; valva simple, approximately three times longer than broad, anterior margin slightly upturned; apex rounded, posterior margin medially slightly convex; sacculus slightly longer than 1/2 length of valva, broader in distal third, apically hook-shaped; labis slender, medium-sized; juxta sub-triangular with apical protrusions; saccus sub-triangular, medium-sized; phallus straight, as long as tegumen, basal sclerite bent, length less than half of phallus, distally a group of thin microspines; cornuti group I a large plate with numerous broad-based triangular spines, distally a group of approximately 10 needle-shaped spines; cornuti group II with 5-7 short spines and 6-8 needle-shaped spines; cornuti group III with 15-20 needle-shaped spines; vesica with few scattered microspines.

Female genitalia: Unknown.

DNA barcodes (Figs 64-66, Tables 1-2): Two specimens were barcoded with some variation in COI (uncorrected p = 0.0030). The two specimens appear isolated on a long branch without clear affiliation to other species. *A. lanzarotae* is clearly differentiated from all other species with uncorrected p distance to other species ranging from 0.0801 (*A. lapalmae*) to 0.1316 (*A. minimum*). Barcode Index Number: AEC2600.

Diagnosis: *A. lanzarotae* resembles no other *Apatema* species known from the Canary Islands, although it may be difficult to distinguish from old specimens of *A. fasciata*. It can be distinguished by the indistinct black spots, in *A. fasciata* the spots are distinct. In the male genitalia the needle-shaped spines distally in cornuti group I are characteristic.

Biology: Unknown. The specimens were collected in late autumn at light.

Distribution: Known only from a few localities in the northern part of the island Lanzarote, Spain.

Etymology: The species is named after its place of occurrence, the island of Lanzarote. The name is an adjective.

***Apatema mixtum* Falck & Karsholt, sp. n. (Figs 7, 8)**

Holotype ♂: SPAIN, TENERIFE, Arona, 500 m, 3-9-III-2013, leg. P. Falck, genitalia slide 2793PF (ZMUC).

Paratypes: SPAIN, TENERIFE. Santiago del Teide, 1000 m, 4 ♂♂, 4 ♀♀, 9-I-1981, leg. P. Stadel Nielsen, genitalia slide 5979LG; Costa del Silencio, 10 m, 1 ♂, 7-I-1981, leg. P. Stadel Nielsen (ZMUC); Callao Salvaje, 1 ♂, 1 ♀, 1-5-I-1985, leg. K. Schnack; Puerto de la Cruz, 1 ♂, 1 ♀, medio III-1987, leg. H. Enghoff (all ZMUC); Armeñime, 100 m, 1 ♂, 2 ♀♀, 26-II-4-III-2012, leg. P. Falck, DNA sample Lepid Phyl 0132PF/CILEP131-19 (PF); Arona, 500 m, 8 ♂♂, 5 ♀♀, 3-9-III-2013, leg. P. Falck, same data but, 3 ♂♂, 3 ♀♀, 8-22-XI-2016, leg. P. Falck, genitalia slides 2788PF, 2802PF, 2821PF, DNA samples Lepid Phyl 0120PF/CILEP119-19, 0121PF/CILEP120-19, 0123PF/CILEP122-19 (PF, MNCN); Taicho, 400 m, 1 ♂, 2-9-III-2013, leg. P. Falck, DNA sample Lepid Phyl 0134PF/CILEP133-19 (PF); Los Gigantes, 150 m, 3 ♂♂, 1 ♀, 8-22-XI-2016, leg. P. Falck, genitalia slide 3191PF (PF); Las Manchas, 1050 m, 4 ♀♀, 1-20-III-2017, leg. P. Falck, genitalia slide 2801PF, DNA sample Lepid Phyl 0019PF/CILEP019-19 (PF); El Médano, 30 m, 1 ♂, 18-XI-8-XII-2018, leg. P. Falck (PF); 2 km S Chio, 870 m, 1 ♂, 26-XII-2018, leg. B. Skule (ZMUC); 5 km NNW San Andrés, Anaga Mts., 780 m, 1 ♂, 29-XII-2018, leg. B. Skule (ZMUC); Puerto de la Cruz, 200 m, 3 ♂♂, 1 ♀, 13-26-VIII-2019, leg. P. Falck, genitalia slide 3192PF (PF); Aguamansa, 1050 m, 1 ♀, 13-26-VIII-2019, leg. P. Falck (PF).

Description Adult: Wingspan 9.5-13 mm. Labial palp slender, upturned, segment 2 creamy white, laterally dark-grey at base and towards apex, medially with a dark-grey spot near apex, segment 3 black, dorsally and apically creamy white. Antenna black, with indistinct dark-grey rings in female, uniformly dark-grey in male. Head, neck and thorax creamy white mottled with dark brown; tegula creamy white, dark brown towards base. Forewing blackish brown mottled with light brown, cream and white; base black; centrally with an irregular oblique whitish brown fascia bordered by four black spots; apical spot at costa white, extending half way towards a tiny white tornal spot; fringe grey. Hindwing grey with grey fringe.

Variation: The species varies in size and appearance of the four black spots which are often well separated but may be confluent in pairs. The costal and tornal spots may be connected by a thin, angulated fascia.

Male genitalia (Figs 35, 35a): Uncus long, slender rectangular, apex spatulate; gnathos almost as long as uncus, straight, apically hook-shaped, apex pointed; tegumen sub-triangular, anterior margin flatly U-shaped; valva simple, approximately three times longer than broad, anterior margin distinctly upturned; apex rounded, posterior margin medially slightly convex; sacculus longer than 1/2 length of valva, broader in distal third, apically hook-shaped; labis slender, medium-sized; juxta sub-triangular with apical protrusions; saccus sub-triangular, medium-sized; phallus straight, as long as tegumen, basal sclerite bent, length less than half of phallus, distally a group of thin microspines; cornuti group I a plate with several broad-based triangular spines; cornuti group II with 3-6 very short spines; cornuti group III with 10-20 needle-shaped spines of medium length; vesica without microspines.

Female genitalia (Fig. 54): Papilla analis long, distally pointed; posterior apophysis slender, as long as papilla analis; anterior apophysis slender, as long as posterior apophysis, base bifurcate; tergum VIII sub-rectangular, posterior margin U-shaped; antrum dorsally bilobed, slightly tapered to fold on ductus bursae, posterior margin with dorso-medial indentation, edge sclerotized; ductus bursae parallel-sided, anteriorly rotated 90 to the right, and rotated downwards 90 just before corpus bursae, left side less sclerotized; ductus seminalis with spinulae; corpus bursae membranous rounded; signum droplet-shape, laterally with 3-4 small spines.

DNA barcodes (Figs 64-66, Tables 1-2): Six specimens were barcoded with very low variation in COI (uncorrected $p = 0.0010$). The specimens are placed on a long branch and are sister to *A. fasciata*. *A. mixtum* is differentiated from all other species with uncorrected p distance to other species ranging from 0.0676 (*A. lapalmae*) to 0.1247 (*A. minimum*). Barcode Index Number: ADR5557.

Diagnosis: *Apatema mixtum* closely resembles *A. fasciata* and adults cannot be distinguished with certainty. In the male genitalia the few, short, sometimes diminutive spines in cornuti group II are

characteristic, in *A. fasciata* cornuti group II is missing. In the female genitalia the double rotated ductus bursae is characteristic.

Biology: Early stages unknown. The specimens were attracted to light during January-March, August and November-December at altitudes ranging from sea level to 1050 m.

Distribution: Known from several localities on the island of Tenerife, Spain.

Etymology: The name refers to the Latin adjective *mixtus* meaning mixed, in this case mixed with *A. fasciata*.

Remarks: Despite the missing details in the genitalia drawings by KLIMESCH (1985: 148, figs. 19, 20, 21) most likely he figures *A. mixtum* as *A. fasciata*.

Apatema fasciata (Stainton, 1859) (Figs 9, 10)

Gelechia fasciata Stainton, 1859. *Ann. Mag. Nat. Hist.*, **3**(3): 213

Type locality: PORTUGAL, Madeira, Deserta Grande.

Material examined: PORTUGAL, MADEIRA. Funchal, Lido, 3 ♀♀, 20-30-IV-1972, 9 ♀♀, 4-17-IX-1973, 4 ♂♂, 4 ♀♀, 17-22-IV-1974, 1 ♂, 13-14-VIII-1974, 2 ♀♀, 24-26-VIII-1974, leg. N. L. Wolff, genitalia slides 3862, 4254, 4255, 4265 Wolff, 5238LG, 5239LG; 1 ♂, 2 ♀♀, same data but 12-16-VIII-1974, leg. E. Traugott-Olsen; 1 ♀, same data but 1-III-1994, leg. P. de Place Bjørn og J. Damgaard; 1 ♂, same data but 20-26-X-1997, leg. D. Nilsson; Ponta de São Lourenço, 100 m, 1 ♀, 15-IX-1977, leg. O. Lomholdt & N. L. Wolff; same data but 0-10 m, 3 ♀♀, 26-VI-1993, leg. O. Karsholt; Ponta do Sol, 1 ♂, 2 ♀♀, 12-29-VI-1993, 1 ♀, 17-IX-1997, leg. O. Karsholt; Santo da Serra, 700 m, 1 ♂, 1 ♀, 24-26-X-1994, leg. O. Karsholt, genitalia slide 5375OK. PORTO SANTO. 3 ♂♂, 10 ♀♀, 23-24-X-1994, 1 ♂♂, 4 ♀♀, 12-16-IV-1996, leg. O. Karsholt. SPAIN. FUERTEVENTURA, Betancuria, 400 m, 1 ♂, 7-27-XI-2017 leg. P. Falck, same data but, 1 ♂, 27-II-19-III-2018, leg. P. Falck, genitalia slides 2790PF, 2795PF, DNA samples Lepid Phyl 0201PF/CILEP200-19, 0202PF/CILEP201-19 (PF); Corralejo, 10 m, 4 ♀♀, 6-26-I-2020, leg. P. Falck (PF); Vega de Río Palmas, 245 m, 1 ♀, 6-21-I-2020, leg. P. Falck (PF). GRAN CANARIA. Los Tilos, Moya, 3 ♂♂, 19-VII-1984 leg. P. Olsen, B. Skule, P. Stadel Nielsen, genitalia slides 5988LG, 5992LG, 6017LG; Barranco Virgen, Moya, 400 m, 2 ♂♂, 2 ♀♀, 20-VII-1984, leg. P. Olsen, B. Skule, P. Stadel Nielsen, genitalia slides 5990LG, 6025 LG, 6027LG, 6028LG; Barranco Moya, 200 m, 1 ♀, 21-VII-1984, leg. P. Olsen, B. Skule, P. Stadel Nielsen, genitalia slide 6011LG; Barranco Mogán, 3 km NNE Mogan, 370 m, 5-XI-2014, leg. B. Skule; El Doctoral, 350 m, 9-12-V-2018, leg. K. Larsen (all ZMUC); Pie de la Cuesta, 500 m, 2 ♂♂, 3 ♀♀, 11-24-VI-2018, leg. P. Falck, same data but, 4 ♂♂, 1 ♀, 17-30-IX-2018, leg. P. Falck, same data but, 3 ♂♂, 5 ♀♀, 4-24-VI-2019, leg. P. Falck, genitalia slides 2798PF, 3193PF, 3194PF, DNA samples Lepid Phyl 0020PF/CILEP020-19, 0021PF/CILEP021-19, 0119PF/CILEP118-19, 0126PF/CILEP125-19, 0130PF/CILEP129-19 (PF); 8 km NNW Pie de la Cuesta, 895 m, 6 ♂♂, 1 ♀, 17-30-IX-2018, leg. P. Falck, genitalia slide 3195PF, DNA sample Lepid Phyl 0133PF/CILEP132-19 (PF); Ayacata, 1400 m, 1 ♀, 17-30-IX-2018, leg. P. Falck, same data but, 1 ♂, 4-23-III-2019, leg. P. Falck (PF); Los Tilos de Moya, 2 ♂♂, 17-30-IX-2018, leg. P. Falck, genitalia slide 3211PF (PF). LANZAROTE. 0.8 km S Conil, 1.4 km N Tias, 240 m, 1 ♂, 2-8-XI-2018, leg. C. Hviid & B. Skule (ZMUC); Tabayesco, 280 m, 1 ♂, 21-X-10-XI-2019, leg. P. Falck, genitalia slide 3224PF, DNA sample Lepid Phyl 0314PF/CILEP313-19 (PF); El Bosquecillo, 610 m, 1 ♂, 21-X-10-XI-2019, leg. P. Falck (PF).

Description Adult: Wingspan 10-11 mm. Labial palp slender, upturned, segment 2 on outer surface black with a creamy coloured band, on inner surface cream coloured with black apex, segment 3 black with cream coloured tip. Antenna black, with indistinct dark-grey rings. Head dark-grey, paler towards face and neck; thorax and tegula black mottled with yellowish grey. Forewing black (especially at base and in apical area) mottled with light brown, cream and white; with an irregular whitish brown fascia in middle of wing bordered by four black spots; costal spot white, extending half way towards tiny white tornal spot; fringe grey. Hindwing grey, with grey fringe.

Variation: The species varies in size and appearance of the four black spots which are often well separated but may be confluent in pairs. The costal and tornal spots may be connected by a thin, angulated fascia.

Male genitalia (Figs 36, 36a): Uncus long, slender rectangular, apex spatulate; gnathos almost as long as uncus, straight, apically hook-shaped, apex pointed; tegumen sub-triangular, anterior margin flatly U-shaped; valva simple, approximately three times longer than broad, anterior margin clearly upturned; apex rounded, posterior margin medially slightly convex; sacculus longer than 1/2 length of valva, broader in distal third, apically hook-shaped; labis slender, medium-sized; juxta sub-triangular with apical protrusions; saccus sub-triangular, medium-sized; phallus straight, as long as tegumen, basal sclerite bent, length less than half of phallus, distally a group of thin microspines; cornuti group I a plate with several broad-based triangular spines; cornuti group II with 3-4 very short spines and 5-8 robust needle-shaped spines; cornuti group III without spines; vesica without microspines.

Female genitalia (Fig. 55): Papilla analis long, distally pointed; posterior apophysis slender, as long as papilla analis; anterior apophysis slender, as long as posterior apophysis, base bifurcate; tergum VIII sub-rectangular, posterior margin U-shaped; antrum dorsally bilobed, slightly tapered to fold on ductus bursae, posterior margin with dorso-medial indentation, edge sclerotized; ductus bursae dilated, membranous in the left side anteriorly from the fold to corpus bursae, right side weakly sclerotized, before corpus bursae rotated 90°; ductus seminalis with few spinulae; corpus bursae membranous, rounded; signum droplet-shape, laterally with 3-4 small spines.

DNA barcodes (Figs 64-66, Tables 1-2): Eight specimens were barcoded with reasonably high variation in COI (uncorrected $p = 0.0165$). The specimens are sister to *A. mixtum*. Despite high internal variation *A. fasciata* is differentiated from all other species with uncorrected p distance to other species ranging from *ca* 0.08 (*A. stadeli* and *A. brunneum*) to 0.1272 (*A. minimum*). Specimens from Gran Canaria (6 specimens) were clearly separate from specimens from Fuerteventura (2) and Lanzarote (1) with uncorrected p distances between them of 0.0269 and 0.0335 respectively. Similarly, the uncorrected p distance between the single specimens from Fuerteventura and Lanzarote was 0.0282. Barcode Index Numbers: ADV0186 (Gran Canaria), ADZ8617 (Fuerteventura), AEC2601 (Lanzarote).

Diagnosis: *A. fasciata* closely resembles *A. mixtum*, *A. grancanariae* and *A. transversum*, for separation see below under *A. grancanariae*. In the male genitalia the triangular cornuti in cornuti group I and the missing cornuti in group III are characteristic. In the female genitalia the weakly sclerotized and rotated ductus bursae is characteristic.

Biology: Early stages unknown. The specimens were attracted to light during January-December at altitudes ranging from sea level to 895 m.

Distribution: Known from Portugal: Madeira, Deserta Grande and Porto Santo; Spain: Fuerteventura, Gran Canaria and Lanzarote.

Remarks: *Gelechia fasciata* was described from an unstated number of specimens collected by T. V. Wollaston on the island of Deserta Grande in the Madeira archipelago. Records of *A. fasciata* from outside of Madeira and the Canary Islands (e. g. GOZMÁNY, 1955: 316) are due to misidentification. *Apatema fasciata* f. *impunctella* Amsel, 1940 represents a separate species, *A. impunctella*. It is known France and Italy (SUTTER 2006).

Apatema coarctella (Rebel, 1896) (Figs 11, 12), **comb. n.**

Lampros coarctella Rebel, 1896. *Annln naturh. Mus. Wien*, **11**: 129

Type locality: SPAIN, TENERIFE, La Orotava.

