Preliminary studies on the genus *Apatema* Walsingham, 1900 (Autostichidae) in Portugal

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Abstract

The genus *Apatema* Walsingham, 1900 has been inadequately studied in Portugal. In addition to *A. mediopallidum* Walsingham, 1900, two other species, *A. proteroclina* (Meyrick, 1938) and *A. albifasciella* Nel, Huemer & Varenne, 2024 are present. Previously published records of *A. parodia* Gozmány, 1988 and *A. apolausticum* Gozmány, 1996 are considered to be misidentifications.
Key Words: Partial revision, *Apatema*, Portugal.

Resumo

O género *Apatema* Walsingham, 1900 tem sido pouco estudado em Portugal. Para além de *A. mediopallidum* Walsingham, 1900, estão presentes outras duas espécies: *A. proteroclina* (Meyrick, 1938) e *A. albifasciella* Nel, Huemer & Varenne, 2024. Os registos anteriormente publicados de *A. parodia* Gozmány, 1988 e *A. apolausticum* Gozmány, 1996 são atualmente considerados erros de identificação.
Palavras-chave: Revisão parcial, *Apatema*, Portugal.

Introduction

Apatema Walsingham, 1900 is a genus of microlepidoptera in family Autostichidae. The moths are essentially blackish with off white markings and a wingspan between 8 and 13 mm. In habitus they are very similar to *Oegoconia* Stainton, 1854, although usually smaller, but they show important differences in wing venation and other microscopic features (Gozmány, 2008: 52). They are distributed in warmer parts of the West Palaearctic region. Gozmány & Riedl (1996) listed just three species in Europe. Several new species were described in the following years. Gozmány (2008) included seven European species (two of these from Cyprus) and three species from the Canary Islands. Falck et al. (2021) found the genus to be species-rich in the Canary Islands, recognising 19 species. Larvae are almost unknown, but it is probable that like *Oegoconia* larvae they feed on plant detritus. Falck reared *A. lapalmae* Falk & Karsholt, 2021 from dead wood overgrown with fungi (Falck et al., 2021).

In Corley (2015) two species of *Apatema* Walsingham, 1900 were recognised as present in continental Portugal: *A. mediopallidum* Walsingham, 1900, recorded from 10 of the 11 Portuguese provinces and *A. parodia* (Gozmány, 1988) from Algarve and Trás-os-Montes. The 11th province (Ribatejo) was added for *A. mediopallidum* in Rosete et al. (2019). A third species, *A. apolausticum* Gozmány, 1996 