Material examined: SPAIN, FUERTEVENTURA, Puerto del Rosario, 1 ♂, 5-6-I-1990, leg. H. Enghoff (ZMUC); Caldereta, 120 m, 16 ♀♀, 7-27-XI-2017, leg. P. Falck, genitalia slides 2770PF, 2772PF, 2773PF, 3217PF, DNA samples Lepid Phyl 0198PF/CILEP197-19, 0199PF/CILEP198-19, 0200PF/CILEP199-19 (PF); Corralejo, 10 m, 1 ♂, 5 ♀♀, 7-27-XI-2017, leg. P. Falck, same data but, 1 ♂, 1 ♀, 27-II-19-III-2018, leg. P. Falck (PF); Betancuria 400 m, 1 ♀, 27-II-19-III-2018, leg. P. Falck, genitalia slide 3210PF (PF); 7 km NW Betancuria, Playa del Valle, 1 ♂, 2 ♀♀, 19-I-2002, leg. O. Karsholt (ZMUC); GRAN CANARIA, Barranco de la Virgen, Moya, 400 m, 2 ♂♂, 3 ♀♀, 20-VII-1984, leg. P. Olsen, B. Skule, P. Stadel Nielsen, genitalia slides 6033LG, 6035LG (ZMUC); Barranco Moya, 200 m, 2 ♀♀, 21-VII-1984, leg. P. Olsen, B. Skule, P. Stadel Nielsen, genitalia slides 5989LG, 6011LG (ZMUC); 1.3 km N Mogán, 430 m, 2 ♂♂, 1 ♀, 3-8-XI-2014, leg. B. Skule (ZMUC); Barranco Mogán,

3 km NNE Mogán, 370 m, 5-XI-2014, leg. B. Skule (ZMUC); Pie de la Cuesta, 500 m, 1 ♂, 1 ♀, 11-24-VI-2018, leg. P. Falck, same data but, 1 ♀, 17-30-IX-2018, leg. P. Falck, same data but, 1 ♀, 4-23-III-2019, leg. P. Falck, genitalia slides 2771PF, 2776PF, 3209PF, 3219PF, DNA samples Lepid Phyl 0156PF/CILEP155-19, 0157PF/CILEP156-19 (PF); Puerto Rico, 50 m, 1 ♀, 11-24-VII-2018, leg. P. Falck (PF); Ayacata, 1400 m, 1 ♀, 17-30-IX-2018, leg. P. Falck, genitalia slide 3218PF (PF); El Sao, 110 m, 1 ♀, 17-30-IX-2018, leg. P. Falck (PF); LANZAROTE, La Degollada, 3 ♂♂, 6 ♀♀, 1-4-II-1994, leg. P. Baungard (ZMUC); Puerto del Carmen, 5 ♂♂, 2 ♀♀, 1-5-II-1994, leg. P. Baungard (ZMUC); Casita de Femes, 1 ♂, 2-II-1994, leg. P. Baungard (ZMUC); Tao, 1 ♂, 3-II-1994, leg. P. Baungard (ZMUC); Urb. Famara, 55 m, 2 ♀♀, 2-8-XI-2018, leg. C. Hviid & B. Skule (ZMUC); 0.8 km S Conil, 1.4 km N Tías, 240 m, 1 ♂, 1 ♀, 2-8-XI-2018, leg. C. Hviid & B. Skule (ZMUC); El Bosquecillo, 600 m, 1 ♂, 1 ♀, 6-XI-2018, leg. C. Hviid & B. Skule (ZMUC); Caleta de Famara, 20 m, 1 ♂, 21-X-10-XI-2019, leg. P. Falck, genitalia slide 3215PF (PF); Puerto del Carmen, 25 m, 1 ♀, 21-X-10-XI-2019, leg. P. Falck, genitalia slide 3216PF, DNA samples Lepid Phyl 0607PF/CILEP606-20, 0608PF/CILEP607-20 (PF). LA PALMA, Los Cancajos, 20 m, 1 ♂, 1 ♀, 17-23-I-2019, leg. P. Falck, genitalia slides 3207PF, 3208PF, DNA samples Lepid Phyl 0203PF/CILEP202-19, 0204PF/CILEP203-19. TENERIFE, Teno Bajo, 100 m, 1 ♂, 4-I-1981, leg. P. Stadel Nielsen (ZMUC); Santiago del Teide, 1000 m, 1 ♂, 1 ♀, 9-I-1981, leg. P. Stadel Nielsen (ZMUC); Aguamansa, 1200 m, 1 ♀, 26-VII-1984, leg. P. Olsen, B. Skule, P. Stadel Nielsen, genitalia slide 5996LG; Calleo Salvaje, 5 ♂♂, 4 ♀♀, 1-5-I-1985, leg. K. Schnack (ZMUC); Armeñime, 100 m, 5 ♀♀, 25-XI-2-XII-2012, leg. P. Falck, same data but, 4 ♀♀, 3-9-III-2013, leg. P. Falck, genitalia slide 3212PF, DNA samples Lepid Phyl 0129PF/CILEP128-19, 0195PF/CILEP194-19, 0196PF/CILEP195-19, 0197PF/CILEP196-19 (PF); Arona, 500 m, 3 ♀♀, 3-9-III-2013, leg. P. Falck, same data but, 1 ♀, 8-22-XI-2016, leg. P. Falck, same data but, 1 ♂, 1-20-III-2017, leg. P. Falck, genitalia slides 2775PF, 3214PF (PF); Los Gigantes, 150 m, 12 ♀♀, 8-22-XI-2016, leg. P. Falck (PF); Erjos, 1000 m, 1 ♂, 1-20-III-2017, leg. P. Falck, genitalia slide 2781PF, DNA sample Lepid Phyl 0212PF/CILEP211-19 (PF); El Médano, 10 m, 1 ♂, 21-V-3-VI-2019, leg. P. Falck, genitalia slide 3213PF, DNA sample Lepid Phyl 0208PF/CILEP207-19 (PF).

Description Adult: Wingspan 7.5-10.5 mm. Labial palp slender, upturned, segment 2 creamy white, laterally black at base and towards apex, medially with a dark-grey spot near apex, segment 3 black, dorsally and apically creamy white. Antenna black, with indistinct dark-grey rings in female, uniformly dark-grey in male. Head and neck light brown mottled with brown; thorax dark brown; tegula creamy white, dark brown towards base. Forewing ground colour black mottled with brown; base black with a small pale reddish-brown spot towards base; with a small pale reddish-brown spot at costa near base; centrally with an irregular, oblique reddish-brown fascia bordered by four black spots; apical spot at costa creamy white, extending half way towards the tiny reddish-brown tornal spot, occasionally forming an indistinct outer fascia; fringe grey. Hindwing grey with grey fringe.

Male genitalia (Figs 37, 37a): Uncus long, slender rectangular, apex spatulate; gnathos almost as long as uncus, straight, apically hook-shaped, apex pointed; tegumen sub-triangular, anterior margin flatly U-shaped; valva simple, approximately three times longer than broad, anterior margin slightly upturned; apex rounded, posterior margin medially clearly convex; sacculus longer than 1/2 length of valva, forked in distal third, anterior part short, apex rounded, posterior part sigmoid, apically hook-shaped; labis slender, short; juxta sub-triangular with apical protrusions; saccus sub-triangular, small; phallus straight, as long as tegumen, basal sclerite bent, length less than half of phallus, distally a group of 8-12 shorter and 1-2 longer robust cornuti.

Female genitalia (Fig. 56): Papilla analis long, distally pointed; posterior apophysis slender, as long as papilla analis; anterior apophysis slender, as long as posterior apophysis, base bifurcate; tergum VIII sub-rectangular, posterior margin U-shaped; antrum dorsally bilobed, sclerotized, slightly tapered to the weakly developed fold on ductus bursae, posterior margin with dorso-medial indentation, edge heavily sclerotized; ductus bursae straight, dilated, membranous with two laterally, weakly sclerotized areas; ductus seminalis with spinulae; corpus bursae membranous rounded; signum small, oval with two small spines.

DNA barcodes (Figs 64-66, Tables 1-3): Fifteen specimens were barcoded with very high

variation in COI (uncorrected $p = 0.0334$). The specimens are sister to a clade comprising *A. junnilaineni*, *A. griseum*, *A. stadelii*, *A. transversum*, *A. skulei*, *A. brunneum*, *A. lucidum* and *A. gran Canariae*. Despite high internal variation *A. coarctella* is differentiated from all other species with uncorrected p distance to other species ranging from 0.0597 (*A. lapalmae*) to 0.1255 (*A. minimum*). *A. coarctella* is divided into three well-separated sub-groups comprised by specimens from Tenerife (6 specimens), La Palma (2), Lanzarote (2), Gran Canaria and Fuerteventura (5), respectively. While within group variation is very low, the four sub-groups are very divergent with the uncorrected p distance between Gran Canaria + Fuerteventura, and La Palma being 0.0534, the distance between Gran Canaria + Fuerteventura, and Tenerife being 0.0463, the distance between Tenerife and La Palma being 0.0295, the distance between Tenerife and Lanzarote being 0.0447, and the distance between La Palma and Lanzarote being 0.054. The distance between Gran Canaria + Fuerteventura, and Lanzarote is low 0.0022, and the two groups do not appear to be isolated. Barcode Index Numbers: ADR9887 (Tenerife), AEA1295 (La Palma), ADY6487 (Fuerteventura, Gran Canaria and Lanzarote).

Diagnosis: *A. coarctella* resembles small specimens of *A. fasciata* and *A. mixtum*. It can be distinguished by an on average smaller size and the reddish-brown markings on the forewing. In the male genitalia the forked distal part of sacculus is characteristic, it separates it from all other known *Apatema* species. In the female genitalia the dilated, membranous ductus with lateral sclerotisations is characteristic.

Biology: Unknown. Most of the specimens are collected at light during January–April, June, July and October–December at altitudes ranging from sea level to 1200 m.

Distribution: *A. coarctella* often occurs in large numbers and it is known from Fuerteventura, La Gomera (KLIMESCH, 1985: 138), Gran Canaria, Lanzarote and Tenerife.

Apatema junnilaineni Vives, 2001 (Figs 13, 14)

Apatema junnilaineni Vives, 2001. *SHILAP Revta. lepid.*, **29**(114): 168, figs 9, 9a

Locus typicus: SPAIN, GRAN CANARIA, Tejeda.

Material examined: SPAIN, GRAN CANARIA, Puerto Rico, 50 m, 1 ♂, 9-11-III-1993, leg. F. Vilhelmsen, genitalia slide 2778PF (PF); Pie de la Cuesta, 500 m, 12 ♂♂, 3 ♀♀, 4-23-III-2019, leg. P. Falck, genitalia slide 3187PF, DNA samples Lepid Phyl 0115PF/CILEP114-19, 0116PF/CILEP115-19 (PF); El Sao, 110 m, 4 ♂♂, 1 ♀, leg. P. Falck (PF); Ayacata, 1400 m, 5 ♂♂, 2 ♀♀, 4-23-III-2019, leg. P. Falck, genitalia slide 3186PF (PF); Guayadeque, 450 m, 5 ♂♂, 4-23-III-2019, leg. P. Falck (PF).

Description Adult: Wingspan 12–14.5 mm. Labial palp slender, upturned, segment 2 white, laterally blackish brown basally, segment 3 creamy white, mottled with black ventrally. Antenna blackish brown. Head and neck creamy white in male, dark brown in female; thorax dark brown, pale brown towards abdomen; tegula brownish. Forewing long and narrow; ground colour creamy white in dorsal half, mottled with brown (especially in female), blackish brown in costal half; with a black spot at dorsum near base; deep black in the middle partcell, almost forming a longitudinal line terminating in a black spot; costal spot very indistinct creamy white; fringe grey. Hindwing grey, with grey fringe.

Male genitalia (Figs 38, 38a): Uncus long, slender rectangular, apex spatulate; gnathos almost as long as uncus, straight, apically hook-shaped, apex pointed; tegumen sub-triangular, anterior margin flatly U-shaped; valva simple, approximately 3.5 times longer than broad, anterior margin slightly upturned; apex rounded, posterior margin medially slightly convex; sacculus slightly longer than 1/2 length of valva, broader in distal third, apically pointed; labis medium-sized; juxta sub-triangular with apical protrusions; saccus sub-triangular, small; phallus straight, distal edge rounded, as long as tegumen, basal sclerite bent, length less than half of phallus, distally a group of thin microspines; cornuti group I a semi-oval large plate with numerous spines; cornuti group II a small plate with 5–8 relatively long needle-shaped spines; cornuti group III with 7–10 long, needle-shaped spines; vesica with several microspines.

Female genitalia (Fig. 57): Papilla analis long, distally pointed; posterior apophysis slender, as long as papilla analis; anterior apophysis slender, as long as posterior apophysis, base bifurcate; tergum VIII sub-rectangular, posterior margin U-shaped; antrum dorsally bilobed, slightly tapered to fold on

ductus bursae, posterior margin with dorso-medial indentation, edge heavily sclerotized; ductus bursae straight, anteriorly slightly widening with a longitudinal fold, evenly sclerotized; ductus seminalis with few spinulae; corpus bursae membranous rounded; signum droplet-shape, laterally with 3-4 small spines.

DNA barcodes (Figs 64-66, Tables 1-2): Two specimens were barcoded with very low internal variation in COI (uncorrected $p = 0.0019$). The specimens two are placed on a long branch as sister to *A. pseudolucidum* and *A. griseum*. *A. junnilainenii* is clearly differentiated from all other species with uncorrected p distance to other species ranging from 0.0671 (*A. grisea*) to 0.1290 (*A. minimum*). Barcode Index Number: ADR4784.

Diagnosis: *A. junnilainenii* is very characteristic and does not resemble other known species of *Apatema*. However, older specimens may resemble *A. grisea*. It can be distinguished by the creamy white dorsum of the forewing. In the male genitalia the small plate with 5-8 relatively long needle-shaped spines in cornuti group II is characteristic. In the female genitalia the longitudinal fold and the evenly sclerotized anterior part of ductus bursae are characteristic.

Biology: Unknown. The specimens were collected during spring at light, at altitudes ranging from sea level to 1400 m.

Distribution: Known only from the southern and central part of the island Gran Canaria.

***Apatema pseudolucidum* Falck & Karsholt, sp. n. (Fig. 15)**

Holotype ♂: SPAIN, GRAN CANARIA, Los Tilos de Moya, 500 m, 4-23-III-2019, leg. P. Falck, genitalia slide 3203PF, DNA sample Lepid Phyl 0117PF/CILEP116-19 (PF).

Description Adult: Wingspan 13 mm. Labial palp slender, upturned, segment 2 white, laterally black basally, segment 3 white. Antenna grey-brown. Head, neck and thorax creamy white; tegula creamy white, brownish towards base. Forewing ground colour white mottled with reddish brown along dorsum, mottled with black-brown in outer half along costa and in apical area; base with a black dot at costa and dorsum; six black spots, three at 1/3 in an almost oblique row, three in outer half of cell; fringe grey. Hindwing light grey with grey fringe.

Male genitalia (Figs 39, 39a): Uncus long, slender rectangular, apex spatulate; gnathos almost as long as uncus, straight, apically hook-shaped, apex pointed; tegumen sub-triangular, anterior margin flatly U-shaped; valva simple, approximately three times longer than broad, anterior margin slightly upturned; apex rounded, posterior margin medially slightly convex; sacculus slightly longer than 1/2 length of valva, slightly broader in distal third, apically sickle-shaped; labis slender, relatively long; juxta sub-triangular with apical protrusions; saccus sub-triangular, medium-sized; phallus straight with distal edge sclerotized, as long as tegumen, basal sclerite slightly bent, length less than half of phallus, distally with relatively few microspines; cornuti group I an elongate plate with numerous robust spines; cornuti group II with 4-6 short spines and 6-8 needle-shaped spines of medium length; cornuti group III with 18-20 needle-shaped spines; vesica relatively long, with few scattered microspines.

Female genitalia: Unknown.

DNA barcodes (Figs 64-66, Tables 1-2): As only a single specimen was barcoded internal variation in COI cannot be assessed. The specimen is sister to *A. griseum*. *A. pseudolucidum* is differentiated from all other species with uncorrected p distance to other species ranging from 0.0321 (*A. griseum*) to 0.1284 (*A. minimum*). Barcode Index Number: ADY7242.

Diagnosis: *A. pseudolucidum* resembles *A. lucidum*. It can be distinguished by the white ground colour and six small distinct spots (in *A. lucidum* the ground colour is light yellowish brown with only four, often confluent, spots). In the male genitalia the few microspines in distal end of basal sclerite and the relatively long vesica are characteristic.

Biology: Unknown. The only known specimen was collected at light in a laurisilva forest during March.

Distribution: Only known from the type locality in the northern part of the island Gran Canaria, Spain.

Etymology: The species name is derived from combining of the Greek word *ψευδο* (pseudo = false) and *lucidum*, referring to its similarity to *A. lucidum*.

***Apatema griseum* Falck & Karsholt, sp. n. (Fig. 16)**

Holotype ♂: SPAIN, GRAN CANARIA, Pie de la Cuesta, 500 m, 4-23-III-2019, leg. P. Falck (ZMUC).

Paratypes: SPAIN, GRAN CANARIA, Pie de la Cuesta, 500 m, 12 ♂♂, 4-23-III-2019, leg. P. Falck, genitalia slides 3189PF, 3190PF, DNA samples Lepid Phyl 0112PF/CILEP111-19, 0113PF/CILEP112-19, 0114PF/CILEP113-19 (PF, MNCN); Ayacata, 1400 m, 2 ♂♂, 4-23-III-2019, leg. P. Falck (PF).

Description Adult: Wingspan 13-14.5 mm. Labial palp slender, upturned, segment 2 dark-grey, dorsally whitish, segment 3 black, creamy white. Antenna dark. Head dark brown, neck pale-grey brown; thorax dark brown, pale brown towards abdomen; tegula grey brown. Forewing lanceolate, ground colour uniform grey mottled with pale brown, mottled dark-grey towards apex; base black; four indistinct small black spots, almost in a row, along the cell; fringe grey. Hindwing grey with grey fringe.

Variation: The species varies in appearance of the four black spots: they are often well separated but may be confluent, almost forming a longitudinal streak.

Male genitalia (Figs 40, 40a): Uncus long, slender rectangular, apex spatulate; gnathos almost as long as uncus, straight, apically hook-shaped, apex pointed; tegumen sub-triangular, anterior margin flatly U-shaped; valva simple, approximately three times longer than broad, anterior margin slightly upturned; apex rounded, posterior margin medially slightly convex; sacculus slightly longer than 1/2 length of valva, of equal wide, apically sickle-shaped; labis slender, relatively long; juxta sub-triangular with apical protrusions; saccus sub-triangular, medium-sized; phallus straight with distal edge sclerotized, as long as tegumen, basal sclerite slightly bent, length less than half of phallus, distally almost without microspines; cornuti group I a long elongate plate with numerous spines; cornuti group II with 4-6 short spines and 8-10 needle-shaped spines of medium length; cornuti group III with 15-18 robust, needle-shaped spines; vesica with few scattered microspines.

Female genitalia: Unknown.

DNA barcodes (Figs 64-66, Tables 1-2): Three specimens were barcoded with no internal variation in COI (uncorrected p = 0.0000). The specimens are sister to *A. pseudolucidum*. *A. griseum* is differentiated from all other species with uncorrected p distance to other species ranging from 0.0321 (*A. pseudolucidum*) to 0.1335 (*A. minimum*). Barcode Index Number: ADY7244.

Diagnosis: *A. griseum* resembles worn specimens of *A. junnilaineni*. It can be distinguished by the uniform grey forewings with four small black dots, almost in a row, along the cell. In the male genitalia the equally wide sacculus with sickle-shaped apex and the cornuti group III with the very robust needle-shaped cornuti are characteristic.

Biology: Unknown. The specimens were collected during spring at light, at altitudes ranging from 500 m to 1400 m.

Distribution: Known only from a few scattered localities in the southern half of Gran Canaria.

Etymology: The species is named after the uniform grey colour of the forewing, from the Latin adjective *griseus* (= grey).

Apatema lucidum Walsingham, 1908 (Figs 17, 18)

Apatema lucidum Walsingham, 1908. *Proc. Zool. Soc. London*, **1907**: 945

Locus typicus: SPAIN, TENERIFE, “Bosque” de la Mina, Realejo, Las Mercedes, La Laguna, Tacoronte.

Material examined: SPAIN, TENERIFE, 5 km N Vilaflor, 1700 m, 1 ♂, 26-IV-1998, leg. K. Larsen, genitalia slide 5359OK (ZMUC); Taicho, 800 m, 1 ♀, 2-9-III-2013, leg. P. Falck, genitalia slide 2782PF, DNA sample Lepid Phyl 0128PF/CILEP127-19 (PF); Aguamansa, 1050 m, 27 ♂♂, 31 ♀♀, 21-V-3-VI-2019, leg. P. Falck, genitalia slides 3180PF, 3181PF, 3183PF, 3185PF, 3354PF, DNA samples

Lepid Phyl 0205PF/CILEP204-19, 0206PF/CILEP205-19, 0207PF/CILEP206-19 (PF); Arona, 400 m, 1 ♀, 21-V-3-VI-2019, leg. P. Falck (PF).

Description Adult: Wingspan 13-16 mm. Labial palp slender, upturned, segment 2 yellowish white, laterally dark brown at base and apically, segment 3 yellowish white. Antenna yellowish brown, in female with indistinct brown rings. Head, thorax and tegula pale yellowish brown, neck pale brown. Forewing ground colour pale yellowish brown mottled with brown especially distally at costa and in apically; base with a black dot at costa and dorsum; four black spots, three in a row along cell at 1/3, 1/2 and distally, the latter often comma-shaped and one spot near dorsum at 2/5; costal spot yellowish and indistinct; fringe grey. Hindwing light grey with grey fringe.

Variation: The two outer pairs of spots are sometimes confluent. Females are often heavily mottled with dark brown giving a dark brown appearance, but the black spots are still visible.

Male genitalia (Figs 41, 41a): Uncus long, slender rectangular, apex spatulate; gnathos almost as long as uncus, straight, apically hook-shaped, apex pointed; tegumen sub-triangular, anterior margin flatly U-shaped; valva simple, approximately three times longer than broad, anterior margin slightly upturned; apex rounded, posterior margin medially slightly convex; sacculus slightly longer than 1/2 length of valva, broader in distal third, apically hook-shaped; labis slender, short; juxta sub-triangular with apical protrusions; saccus sub-triangular, medium-sized; phallus straight, as long as tegumen, basal sclerite bent, length less than half of phallus, distally a group of thin microspines; cornuti group I a large plate with numerous triangular spines; cornuti group II with 8-10 long and 5-10 shorter needle-shaped spines; cornuti group III missing; vesica without microspines.

Female genitalia (Fig. 58): Papilla analis long, distally pointed; posterior apophysis slender, as long as papilla analis; anterior apophysis slender, as long as posterior apophysis, base bifurcate; tergum VIII sub-rectangular, posterior margin U-shaped; antrum dorsally bilobed, slightly tapered to fold on ductus bursae, posterior margin with dorso-medial indentation, edge sclerotized; ductus bursae from the fold to corpus bursae dilated in the middle part, left 2/3 membranous, right side weakly sclerotized; ductus seminalis with few spinulae; corpus bursae membranous rounded, rotation angel approximately 90°; signum droplet-shape, laterally with 3-4 small spines.

DNA barcodes (Figs 64-66, Tables 1-2): Four specimens were barcoded with some internal variation in COI (uncorrected $p = 0.0031$). The specimens are sister to *A. grancanariae*. *A. lucidum* is clearly differentiated from all other species with uncorrected p distance to other species ranging from 0.0504 (*A. grancanariae*) to 0.1309 (*A. minimum*). Barcode Index Number: ADY7243.

Diagnosis: *A. lucidum* resembles *A. pseudolucidum*. It can be distinguished by the pale yellowish brown colour of the forewing and by having only four black and less distinct spots (six small black, very distinct spots in *A. pseudolucidum*). In the male genitalia the lack of cornuti group II and rather few long needle-shaped cornuti in cornuti group III are characteristic. In the female genitalia the dilated membranous ductus bursae and the rotation angel are characteristic.

Biology: Early stages unknown. The adults were flying actively in the evening sunshine in mixed forest and attracted to light during April-June at altitudes ranging from 400 m to 1700 m.

Distribution: Only known from the island of Tenerife, Spain.

Remarks: The adults figured by GOZMÁNY (2008: 483, plate 115, figs. 10, 10a) do not correspond to *A. lucidum*, fig. 10 is most likely *A. fasciata* and fig. 10a *A. mixta*. The male and female genitalia are figured by GOZMÁNY (2008: 370, plate 4, fig.10; 438, plate 72, fig. 10), the male paralectotype, "Tacaronte, Tenerife 31-V-1907 W[a]ls[ingha]m. 98251" "*Apatema lucidum* W[a]ls[ingh]m P[roceedings of the] Z[oolological] S[ociety] [London] 1907-947-8. [sic!] Paratype 9/11" (NMW), and the female paralectotype "Type" "La Laguna, Tenerife 23-V-1907 W[a]ls[ingha]m. 98241" "Walsingham Collection 1910-427" "*Apatema lucidum* W[a]ls[ingha]m. Type ♀ (BMNH).

Apatema grancanariae Falck & Karsholt, sp. n. (Fig. 19)

Holotype ♂: SPAIN, GRAN CANARIA, Pie de la Cuesta, 500 m, 4-23-III-2019, leg. P. Falck, DNA sample Lepid Phyl 0124PF/CILEP123-19 (ZMUC).

Paratypes: SPAIN, GRAN CANARIA, Ayacata, 1400 m, 2 ♂♂, 3 ♀♀, 4-23-III-2019, leg. P. Falck, genitalia slides 3198PF, 3199PF, 3200PF, DNA samples Lepid Phyl 0122PF/CILEP121-19, 0125PF/CILEP124-19, 0127PF/CILEP126-19 (PF, MNCN); Pie de la Cuesta, 500 m, 1 ♂, 4-23-III-2019, leg. P. Falck, genitalia slide 3201PF, DNA sample Lepid Phyl 0192PF/CILEP191-19 (PF); Guayadeque, 460 m, 1 ♂, 4-23-III-2019, leg. P. Falck, genitalia slide 3202PF, DNA sample Lepid Phyl 0193PF/CILEP192-19 (PF).

Description Adult: Wingspan 13.5-15 mm. Labial palp slender, upturned, segment 2 white, laterally black at base and apically, segment 3 black with white tip. Antenna black, in female with indistinct grey rings. Head and neck pale brown mottled with dark brown; thorax dark brown, paler brown towards abdomen; tegula brown, darker brown basally. Forewing ground colour dark-grey mottled with black; base black with a creamy white spot medially; centrally with an irregular oblique creamy white fascia mottled with grey and brown, the fascia is bordered by four black spots; apical spot at costa creamy white, extending half way towards tiny white tornal spot, sometimes forming an indistinct outer fascia; fringe grey. Hindwing grey with grey fringe.

Male genitalia (Figs 42, 42a): Uncus long, slender rectangular, apex spatulate; gnathos almost as long as uncus, straight, apically hook-shaped, apex pointed; tegumen sub-triangular, anterior margin flatly U-shaped; valva simple, approximately three times longer than broad, anterior margin slightly upturned; apex rounded, posterior margin medially slightly convex; sacculus slightly longer than 1/2 length of valva, broader in distal third, apically hook-shaped; labis slender, medium-sized; juxta sub-triangular with apical protrusions; saccus sub-triangular, medium-sized; phallus straight, as long as tegumen, basal sclerite bent, length approximately 1/3 of phallus, distally a group of thin microspines; cornuti group I a large plate with numerous relatively long spines; cornuti group II with 3-5 short spines and 8-12 needle-shaped; cornuti group III missing, vesica without microspines.

Female genitalia (Fig. 59): Papilla analis long, distally pointed; posterior apophysis slender, approximately 1/5 longer than papilla analis; anterior apophysis slender, as long as posterior apophysis, base bifurcate; tergum VIII sub-rectangular, posterior margin with U-shaped indentation; antrum dorsally bilobed, slightly tapered to fold on ductus bursae, posterior margin with dorso-medial indentation, edge sclerotized; ductus bursae sclerotized only anteriorly to the fold and around ductus seminalis, otherwise becoming dilated and membranous, rotated 90° just before corpus bursae; ductus seminalis with spinulae; corpus bursae membranous rounded; signum droplet-shape, laterally with 3-4 small spines.

DNA barcodes (Figs 64-66, Tables 1-2): Six specimens were barcoded with very high variation in COI (uncorrected $p = 0.0233$). The specimens are sister to *A. lucidum*. Despite high internal variation *A. grancanariae* is differentiated from all other species with uncorrected p distance to other species ranging from 0.0504 (*A. lucidum*) to 0.1352 (*A. minimum*). Barcode Index Numbers: AEA2797, AEA0771 and ADY6665.

Diagnosis: *A. grancanariae* resembles other *Apatema* species with similar wing pattern, especially *A. fasciata*, *A. mixtum* and *A. transversum*. It can be distinguished from *A. fasciata* and *A. mixtum* by an on average larger size, but it is not always possible to separate adults confidently. It can be distinguished from *A. transversum* by the paler and more oblique fascia in the middle of the forewing. In the male genitalia the short sclerite, the relatively long spines in cornuti group I, the missing cornuti group III and the lack of microspines in the vesica are characteristic (in *A. fasciata* the cornuti in group I are triangular, in *A. mixtum* cornuti group II and III are present with few minute cornuti in group II, in *A. transversum* cornuti group II and III are present with a number of shorter spines in group II). In the female genitalia the dilated, membranous ductus bursae with a 90 rotation just before corpus bursae is characteristic.

Biology: Unknown. The specimens were attracted to light in March at altitudes ranging from 460 m to 1400 m.

Distribution: Known only from a few scattered localities in the southern part of the island of Gran Canaria, Spain.

Etymology: The species is named after its place of occurrence, the island of Gran Canaria. The name is an adjective.

***Apatema brunneum* Falck & Karsholt, sp. n. (Fig. 20)**

Holotype ♀: SPAIN, TENERIFE, Aguamansa, 1050 m, 13-26-VIII-2019, leg. P. Falck (ZMUC).

Paratypes: SPAIN, TENERIFE. Aguamansa, 1050 m, 1 ♂, 5 ♀♀, 26-VII-1984, leg. P. Olsen, B. Skule, P. Stadel Nielsen, genitalia slides 6006LG, 6013LG, 6014LG, 6019LG (ZMUC); same data but 1 ♀, 1-VIII-1979, leg. P. Stadel Nielsen (ZMUC), same data but, 2 ♂♂, 36 ♀♀, 13-26-VIII-2019, leg. P. Falck, genitalia slides 3176PF, 3177PF, 3178PF, 3184PF, 3355PF, DNA samples Lepid Phyl 0316PF/CILEP315-19, 0317PF/CILEP316-19, 0318PF/CILEP317-19 (PF, MNCN); Las Mercedes, 750 m, 2 ♂♂, 13 ♀♀, 13-26-VIII-2019, leg. P. Falck, genitalia slides 3179PF, 3182PF, DNA sample Lepid Phyl 0319PF/CILEP318-19 (PF).

Description: Adult. Wingspan 10.5-13 mm. Labial palp slender, upturned, segment 2 creamy white, laterally and basally dark-grey, with dark-grey rings distally, segment 3 black, dorsally and apically creamy white. Antenna black, with indistinct dark-grey rings in female. Head, neck and thorax yellowish brown, head in particular mottled with dark brown; tegula yellowish brown, dark brown towards base. Forewing dark brown mottled with yellowish brown, apically black with a golden shine; base black, center of wing an irregular oblique yellowish brown fascia bordered by four black spots; costal spot yellowish, mottled with brown, extending to tornal spot, forming an angulated fascia; fringe grey. Hindwing grey with grey fringe.

Variation: The species is rather uniform in appearance, but the four black spots display some variation; they are often well separated, but the outer pair may be confluent.

Male genitalia (Figs 43, 43a): Uncus long, slender rectangular, apex spatulate; gnathos almost as long as uncus, straight, apically hook-shaped, apex pointed; tegumen sub-triangular, anterior margin flatly U-shaped; valva simple, approximately three times longer than broad, slightly tapered towards apex, anterior margin slightly upturned; apex rounded, posterior margin medially slightly convex; sacculus slightly longer than 1/2 length of valva, broader in distal third, apically hook-shaped; labis medium-sized; juxta sub-triangular with apical protrusions; saccus sub-triangular, large; phallus straight, as long as tegumen, basal sclerite bent, length less than half of phallus, distally a group of thin microspines; cornuti group I a large plate, slightly turned about the longitudinal axis, with numerous triangular spines; cornuti group II with few (3-5) short spines and 12-15 needle-shaped spines; cornuti group III with 11-12 needle-shaped spines; vesica with few scattered microspines.

Female genitalia (Fig. 60): Papilla analis long, distally pointed; posterior apophysis slender, as long as papilla analis; anterior apophysis slender, as long as posterior apophysis, base bifurcate; tergum VIII sub-rectangular, posterior margin V-shaped; antrum dorsally bilobed, slightly tapered to fold on ductus bursae, posterior margin with dorso-medial V-shaped indentation, edge sclerotized; ductus bursae from the fold to corpus bursae dilated in the middle part, with longitudinal fold, left half membranous, right side sclerotized; ductus seminalis heavily twisted with numerous spinulae; corpus bursae membranous rounded, rotation angle approximately 90; signum droplet-shape, laterally with 3-4 small spines.

DNA barcodes (Figs 64-66, Tables 1-2): Four specimens were barcoded with very low internal variation in COI (uncorrected $p = 0.0015$). The specimens are placed as sister to group comprising *A. transversum*, *A. stadelii* and *A. skulei*. *A. brunneum* is clearly differentiated from all other species with uncorrected p distance to other species ranging from *ca* 0.06 (*A. lucidum* and *A. stadelii*) to 0.1106 (*A. confluellum*). Barcode Index Number: AEC2839.

Diagnosis: *A. brunneum* resembles several other *Apatema* species, especially *A. mixtum* and *A. fasciata*. It can be distinguished by the yellowish brown fascia and the overall golden shine. In the male genitalia the relatively large saccus and the large cornuti group I, turned about the longitudinal axis, giving an impression of the spines being pointing in different directions, are characteristic. In the

female genitalia the dilated and membranous part of ductus bursae, the twisted ductus seminalis and the rotated corpus bursae are characteristic.

Biology: Early stages unknown. The adults were flying actively in the evening sunshine, and later attracted to artificial light, in mixed forest at altitudes from 750 m to 1050 m.

Distribution: Only known from a few forest-localities in the island of Tenerife, Spain.

Etymology: The species is named after the brown colour of the forewing, from the Latin adjective *brunneus* (= brown).

Remarks: The female genitalia is figured by GOZMÀNY (2008: 341 and 438 plate 72 fig. 10a).

***Apatema transversum* Falck & Karsholt, sp. n. (Figs 21, 22)**

Holotype ♀: SPAIN, GRAN CANARIA, Pie de la Cuesta, 500 m, 11-24-VI-2018, leg. P. Falck (ZMUC).

Paratypes: SPAIN, GRAN CANARIA, Pie de la Cuesta, 500 m, 6 ♂♂, 3 ♀♀, 11-24-VI-2018, leg. P. Falck, genitalia slides 2789PF, 2797PF, DNA sample Lepid Phyl 0017PF/CILEP017-19 (PF), same data but, 1 ♂, 17-30-IX-2018, leg. P. Falck (PF); Barranquillo Andrés, 700 m, 1 ♂, 5 ♀♀, 11-24-VI-2018, leg. P. Falck, genitalia slides 2783PF, 2800PF, DNA samples Lepid Phyl 0016PF/CILEP016-19, 0018PF/CILEP018-19 (PF, MNCN); Puerto Rico, 50 m, 2 ♂♂, 1 ♀, 11-24-VI-2018, leg. P. Falck, genitalia slides 2791PF, 2799F, 2803PF (PF); Playa del Cura, 30 m, 1 ♂, 4-23-III-2019, leg. P. Falck, DNA sample Lepid Phyl 0118PF/CILEP117-19 (PF).

Description adult: Wingspan 10-12.5 mm. Labial palp slender, upturned, segment 2 creamy white, base laterally and towards apex dark-grey, segment 3 black, dorsally and apically creamy white. Antenna black, with indistinct dark-grey rings in female, uniformly dark-grey in male. Head creamy white, neck and thorax creamy white mottled with dark brown; tegula creamy white, dark brown towards base. Forewing grey-brown mottled with yellowish brown, dark-grey and black, especially towards apex; base black; centrally an irregular, slightly oblique yellowish brown fascia bordered by four black spots, the colour of the wing laterally of the fascia only slightly darker; costal spot yellowish white, extending to tiny white tornal spot, forming a diffuse fascia; fringe grey. Hindwing grey with grey fringe.

Variation: The species varies in appearance of the four black spots, they are often well separated but may be confluent in pairs.

Male genitalia (Figs 44, 44a): Uncus long, slender rectangular, apex spatulate; gnathos almost as long as uncus, straight, apically hook-shaped, apex pointed; tegumen sub-triangular, anterior margin flatly U-shaped; valva simple, approximately three times longer than broad, anterior margin slightly upturned; apex rounded, posterior margin medially slightly convex; sacculus 2/3 length of valva, distinctively broader in distal third, apically hook-shaped; labis medium-sized; juxta sub-triangular with apical protrusions; saccus sub-triangular, medium-sized; phallus straight, as long as tegumen, distal edge sclerotized, basal sclerite bent, length less than half of phallus, distally a group of thin microspines; cornuti group I a large plate with numerous spines; cornuti group II with numerous short spines and 5-10 short needle-shaped spines; cornuti group III with 15-20 needle-shaped spines of medium length; vesica with several triangular scattered microspines.

Female genitalia (Fig. 61): Papilla analis long, distally pointed; posterior apophysis slender, as long as papilla analis; anterior apophysis slender, as long as posterior apophysis, base bifurcate; tergum VIII sub-rectangular, posterior margin with weak indentation; antrum dorsally bilobed, slightly tapered to fold on ductus bursae, posterior margin with dorso-medial indentation, edge heavily sclerotized; ductus bursae straight, anteriorly slightly widening, evenly sclerotized; ductus seminalis with few spinulae; corpus bursae membranous, rounded; signum droplet-shape, laterally with 3-4 small spines.

DNA barcodes (Figs 64-66, Tables 1-2): Four specimens were barcoded with some internal variation in COI (uncorrected $p = 0.0055$). The specimens are placed in an unresolved trichotomy with *A. skulei* and *A. stadelii*. *A. transversum* is differentiated from all other species with uncorrected p

distance to other species ranging from *ca* 0.046 (*A. stadelii* and *A. skulei*) to 0.1307 (*A. minimum*). Barcode Index Number: ADT8536.

Diagnosis: *A. transversum* resembles *A. mixtum*, *A. fasciata*, *A. brunneum* and *A. grancanariae*. It can be distinguished by the almost transverse fascia and the colour of the fascia, which is almost the same as the rest of wing. In the male genitalia the numerous short spines in cornuti group II and the presence of several triangular microspines in the vesica are characteristic. In the female genitalia the evenly sclerotized ductus bursae and the short longitudinal fold anteriorly are characteristic.

Biology: Unknown. The specimens were attracted to artificial light.

Distribution: Known only from the southern part of the island of Gran Canaria, Spain.

Etymology: The species is named after the almost transverse fascia of the forewing, from the Latin adjective *transversus* (= transverse, from side to side).

***Apatema stadelii* Falck & Karsholt, sp. n. (Figs 23, 24)**

Holotype ♂: SPAIN, TENERIFE, Aguamansa, 1050 m, 1-VIII-1979, leg. P. Stadel Nielsen (ZMUC).

Paratypes: SPAIN, TENERIFE, Aguamansa, 1050 m, 7 ♂♂, 13 ♀♀, 29-VII-1-VIII-1979, leg. P. Stadel Nielsen, genitalia slides ZMUC1PF, ZMUC2PF, 3356aPF (ZMUC); same data but, 1 ♀, 26-VII-1984, leg. P. Olsen, B. Skule, P. Stadel Nielsen, genitalia slide 5995LG (ZMUC), same data but, 2 ♂♂, 7 ♀♀, 13-26-VIII-2019, leg. P. Falck (PF); Arona, 670 m, 9 ♂♂, 14 ♀♀, 21-V-3-VI-2019, leg. P. Falck, genitalia slide 2780PF, DNA samples 0012PF/CILEP012-19, 0209PF/CILEP208-19, 0210PF/CILEP209-19, 0211PF/CILEP210-19 (PF, MNCN); Las Manchas, 1050 m, 6 ♂♂, 9 ♀♀, 21-V-3-VI-2019, leg. P. Falck, genitalia slide 3356PF (PF, MNCN); Las Mercedes, 750 m, 1 ♂, 1 ♀, 13-26-VIII-2019, leg. P. Falck (PF); Puerto de la Cruz, 200 m, 1 ♀, 13-26-VIII-2019, leg. P. Falck (PF).

Description Adult: Wingspan 10.5-13 mm. Labial palp slender, upturned, segment 2 white, laterally at base and towards apex black, segment 3 white mottled with black towards base. Antenna black. Head varies from creamy white to blackish brown, neck blackish brown; thorax blackish, towards abdomen creamy white; tegula creamy white, blackish brown towards base. Forewing ground colour black; base white, with a small white spot at costa near base; wing centrally with an irregular, slightly oblique white fascia almost extending to dorsum; costal spot white, occasionally extending to white tornal spot, forming a fascia; fringe grey. Hindwing grey with grey fringe.

Variation: The species varies in the colour of the head, see above; in some specimens the four black spots bordering the white fascia centrally on the wing are visible.

Male genitalia (Figs 45, 45a): Uncus long, slender rectangular, apex spatulate; gnathos almost as long as uncus, straight, apically hook-shaped, apex pointed; tegumen sub-triangular, anterior margin flatly U-shaped; valva simple, approximately 3.5 times longer than broad, anterior margin slightly upturned; apex rounded, posterior margin medially slightly convex; sacculus slightly longer than 1/2 length of valva, broader in distal third, apically hook-shaped; labis slender, long; juxta sub-triangular with apical protrusions; saccus sub-triangular, medium-sized; phallus straight, as long as tegumen, basal sclerite bent, length less than half of phallus, distally a group of thin microspines; cornuti group I a large plate with numerous spines; cornuti group II with 15-20 short spines and 6-10 needle-shaped spines of medium length; cornuti group III with numerous very thin spines of different length, distally 3-5 needle-shaped spines; vesica with scattered microspines.

Female genitalia (Fig. 62): Papilla analis long, pointed distally; posterior apophysis slender, as long as papilla analis; anterior apophysis slender, as long as posterior apophysis, base bifurcate; tergum VIII sub-rectangular, posterior margin U-shaped; antrum dorsally bilobed, slightly tapered to fold on ductus bursae, posterior margin with dorso-medial indentation, edge heavily sclerotized; ductus bursae straight, anteriorly parallel-sided with small longitudinal fold, evenly sclerotized; ductus seminalis with spinulae; corpus bursae membranous rounded; signum droplet-shape, laterally with 3-4 small spines.

DNA barcodes (Figs 64-66, Tables 1-2): Four specimens were barcoded with very low internal variation in COI (uncorrected $p = 0.0015$). The specimens are placed in an unresolved trichotomy with *A. skulei* and *A. transversum*. *A. stadelii* is differentiated from all other species with uncorrected p

distance to other species ranging from *ca* 0.046 (*A. transversum* and *A. skulei*) to 0.1294 (*A. minimum*). Barcode Index Number: ADZ8618.

Diagnosis: *A. stadelii* resembles *A. skulei* and *A. mediopallidum*. It can be distinguished by the black forewings with pure white markings; in *A. skulei* the forewing is more or less mottled with blackish brown in the markings; in *A. mediopallidum* the markings are creamy white and the black spots, bordering the fascia in the middle of the forewing, are clearly visible. In the male genitalia the relatively long labis and cornuti group III with the combination of thin, gracile spines and a few needle-shaped spines are characteristic, in *A. mediopallidum* only two cornuti groups are present. In the female genitalia the small longitudinal fold and the anteriorly parallel-sided ductus bursae are characteristic.

Biology: Unknown. The specimens were attracted to light during May–August at altitudes ranging from 670 m to 1050 m.

Distribution: Known only from the island of Tenerife, Spain.

Etymology: The species name (a noun in the genitive case) is dedicated to the Danish lepidopterist Per Stadel Nielsen who collected some of the first specimens and many other *Apatema* specimens used for our study.

***Apatema skulei* Falck & Karsholt, sp. n. (Figs 25, 26)**

Holotype ♀: SPAIN, GRAN CANARIA, Barranco Moya, 400 m, 20-VII-1984, leg. P. Olsen, B. Skule, P. Stadel, genitalia slide 5999LG (ZMUC).

Paratypes: SPAIN, GRAN CANARIA, Los Tilos de Moya, 1 ♀, 19-VII-1984 leg. P. Olsen, B. Skule, P. Stadel Nielsen, genitalia slides 6007LG (ZMUC); Barranco Moya, 400 m, 2 ♂♂, 4 ♀♀, 20-VII-1984, leg. P. Olsen, B. Skule, P. Stadel Nielsen, genitalia slides 5980LG, 5987LG, 5998LG, 6049LG, 3203aPF (ZMUC), same data but, 1 ♂, 8-20-VIII-2020, leg. P. Falck (PF); Carretera, 455 m, 14 ♂♂, 36 ♀♀, 8-20-VIII-2020, leg. P. Falck, genitalia slides 3380PF, 3387PF, 3388PF, 3389PF, DNA samples Lepid Phyl 0667PF/CILEP666-20, 0668PF/CILEP667-20, 0669PF/CILEP668-20, 0670PF/CILEP669-20, 0671PF/CILEP670-20, 0672PF/CILEP671-20, 0673PF/CILEP672-20 (PF, MNCN); Barranco de Azuaje, 270 m, 2 ♂♂, 9 ♀♀, 8-20-VIII-2020, leg. P. Falck (PF); Teror, 500 m, 2 ♂♂, 2 ♀♀, 26-X-13-XI-2020, leg. P. Falck (PF).

Description Adult: Wingspan 9.5–12 mm. Labial palp slender, upturned, segment 2 black, dorsally creamy white, segment 3 black, dorsally and tip creamy white. Antenna black, in female with indistinct dark-grey rings. Head dark-brown, towards neck pale-brown, neck blackish brown; thorax blackish, mottled with cream and pale-brown, towards abdomen creamy white; tegula creamy white, blackish brown towards base. Forewing ground colour black, mottled with pale-brown to reddish brown in markings; base white, with a small white spot at costa near base; centrally with an irregular, slightly oblique creamy white fascia extending towards dorsum, bordered by four black spots; costal and tornal spot creamy white, sometimes forming a fascia; fringe grey. Hindwing grey with grey fringe.

Variation: *A. skulei* varies in the amount of black in the white markings; especially males can be very dark in general appearance.

Male genitalia (Figs 46, 46a): Uncus long, slender rectangular, apex spatulate; gnathos almost as long as uncus, straight, apically hook-shaped, apex pointed; tegumen sub-triangular, anterior margin flatly U-shaped; valva simple, approximately 3.5 times longer than broad, anterior margin slightly upturned; apex rounded, posterior margin medially slightly convex; sacculus longer than 1/2 length of valva, slightly broader in distal third, apically hook-shaped; labis slender, long; juxta sub-triangular with apical protrusions; saccus sub-triangular, medium-sized; phallus straight, as long as tegumen, basal sclerite bent, length less than half of phallus, distally a group of thin microspines; cornuti group I a large plate with numerous spines; cornuti group II with 15–20 short spines and 8–10 needle-shaped spines of medium length; cornuti group III with 15–20 needle-shaped spines; vesica with numerous microspines.

Female genitalia (Fig. 63): Papilla analis long, distally pointed; posterior apophysis slender, as long as papilla analis; anterior apophysis slender, as long as posterior apophysis, base bifurcate; tergum VIII sub-rectangular, posterior margin U-shaped; antrum dorsally bilobed, slightly tapered to fold on ductus bursae, posterior margin with dorso-medial indentation, edge heavily sclerotized; ductus bursae straight, anteriorly parallel-sided with small longitudinal fold, evenly sclerotized; ductus seminalis with spinulae; corpus bursae membranous, rounded; signum droplet-shape, laterally with 3-4 small spines.

DNA barcodes (Figs 64-66, Tables 1-2): Seven specimens were barcoded with some internal variation (uncorrected $p = 0.0042$). The specimens are placed in an unresolved trichotomy with *A. stadelii* and *A. transversum*. *A. skulei* is differentiated from all other species with uncorrected p distance to other species ranging from *ca* 0.046 (*A. transversum* and *A. stadelii*) to 0.1324 (*A. minimum*). Barcode Index Number: AEG1008.

Diagnosis: *A. skulei* resembles *A. stadelii* and *A. mediopallidum*. It can be distinguished by the black forewing with markings more or less mottled with black, brown and reddish; in *A. stadelii* the markings are pure white and the black spots are often not visible; in *A. mediopallidum* the markings are creamy white and the black spots, bordering the fascia centrally in the forewing, are clearly visible. In the male genitalia the relatively long labis and cornuti group III with the combination of thin, gracile spines and a few needle-shaped spines, and the numerous microspines in vesica are characteristic. It is very similar to *A. stadelii*, but the number of microspines in vesica is higher; in *A. mediopallidum* only two cornuti groups are present. In the female genitalia the small longitudinal fold and the anteriorly parallel-sided ductus bursae are characteristic.

Biology: Unknown. Most of the specimens were collected at light and a few ones disturbed from a rock wall in the afternoon July-November at altitudes ranging from 270 m to 500 m.

Distribution: Known only from a few localities in the northern part on the island of Gran Canaria, Spain.

Etymology: The species name (a noun in the genitive case) is dedicated to the Danish lepidopterist Bjarne Skule, who collected some of the first specimens and many other *Apatema* specimens used in our study.

Phylogenetic analyses

The phylogenetic analyses yielded overall congruent results. All species treated herein are monophyletic and well-supported in all analyses, but the backbone phylogeny is poorly supported as evident by low support values and unresolved branches in the two MrBayes analyses (Figs 64-65), and “fuzzy”/unresolved relationships in the DensiTree rendering of the BEAST analysis (Fig. 66). Many species pairs or species groups are, however, well supported in all analyses, as evident either by strong support values in the MrBayes analyses, or by a dense and compact (= stable, BOUCKEART & HELED (2014)) appearance in the DensiTree rendering. The main difference between the analyses of the Canarian specimens only (both MrBayes and BEAST) and the analysis of all *Apatema* sequences is that the latter analysis indicated that the Canarian species may not comprise a monophyletic group as the clade comprising *A. confluentum* and *A. minimum* is sister to a clade comprising the non-Canarian species *A. whalleyi* and *A. baixerasi*, and two of the four specimens identified as *A. mediopallidum*. The remaining Canarian species from a monophyletic clade together with the remaining two species identified as *A. mediopallidum*.

Discussion

The molecular analyses (Figs. 64-66, Table 2) strongly support the taxonomic arrangement discussed above. All identified species are clearly genetically distinct from other species (Table 2) with uncorrected p distance values between species ranging from 0.0321 (between *A. griseum* and *A. pseudolucidum*) to 0.1352 (between *A. minimum* and *A. grancanariae*). All between-species values are thus well above the 2% threshold suggested as putative guideline for species delimitation by HEBERT

et al. (2003). The threshold is not entirely unproblematic, however, as some species (*A. minimum*, *A. coarctella* and *A. grancanariae*) have within species distance values that are above 0.02. For *A. minimum* and *A. coarctella* the average within-species diversity is approximately as high as the average distance between *A. griseum* and *A. pseudolucidum*. This clearly indicate that the species requires further investigation. Both MrBayes analyses further support the taxonomic arrangement as all recognised species are monophyletic in the analysis with high support values between 0.98 and 1. The DensiTree rendering of the BEAST analysis (Fig. 66) further illustrates this as all species are rendered as dense and compact, while many deeper relationships between species or species groups are less well defined. The analyses also confirm that *A. fasciata* and *A. coarctella* show considerable intraspecific geographical diversity. *A. coarctella* (Table 3) is divided into three populations comprising specimens from Tenerife, La Palma, and Gran Canaria/Fuerteventura/Lanzarote, respectively. The three populations all display average inter-population uncorrected p distance > 0.02. Similarly, *A. fasciata* (Table 4) is divided into three populations comprising specimens from Gran Canaria, Fuerteventura, and Lanzarote, respectively (although we were able to include only one specimen from the latter locality). Again the three populations all display average inter-population uncorrected p distance > 0.02. The analysis of all available *Apatema* sequences (Fig. 65) indicates that the species found on the Canary Island and Madeira do not comprise a monophyletic group as *A. confluentum* and *A. minimum* are placed in a well-supported (pp > 0.9) clade with the species *A. baixerasi*, *A. mediopallidum*, and *A. whalleyi* from continental Europe. One *A. mediopallidum* (PHLSA273-11) from Valencia in mainland Spain groups with *A. coarctella* and actually renders the latter species non-monophyletic in the majority rule tree, while another *A. mediopallidum* (LEFIJ5483-16) from Cyprus is also placed deeply within the Canarian *Apatema*, albeit not clearly associated with any species (Fig. 66). We have not examined either of the *A. mediopallidum* specimens, but we consider it likely that their placement in the analysis is due to some mitochondrial DNA artefact caused by external factors such as *Wolbachia* based on similar observations in previous studies (e. g. KONDANDARAMAIAH *et al.*, 2013, SIMONSEN *et al.*, 2019).

The results presented here show that the genus *Apatema* is very diverse in the Canary Islands. 18 of the currently known 28 *Apatema* species occur in these islands, with the other ten species being found in continental Europe, the Mediterranean islands or North Africa. There is, however, hidden diversity among *Apatema* species occurring outside of the Macaronesian islands as well as evident from unpublished morphological and genetic studies of the genus (P. Huemer and J. Šumpich in litt.). We have not found any overlap between species occurring in the Canary Islands and elsewhere. Only one species from continental Europe, *A. mediopallidum* has been recorded from the Canary Islands (KLIMESCH, 1985: 137), but the records are due to misidentification. *A. mediopallidum* should be deleted from the list of Canary Island Lepidoptera (VIVES MORENO, 2014: 107).

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Table 1.– Species affiliation, voucher and BOLD ID, and collection localities for all species included in the molecular analyses as described in the text.

Genus	Species	BOLD ID#	Voucher ID	Country	Region	Island	Locality
<i>Ambroma</i>	<i>klimeschi</i>	CILEP050-19	0050PF	Spain	Canary Islands	Tenerife	Playa Paraiso
<i>Epanastasis</i>	<i>sophroniella</i>	CILEP030-19	0030PF	Spain	Canary Islands	Tenerife	Arona
<i>Epanastasis</i>	<i>canariensis</i>	CILEP043-19	0043PF	Spain	Canary Islands	Gran Canaria	Ayacata
<i>Oegoconia</i>	<i>quadripuncta</i>	CGUKC819-09		United Kingdom	Surry		South Croydon
<i>Oegoconia</i>	<i>decuratella</i>	XAG374-05		Canada	Ontario		Puslinch Township, Wellington Co.
<i>Oegoconia</i>	<i>decuratella</i>	LEFIF982-10		Finland	Regio aboensis		Dragsfjärd
<i>Oegoconia</i>	<i>novimundi</i>	LEEUA169-11		Denmark	NEZ		Copenhagen
<i>Oegoconia</i>	<i>novimundi</i>	BBLOE684-11		USA	California		Point Mugu SP, Los Angeles Co.
<i>Oegoconia</i>	<i>quadripuncta</i>	LNAUT3224-15		USA	California		San Diego, San Diego Co.
<i>Apatema</i>	<i>apolausticum</i>	LASTS834-15		Italy	South Tyrol		Fuchsberg
<i>Apatema</i>	<i>apolausticum</i>	PHLAE116-11		Italy	Piedmont		Massiccio Argentera, Cuneo
<i>Apatema</i>	<i>apolausticum</i>	PHLAC259-10		Italy	South Tyrol		Montiggl
<i>Apatema</i>	<i>apolausticum</i>	LASTS481-14		Italy	South Tyrol		Margreid
<i>Apatema</i>	<i>apolausticum</i>	PHLAC260-10		Italy	South Tyrol		Montiggl
<i>Apatema</i>	<i>baixerasi</i>	PHLSA165-11		Spain	Valencia		El Saler
<i>Apatema</i>	<i>mediopallidum</i>	LON6917-18		Croatia	Zadar		Meka Draga
<i>Apatema</i>	<i>mediopallidum</i>	LON6918-18		Croatia	Zadar		Pag
<i>Apatema</i>	<i>mediopallidum</i>	PHLSA273-11		Spain	Valencia		Sierra de Crevillente
<i>Apatema</i>	<i>mediopallidum</i>	LEFIJ5483-16		Cyprus	Pafos		Oreites Forest
<i>Apatema</i>	<i>whalleyi</i>	LEATJ364-15		Italy	South Tyrol		Sonnenberg
<i>Apatema</i>	<i>whalleyi</i>	LEATE498-13		Italy	South Tyrol		Schleiser Leiten
<i>Apatema</i>	<i>whalleyi</i>	LEATC349-13		Italy	South Tyrol		Schleiser Leiten
<i>Apatema</i>	<i>whalleyi</i>	PHLAE115-11		Italy	Piedmont		Massiccio Argentera, Cuneo
<i>Apatema</i>	<i>whalleyi</i>	LEATC345-13		Italy	South Tyrol		Schleiser Leiten
<i>Apatema</i>	<i>whalleyi</i>	PHLAH060-12		Austria	Carinthia		Reinegg, Magerasen
<i>Apatema</i>	<i>confluellum</i>	CILEP013-19	0013PF	Spain	Canary Islands	Tenerife	Playa Paraiso
<i>Apatema</i>	<i>confluellum</i>	CILEP014-19	0014PF	Spain	Canary Islands	Tenerife	Adeje, Tenerife
<i>Apatema</i>	<i>confluellum</i>	CILEP015-19	0015PF	Spain	Canary Islands	Tenerife	Los Gigantes
<i>Apatema</i>	<i>minimium</i>	CILEP024-19	0024PF	Spain	Canary Islands	Fuerteventura	Betancuria
<i>Apatema</i>	<i>minimium</i>	CILEP312-19	0313PF	Spain	Canary Islands	Lanzarote	Tabayesco
<i>Apatema</i>	<i>minimium</i>	CILEP608-20	0609PF	Spain	Canary Islands	Lanzarote	Tabayesco
<i>Apatema</i>	<i>minimium</i>	CILEP673-20	0674PF	Spain	Canary Islands	Lanzarote	Tabayesco

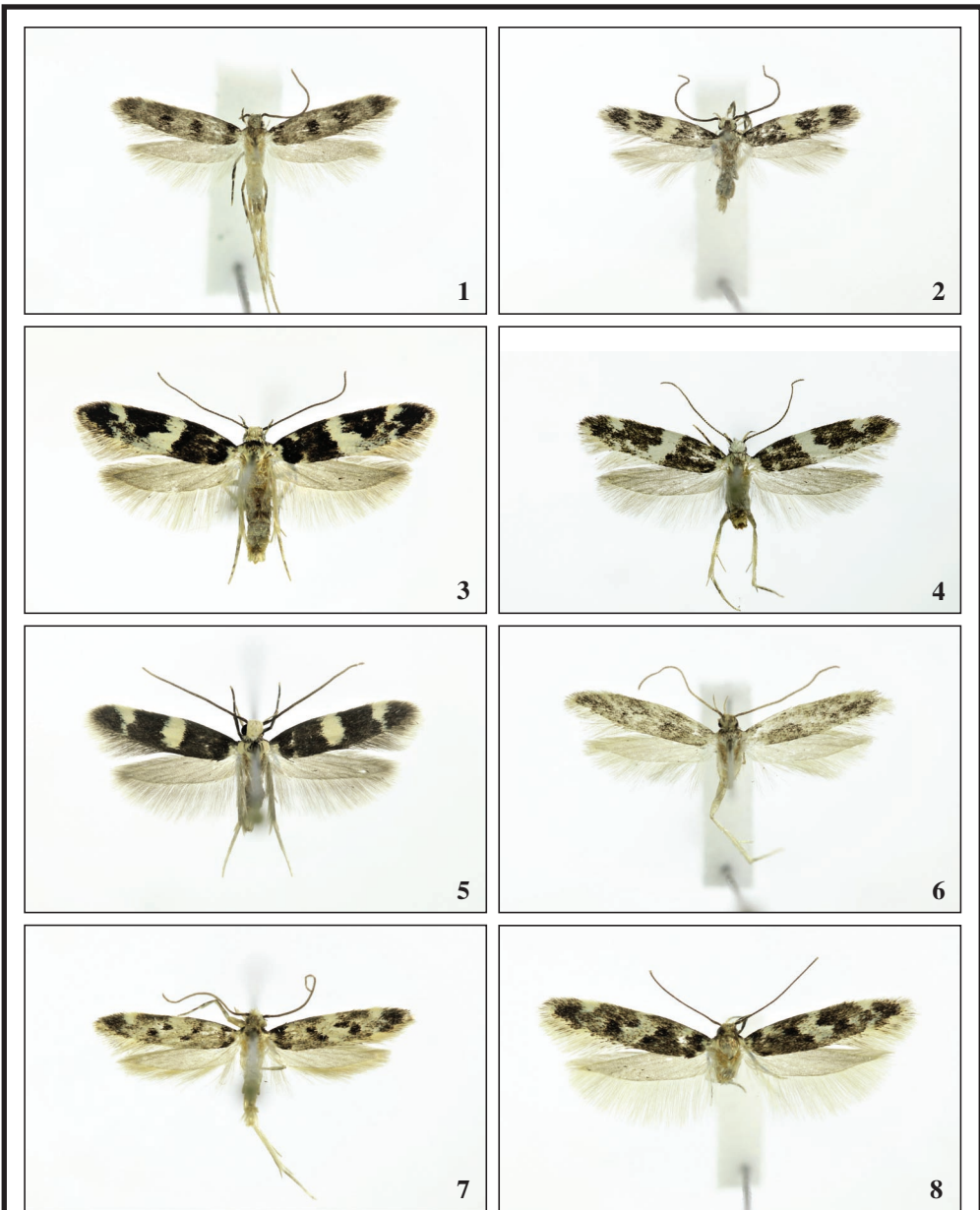
<i>Apatema</i>	<i>minimum</i>	CILEP674-20	0675PF	Spain	Canary Islands	Lanzarote	El Bosquecillo
<i>Apatema</i>	<i>lapalmae</i>	CILEP134-19	0135PF	Spain	Canary Islands	La Palma	La Galga
<i>Apatema</i>	<i>lapalmae</i>	CILEP135-19	0136PF	Spain	Canary Islands	La Palma	La Galga
<i>Apatema</i>	<i>helleri</i>	CILEP010-19	0010PF	Spain	Canary Islands	Gran Canaria	Los Tilos de Moya
<i>Apatema</i>	<i>helleri</i>	CILEP011-19	0011PF	Spain	Canary Islands	Gran Canaria	Los Tilos de Moya
<i>Apatema</i>	<i>sallyae</i>	CILEP022-19	0022PF	Spain	Canary Islands	Gran Canaria	Pie de la Cuesta
<i>Apatema</i>	<i>sallyae</i>	CILEP023-19	0023PF	Spain	Canary Islands	Gran Canaria	Pie de la Cuesta
<i>Apatema</i>	<i>lanzarotae</i>	CILEP314-19	0315PF	Spain	Canary Islands	Lanzarote	Mojón Blanco
<i>Apatema</i>	<i>lanzarotae</i>	CILEP325-19	0326PF	Spain	Canary Islands	Lanzarote	Mojón Blanco
<i>Apatema</i>	<i>mixtum</i>	CILEP019-19	0019PF	Spain	Canary Islands	Tenerife	Las Manchas
<i>Apatema</i>	<i>mixtum</i>	CILEP119-19	0120PF	Spain	Canary Islands	Tenerife	Arona
<i>Apatema</i>	<i>mixtum</i>	CILEP120-19	0121PF	Spain	Canary Islands	Tenerife	Arona
<i>Apatema</i>	<i>mixtum</i>	CILEP122-19	0123PF	Spain	Canary Islands	Tenerife	Arona
<i>Apatema</i>	<i>mixtum</i>	CILEP131-19	0132PF	Spain	Canary Islands	Tenerife	Armeñime
<i>Apatema</i>	<i>mixtum</i>	CILEP133-19	0134PF	Spain	Canary Islands	Tenerife	Arona
<i>Apatema</i>	<i>fasciata</i>	CILEP020-19	0020PF	Spain	Canary Islands	Gran Canaria	Pie de la Cuesta
<i>Apatema</i>	<i>fasciata</i>	CILEP021-19	0021PF	Spain	Canary Islands	Gran Canaria	Pie de la Cuesta
<i>Apatema</i>	<i>fasciata</i>	CILEP118-19	0119PF	Spain	Canary Islands	Gran Canaria	Pie de la Cuesta
<i>Apatema</i>	<i>fasciata</i>	CILEP125-19	0126PF	Spain	Canary Islands	Gran Canaria	Pie de la Cuesta
<i>Apatema</i>	<i>fasciata</i>	CILEP129-19	0130PF	Spain	Canary Islands	Gran Canaria	Pie de la Cuesta
<i>Apatema</i>	<i>fasciata</i>	CILEP132-19	0133PF	Spain	Canary Islands	Gran Canaria	Pie de la Cuesta
<i>Apatema</i>	<i>fasciata</i>	CILEP200-19	0201PF	Spain	Canary Islands	Fuerteventura	Betancuria
<i>Apatema</i>	<i>fasciata</i>	CILEP201-19	0202PF	Spain	Canary Islands	Fuerteventura	Betancuria
<i>Apatema</i>	<i>fasciata</i>	CILEP313-19	0314PF	Spain	Canary Islands	Lanzarote	Tabayesco
<i>Apatema</i>	<i>coarctella</i>	CILEP128-19	0129PF	Spain	Canary Islands	Tenerife	Armeñime
<i>Apatema</i>	<i>coarctella</i>	CILEP155-19	0156PF	Spain	Canary Islands	Gran Canaria	Pie de la Cuesta
<i>Apatema</i>	<i>coarctella</i>	CILEP156-19	0157PF	Spain	Canary Islands	Gran Canaria	Pie de la Cuesta
<i>Apatema</i>	<i>coarctella</i>	CILEP194-19	0195PF	Spain	Canary Islands	Tenerife	Armeñime
<i>Apatema</i>	<i>coarctella</i>	CILEP195-19	0196PF	Spain	Canary Islands	Tenerife	Armeñime
<i>Apatema</i>	<i>coarctella</i>	CILEP196-19	0197PF	Spain	Canary Islands	Tenerife	Armeñime
<i>Apatema</i>	<i>coarctella</i>	CILEP197-19	0198PF	Spain	Canary Islands	Fuerteventura	Caldereta
<i>Apatema</i>	<i>coarctella</i>	CILEP198-19	0199PF	Spain	Canary Islands	Fuerteventura	Caldereta
<i>Apatema</i>	<i>coarctella</i>	CILEP199-19	0200PF	Spain	Canary Islands	Fuerteventura	Caldereta
<i>Apatema</i>	<i>coarctella</i>	CILEP202-19	0203PF	Spain	Canary Islands	La Palma	Los Cancajos

<i>Apatema</i>	<i>coarctella</i>	CILEP203-19	0204PF	Spain	Canary Islands	La Palma	Los Cancajos
<i>Apatema</i>	<i>coarctella</i>	CILEP207-19	0208PF	Spain	Canary Islands	Tenerife	El Médano
<i>Apatema</i>	<i>coarctella</i>	CILEP211-19	0212PF	Spain	Canary Islands	Tenerife	Erjos
<i>Apatema</i>	<i>coarctella</i>	CILEP606-20	0607PF	Spain	Canary Islands	Lanzarote	Puerto del Carmen
<i>Apatema</i>	<i>coarctella</i>	CILEP607-20	0608PF	Spain	Canary Islands	Lanzarote	Puerto del Carmen
<i>Apatema</i>	<i>junnilaineni</i>	CILEP114-19	0115PF	Spain	Canary Islands	Gran Canaria	Pie de la Cuesta
<i>Apatema</i>	<i>junnilaineni</i>	CILEP115-19	0116PF	Spain	Canary Islands	Gran Canaria	Pie de la Cuesta
<i>Apatema</i>	<i>pseudolucidum</i>	CILEP116-19	0117PF	Spain	Canary Islands	Gran Canaria	Los Tilos de Moya
<i>Apatema</i>	<i>griseum</i>	CILEP111-19	0112PF	Spain	Canary Islands	Gran Canaria	Pie de la Cuesta
<i>Apatema</i>	<i>griseum</i>	CILEP112-19	0113PF	Spain	Canary Islands	Gran Canaria	Pie de la Cuesta
<i>Apatema</i>	<i>griseum</i>	CILEP113-19	0114PF	Spain	Canary Islands	Gran Canaria	Pie de la Cuesta
<i>Apatema</i>	<i>lucidum</i>	CILEP127-19	0128PF	Spain	Canary Islands	Tenerife	Taicho
<i>Apatema</i>	<i>lucidum</i>	CILEP204-19	0205PF	Spain	Canary Islands	Tenerife	Aguamansa
<i>Apatema</i>	<i>lucidum</i>	CILEP205-19	0206PF	Spain	Canary Islands	Tenerife	Aguamansa
<i>Apatema</i>	<i>lucidum</i>	CILEP206-19	0207PF	Spain	Canary Islands	Tenerife	Aguamansa
<i>Apatema</i>	<i>grancanariae</i>	CILEP121-19	0122PF	Spain	Canary Islands	Gran Canaria	Ayacata
<i>Apatema</i>	<i>grancanariae</i>	CILEP123-19	0124PF	Spain	Canary Islands	Gran Canaria	Pie de la Cuesta
<i>Apatema</i>	<i>grancanariae</i>	CILEP124-19	0125PF	Spain	Canary Islands	Gran Canaria	Ayacata
<i>Apatema</i>	<i>grancanariae</i>	CILEP126-19	0127PF	Spain	Canary Islands	Gran Canaria	Ayacata
<i>Apatema</i>	<i>grancanariae</i>	CILEP191-19	0192PF	Spain	Canary Islands	Gran Canaria	Pie de la Cuesta
<i>Apatema</i>	<i>grancanariae</i>	CILEP192-19	0193PF	Spain	Canary Islands	Gran Canaria	Guayadeque
<i>Apatema</i>	<i>brunneum</i>	CILEP315-19	0316PF	Spain	Canary Islands	Tenerife	Aguamansa
<i>Apatema</i>	<i>brunneum</i>	CILEP316-19	0317PF	Spain	Canary Islands	Tenerife	Aguamansa
<i>Apatema</i>	<i>brunneum</i>	CILEP317-19	0318PF	Spain	Canary Islands	Tenerife	Aguamansa
<i>Apatema</i>	<i>brunneum</i>	CILEP318-19	0319PF	Spain	Canary Islands	Tenerife	Las Mercedes
<i>Apatema</i>	<i>transversum</i>	CILEP016-19	0016PF	Spain	Canary Islands	Gran Canaria	Barranquillo Andrés
<i>Apatema</i>	<i>transversum</i>	CILEP017-19	0017PF	Spain	Canary Islands	Gran Canaria	Pie de la Cuesta
<i>Apatema</i>	<i>transversum</i>	CILEP018-19	0018PF	Spain	Canary Islands	Gran Canaria	Barranquillo Andrés
<i>Apatema</i>	<i>transversum</i>	CILEP117-19	0118PF	Spain	Canary Islands	Tenerife	Arona
<i>Apatema</i>	<i>stadeli</i>	CILEP012-19	0012PF	Spain	Canary Islands	Tenerife	Arona
<i>Apatema</i>	<i>stadeli</i>	CILEP208-19	0209PF	Spain	Canary Islands	Tenerife	Arona
<i>Apatema</i>	<i>stadeli</i>	CILEP209-19	0210PF	Spain	Canary Islands	Tenerife	Arona
<i>Apatema</i>	<i>stadeli</i>	CILEP210-19	0211PF	Spain	Canary Islands	Tenerife	Arona
<i>Apatema</i>	<i>skulei</i>	CILEP666-20	0667PF	Spain	Canary Islands	Gran Canaria	Carretería

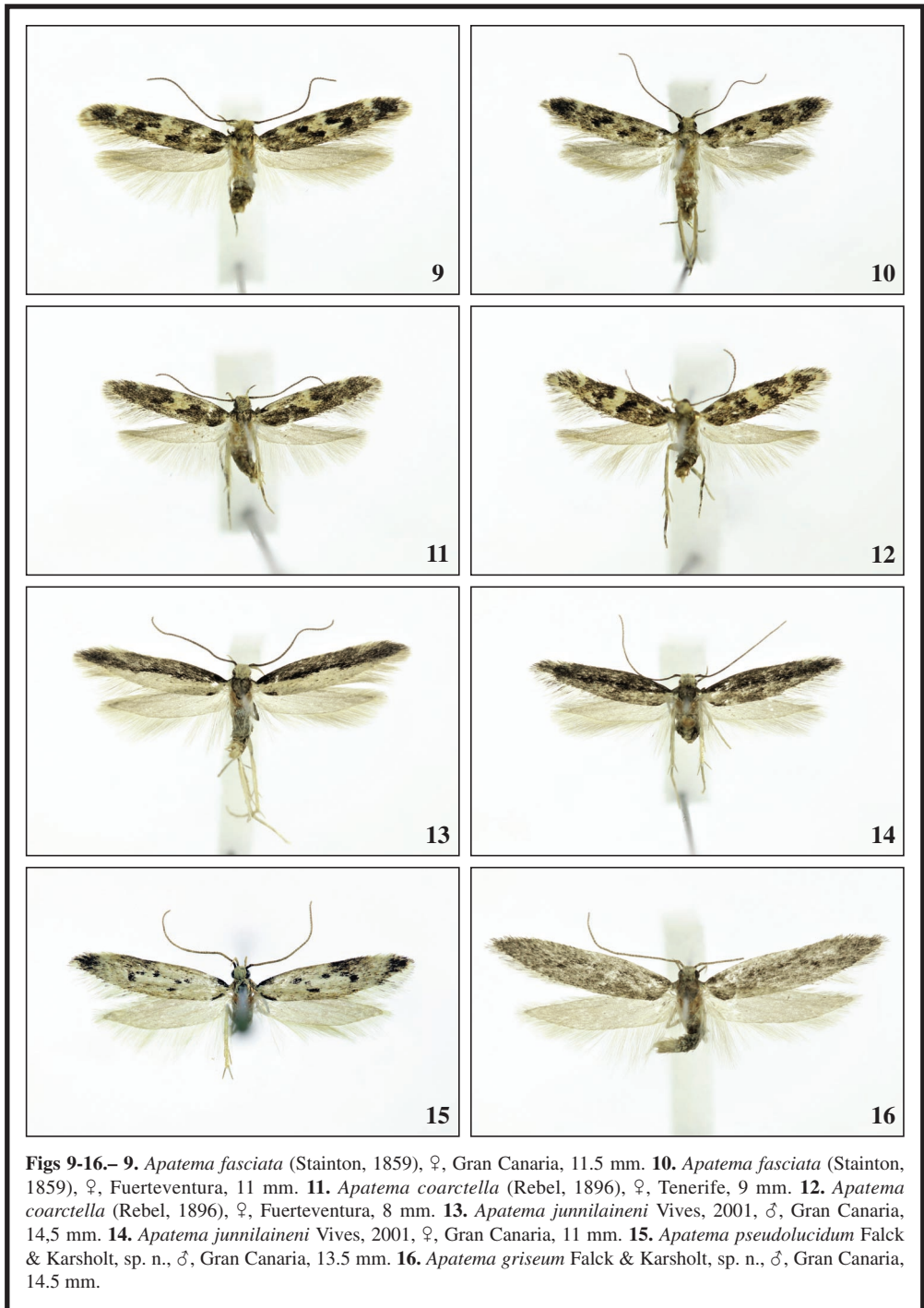
<i>Apatema</i>	<i>skulei</i>	CILEP667-20	0668PF	Spain	Canary Islands	Gran Canaria	Carretería
<i>Apatema</i>	<i>skulei</i>	CILEP668-20	0669PF	Spain	Canary Islands	Gran Canaria	Carretería
<i>Apatema</i>	<i>skulei</i>	CILEP669-20	0670PF	Spain	Canary Islands	Gran Canaria	Carretería
<i>Apatema</i>	<i>skulei</i>	CILEP670-20	0671PF	Spain	Canary Islands	Gran Canaria	Carretería
<i>Apatema</i>	<i>skulei</i>	CILEP671-20	0672PF	Spain	Canary Islands	Gran Canaria	Carretería
<i>Apatema</i>	<i>skulei</i>	CILEP672-20	0673PF	Spain	Canary Islands	Gran Canaria	Carretería

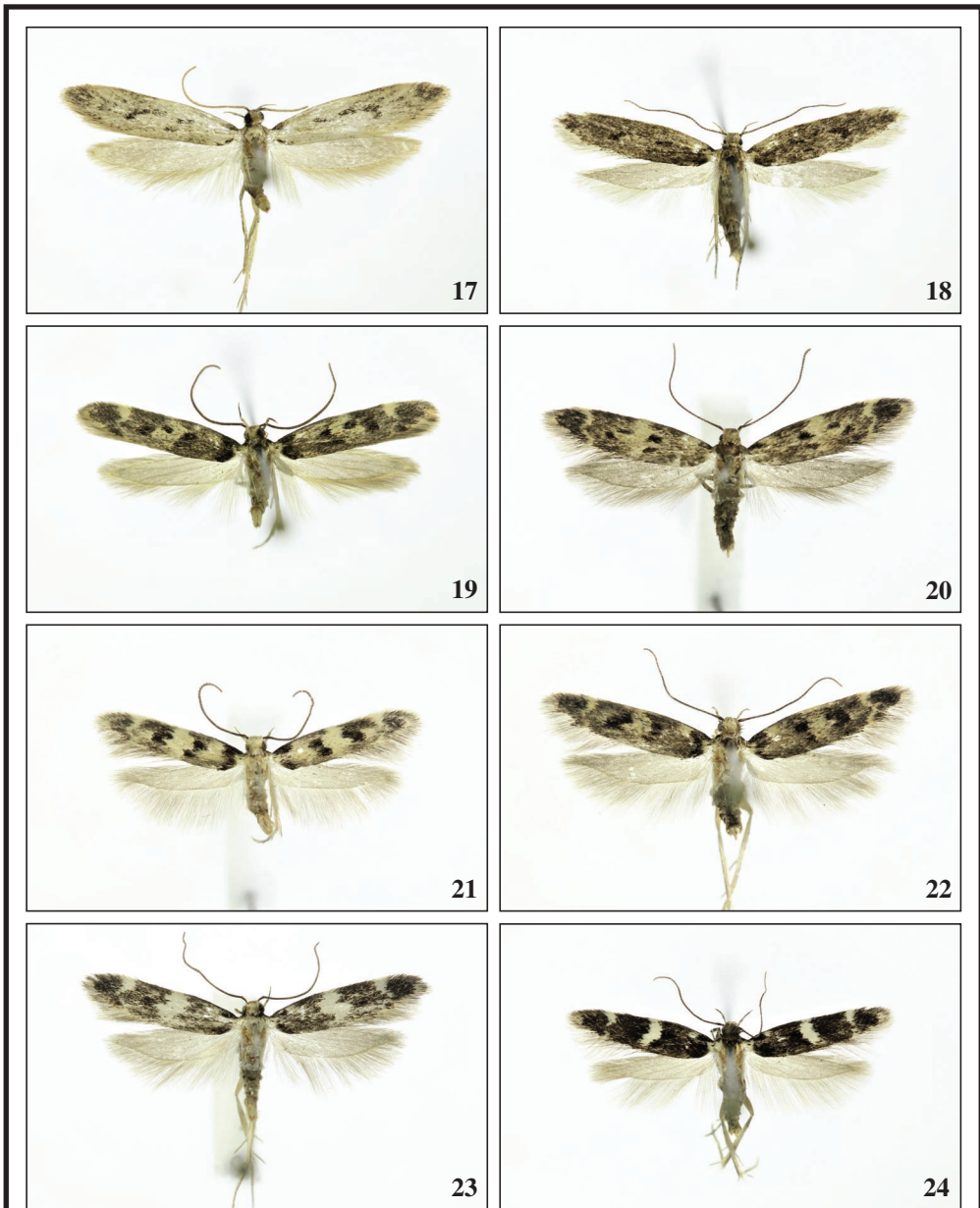
Table 2.— Average uncorrected p distance within and between all species of *Apatema* in the Canary Islands as described in the text.

	<i>fasciata</i>	<i>sallyae</i>	<i>mixtum</i>	<i>lucidum</i>	<i>lapalmae</i>	<i>helleri</i>	<i>conflue.</i>	<i>jumi.</i>	<i>brunn.</i>	<i>tranver.</i>	<i>stadei</i>	<i>griseum</i>	<i>pseudo.</i>	<i>minimum</i>	<i>granca.</i>	<i>lanzar.</i>	<i>coarc.</i>	<i>skulei</i>
<i>fasciata</i>	0.0165																	
<i>sallyae</i>	0.0960	0.0000																
<i>mixtum</i>	0.0909	0.0838	0.0010															
<i>lucidum</i>	0.0919	0.0774	0.0985	0.0031														
<i>lapalmae</i>	0.0954	0.0741	0.0676	0.0722	0.0049													
<i>helleri</i>	0.0993	0.0744	0.0894	0.0927	0.0563	0.0031												
<i>confluellum</i>	0.1207	0.0928	0.1119	0.1061	0.0971	0.0984	0.0061											
<i>jumilaineni</i>	0.0897	0.0852	0.0802	0.0738	0.0802	0.0902	0.1035	0.0019										
<i>brunneum</i>	0.0798	0.0798	0.0937	0.0600	0.0720	0.0883	0.1106	0.0784	0.0015									
<i>tranversum</i>	0.0894	0.0777	0.0714	0.0615	0.0679	0.0746	0.1138	0.0704	0.0686	0.0055								
<i>stadei</i>	0.0804	0.0830	0.0950	0.0677	0.0708	0.0816	0.1161	0.0738	0.0608	0.0456	0.0015							
<i>griseum</i>	0.0967	0.0895	0.0928	0.0612	0.0770	0.0902	0.1057	0.0671	0.0712	0.0768	0.0805	0.0000						
<i>pseudolucidum</i>	0.1108	0.0967	0.0922	0.0714	0.0793	0.0815	0.0935	0.0729	0.0846	0.0744	0.0798	0.0321	n/a					
<i>minimum</i>	0.1270	0.1208	0.1247	0.1309	0.1264	0.1316	0.0986	0.1290	0.1080	0.1307	0.1294	0.1335	0.1284	0.0317				
<i>grancanariae</i>	0.0875	0.0753	0.0992	0.0504	0.0767	0.0913	0.1078	0.0827	0.0677	0.0766	0.0695	0.0737	0.0754	0.1352	0.0233			
<i>lanzarotae</i>	0.1196	0.0867	0.1022	0.0850	0.0801	0.0982	0.1145	0.1056	0.0948	0.0946	0.0942	0.1062	0.1079	0.1316	0.0981	0.0030		
<i>coarctella</i>	0.0845	0.0762	0.0777	0.0662	0.0597	0.0728	0.1058	0.0749	0.0698	0.0653	0.0641	0.0816	0.0806	0.1255	0.0710	0.0834	0.0334	
<i>skulei</i>	0.0934	0.0741	0.0907	0.0664	0.0640	0.0801	0.0998	0.0812	0.0694	0.0456	0.0463	0.0698	0.0683	0.1324	0.0742	0.0830	0.0713	0.0042

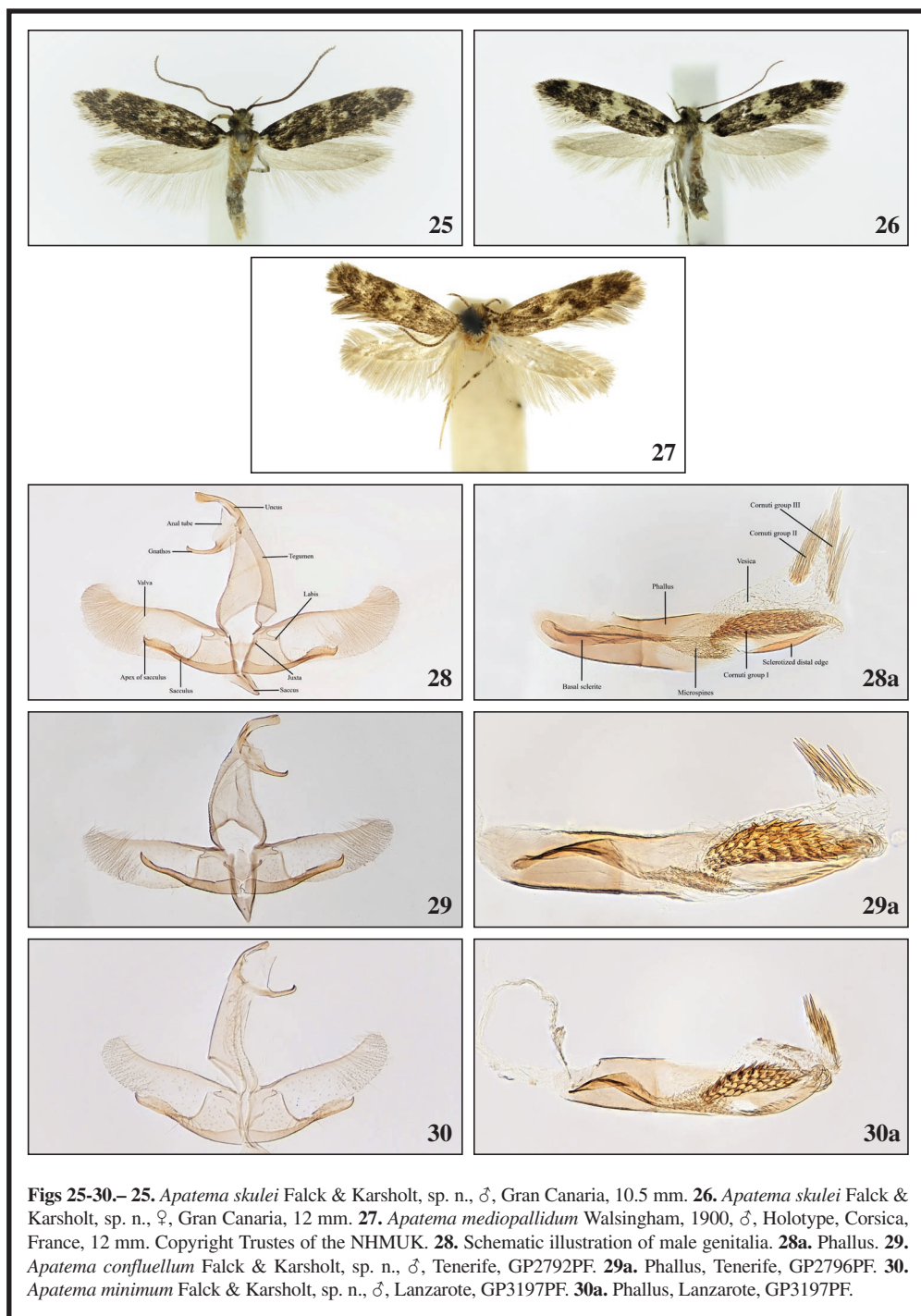


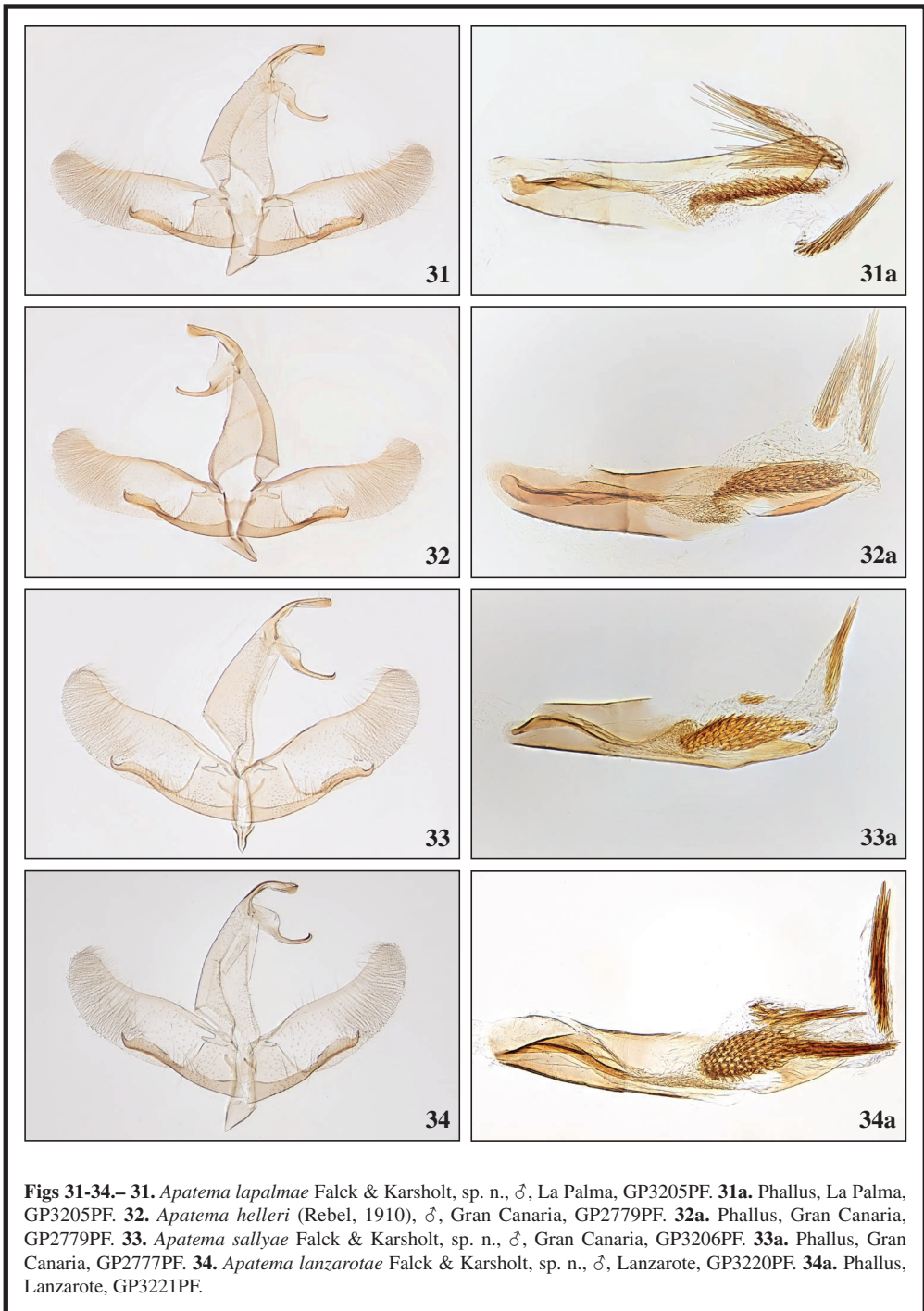
Figs 1-8.— **1.** *Apatema confluellum* Falck & Karsholt, sp. n., ♂, Tenerife, 9 mm. **2.** *Apatema minimum* Falck & Karsholt, sp. n., ♂, Lanzarote, 7 mm. **3.** *Apatema lapalmae* Falck & Karsholt, sp. n., ♀, La Palma, 14 mm. **4.** *Apatema helleri* (Rebel, 1910), ♂, Gran Canaria, 14 mm. **5.** *Apatema sallyae* Falck & Karsholt, sp. n., ♂, Gran Canaria, 12 mm. **6.** *Apatema lanzarotae* Falck & Karsholt, sp. n., ♂, Lanzarote, 11 mm. **7.** *Apatema mixtum* Falck & Karsholt, sp. n., ♂, Tenerife, 12 mm. **8.** *Apatema mixtum* Falck & Karsholt, sp. n., ♀, Tenerife, 15.5 mm.

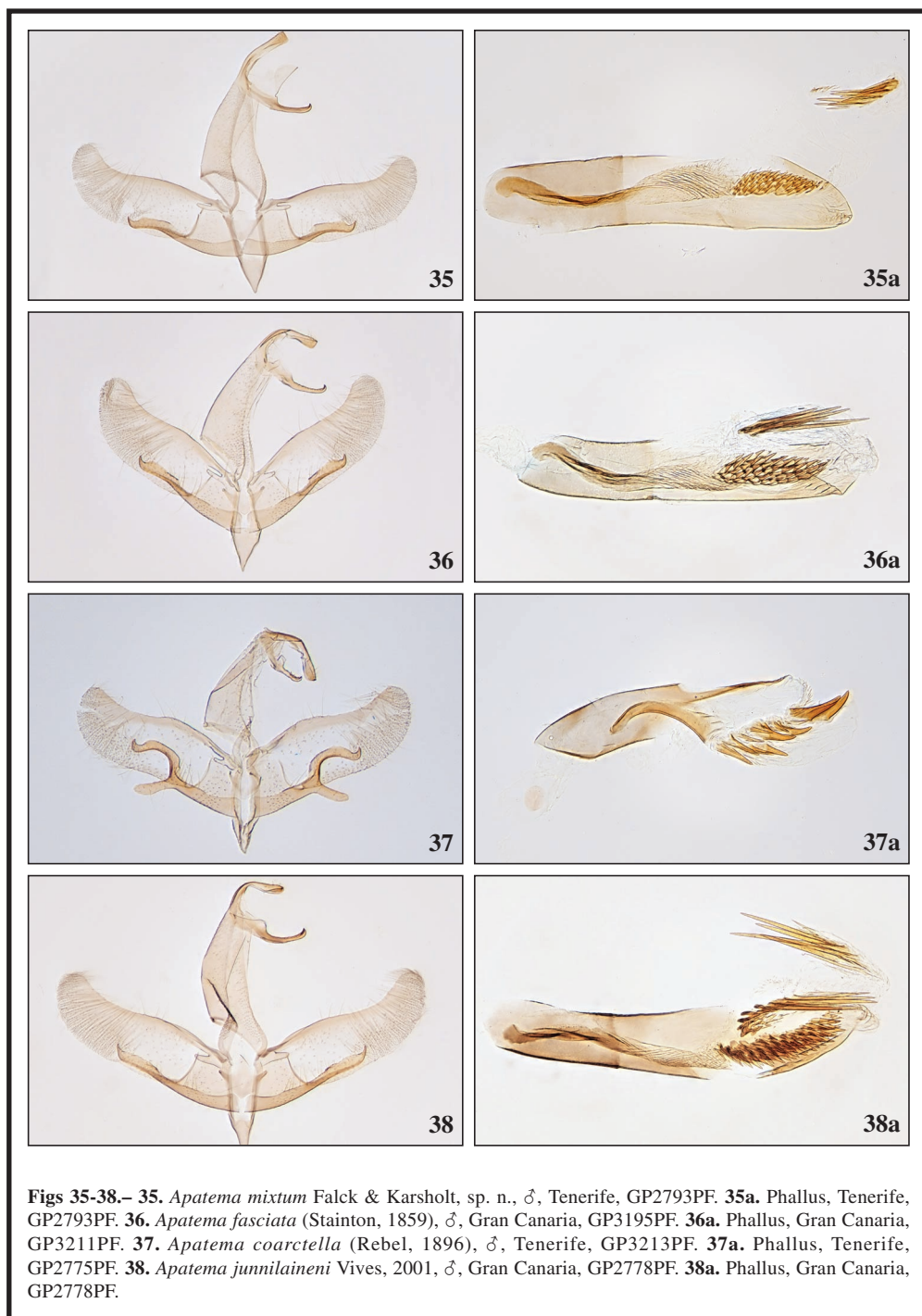


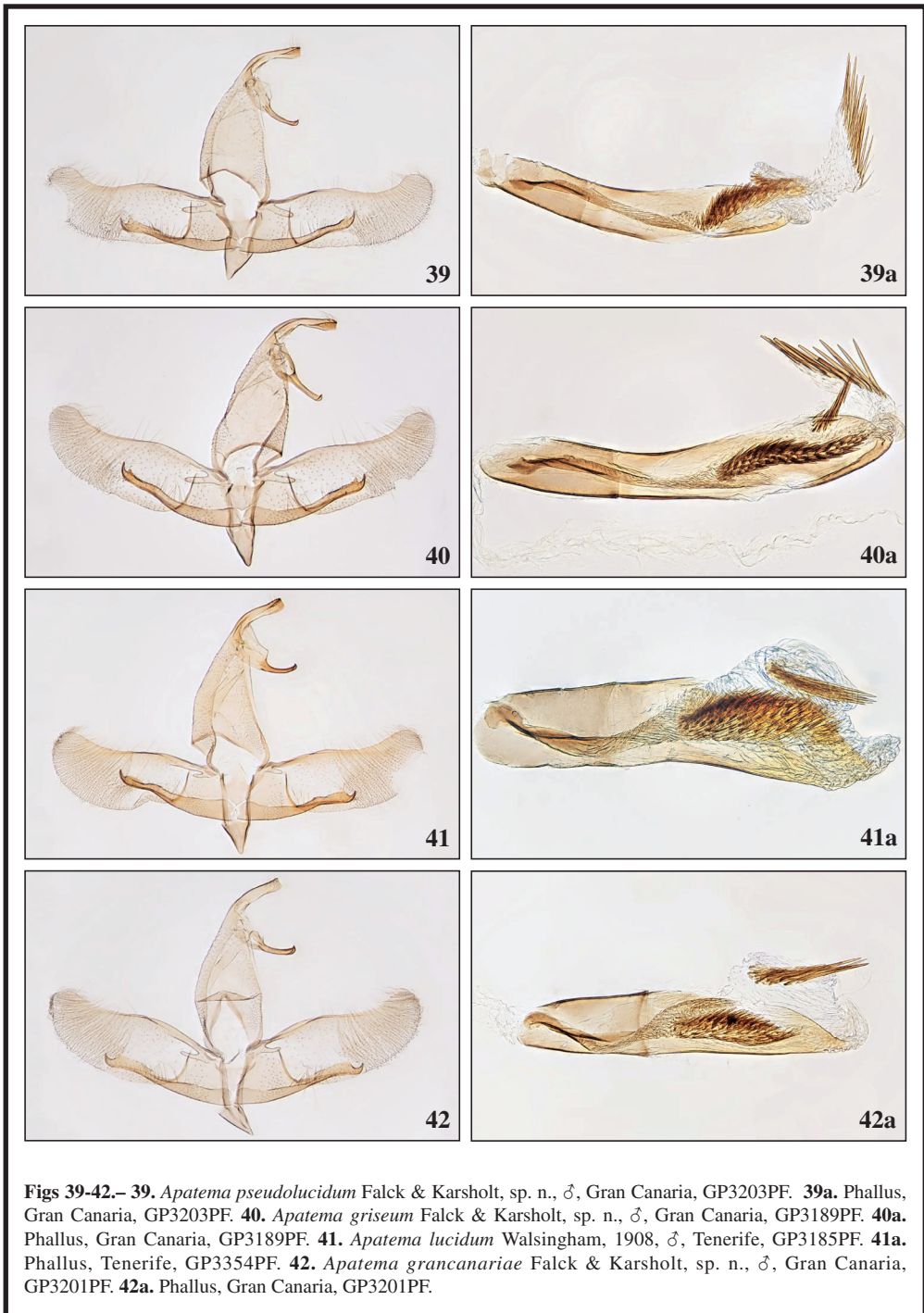


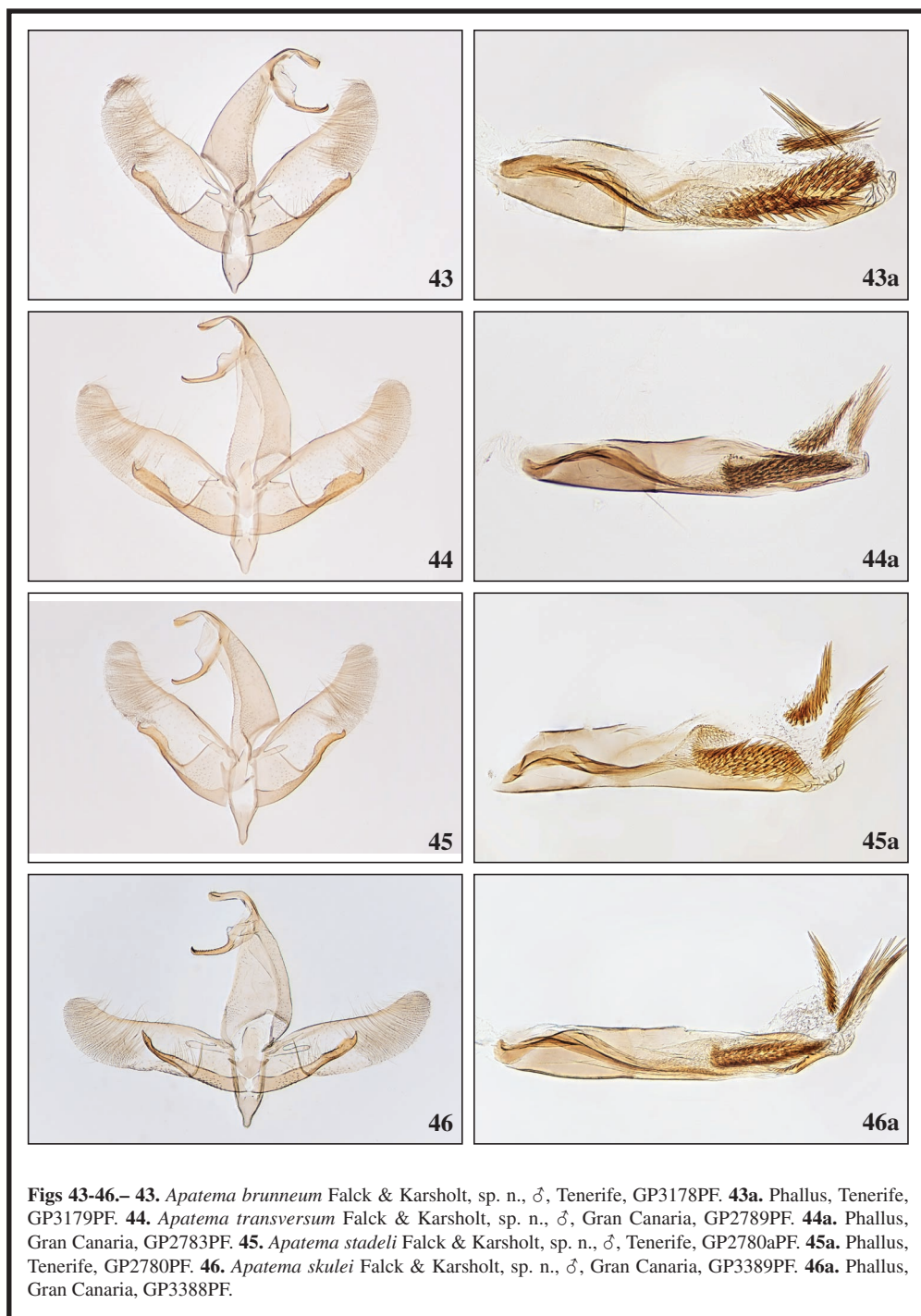
Figs 17-24.— **17.** *Apatema lucidum* Walsingham, 1908, ♂, Tenerife, 17 mm. **18.** *Apatema lucidum* Walsingham, 1908, ♀, Tenerife, 14 mm. **19.** *Apatema grancanariae* Falck & Karsholt sp. n., ♂, Gran Canaria, 15 mm. **20.** *Apatema brunneum* Falck & Karsholt, sp. n., ♀, Tenerife, 11.5 mm. **21.** *Apatema transversum* Falck & Karsholt, sp. n., ♂, Gran Canaria, 10 mm. **22.** *Apatema transversum* Falck & Karsholt, sp. n., ♀, Gran Canaria, 12 mm. **23.** *Apatema stadelii* Falck & Karsholt, sp. n., ♂, Tenerife, 12.5 mm. **24.** *Apatema stadelii* Falck & Karsholt, sp. n., ♀, Tenerife, 12 mm.

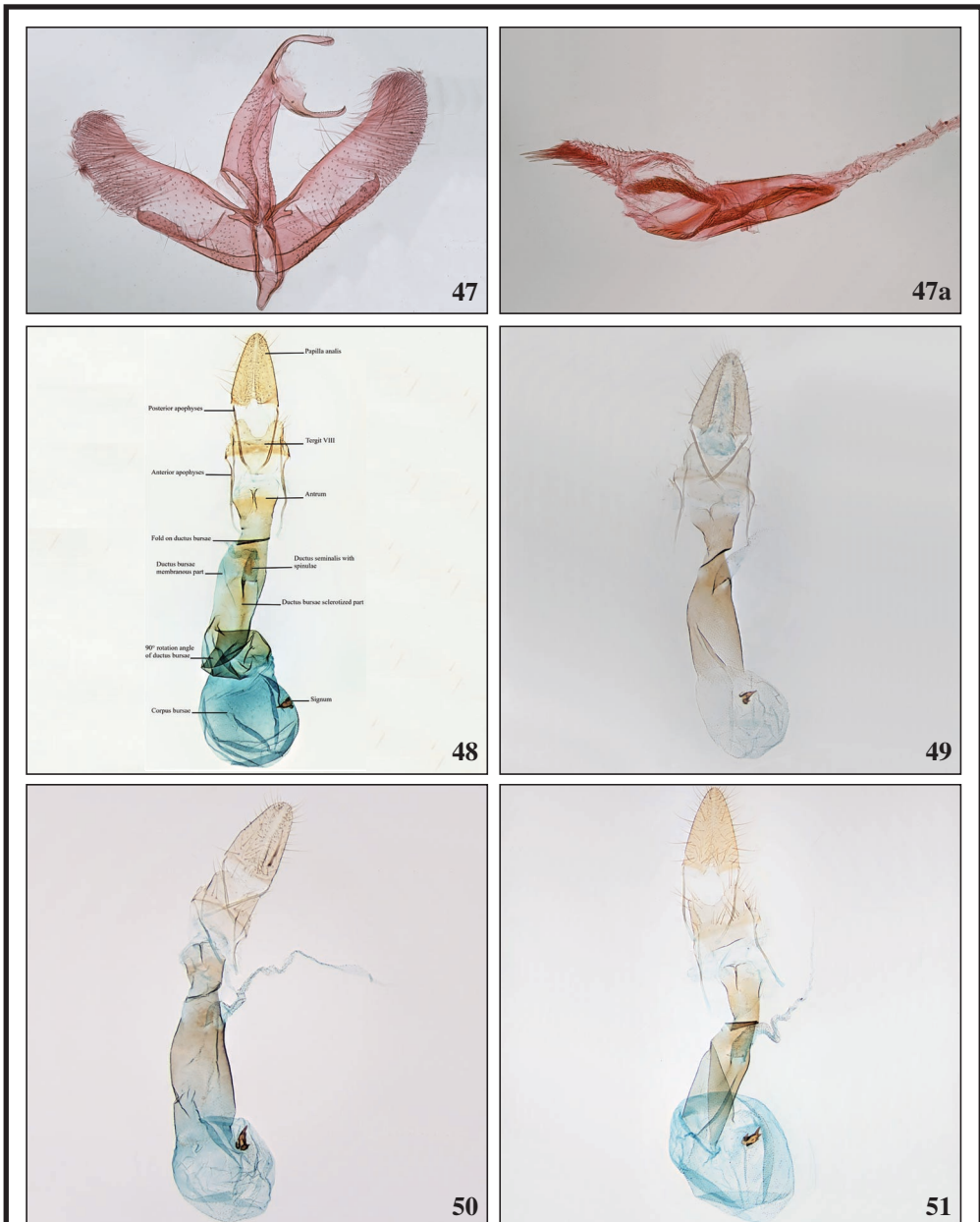




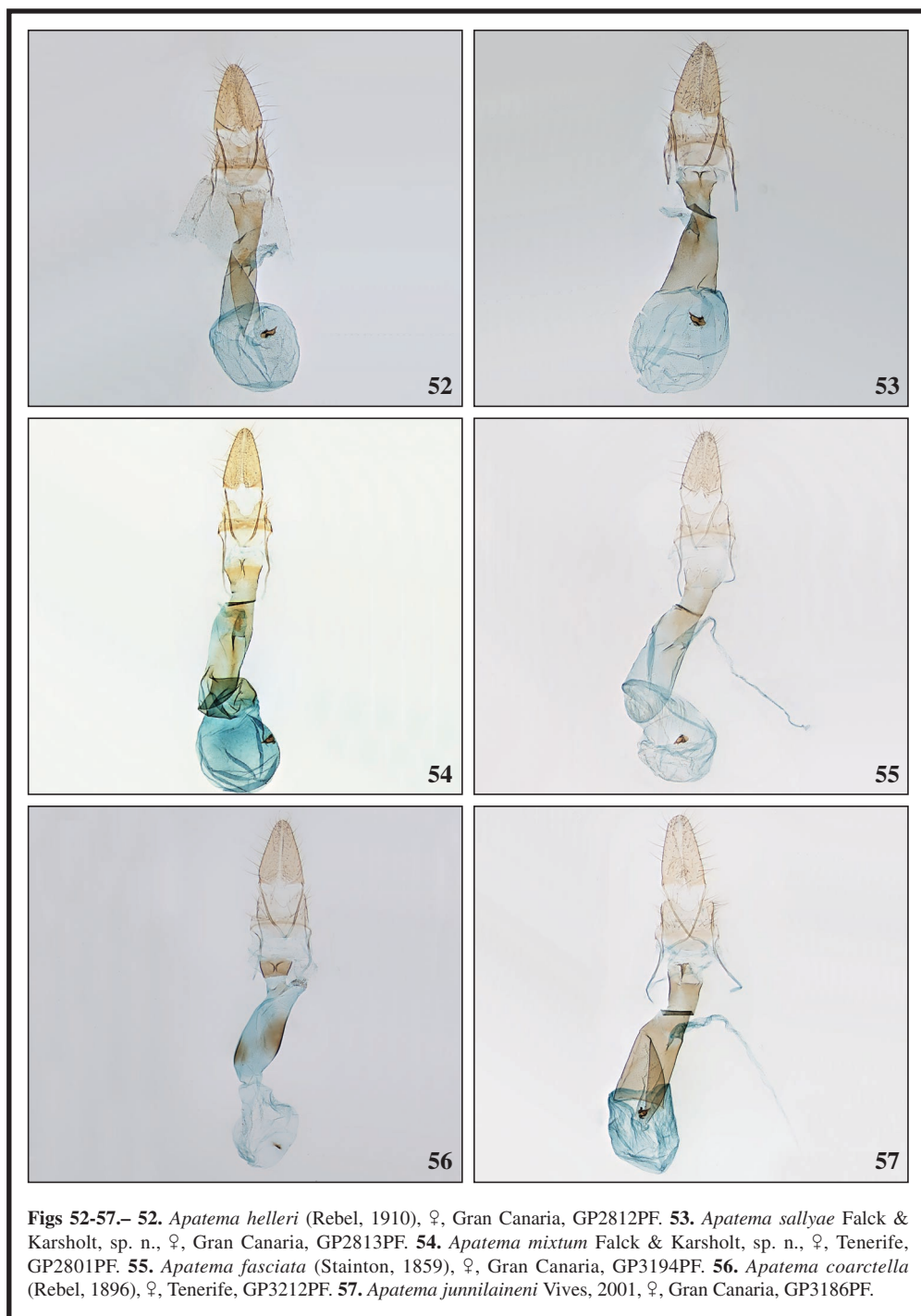








Figs 47-51.— **47.** *Apatema mediopallidum* Walsingham, 1900, ♂, Holotype, Corsica, France, no. 13944. Copyright Trustees of the NHMUK. **47a.** Phallus, Corsica, France, no. 13944. **48.** Schematic illustration of female *Apatema* genitalia. **49.** *Apatema confluellum* Falck & Karsholt, sp. n., ♀, Tenerife, GP2794PF. **50.** *Apatema minimum* Falck & Karsholt, sp. n., ♀, Lanzarote, GP3196PF. **51.** *Apatema lapalmae* Falck & Karsholt, sp. n., ♀, La Palma, GP3204PF.



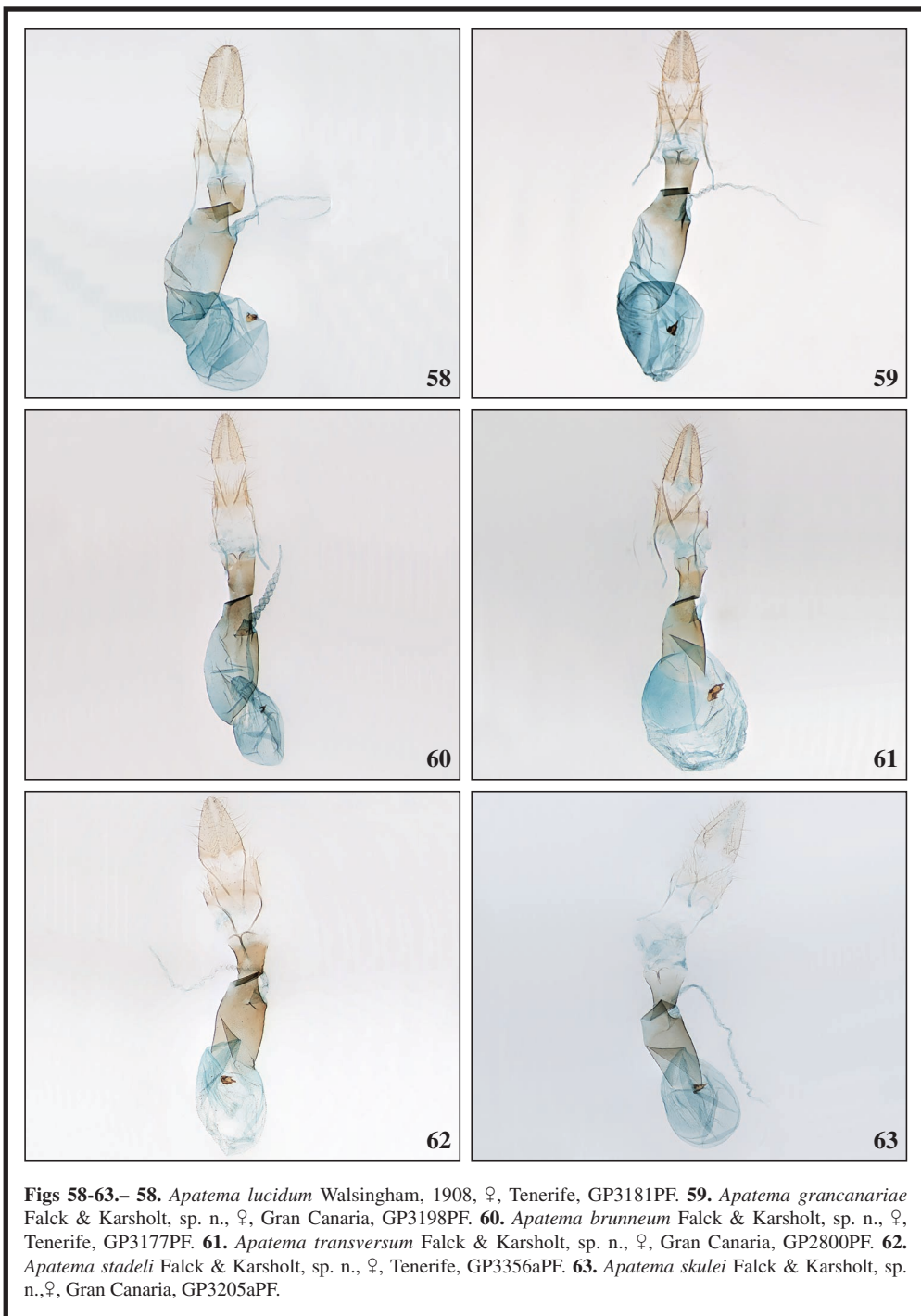




Fig. 64.– Consensus tree from the 10 million generation analysis in MrBayes with 25% burnin of the DNA-barcodes of the *Apatema* species occurring in the Canary Island. Numbers below the branches are posterior probability values.

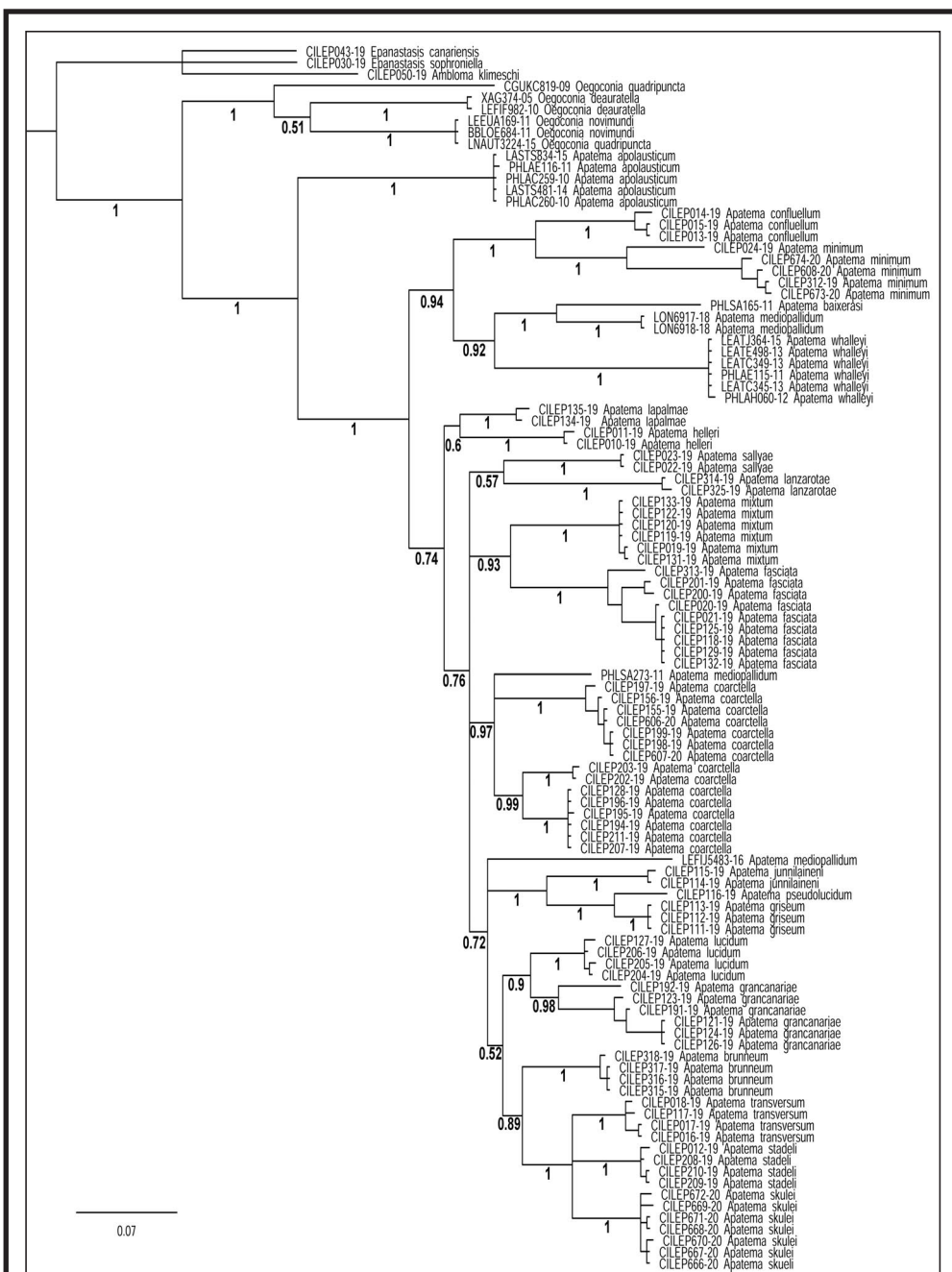


Fig. 65.– Consensus tree from the 20 million generation analysis in MrBayes with 25% burnin of all available DNA-barcodes of *Apatema* species. Numbers below the branches are posterior probability values.

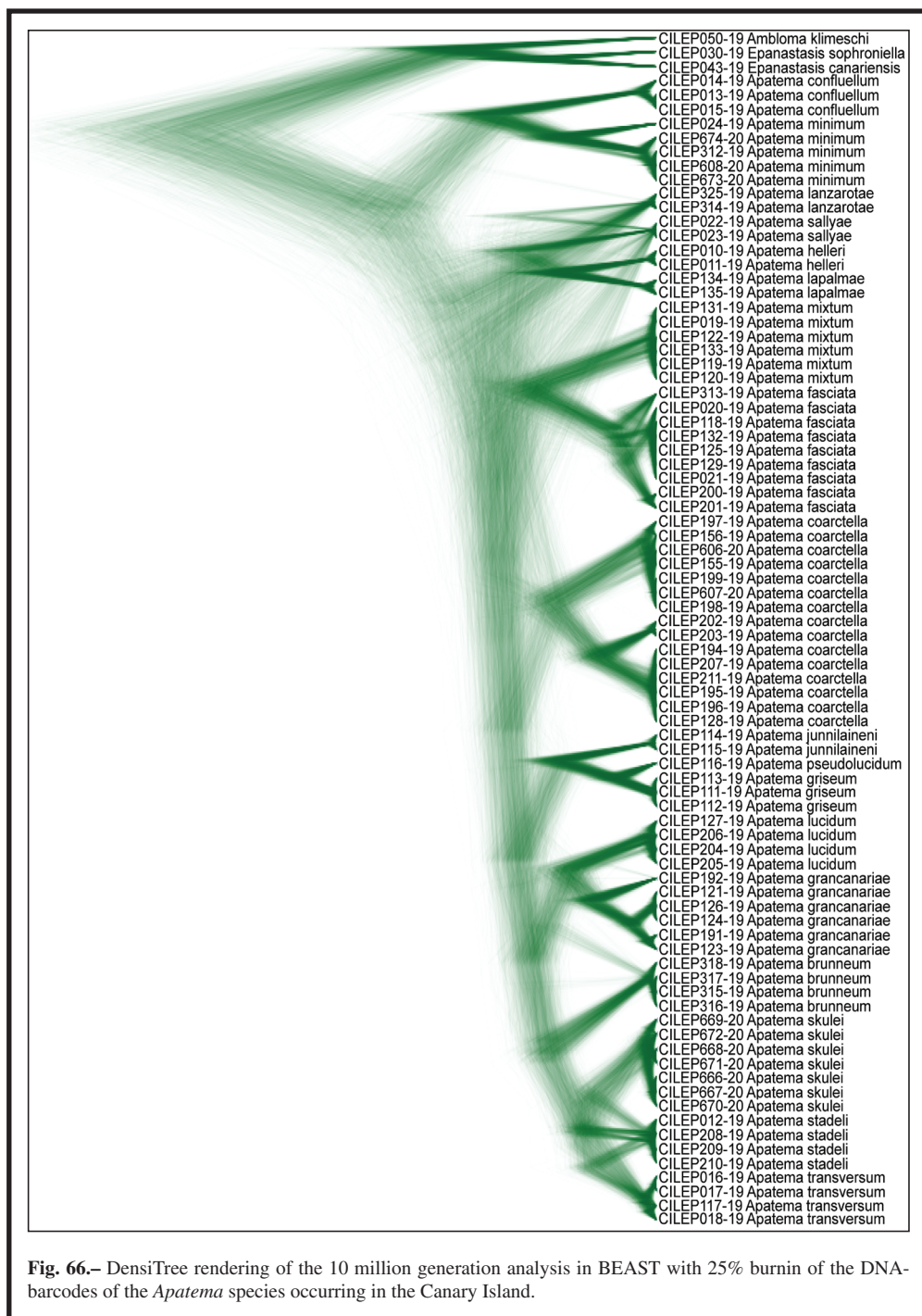


Fig. 66.– DensiTree rendering of the 10 million generation analysis in BEAST with 25% burnin of the DNA-barcodes of the *Apatema* species occurring in the Canary Island.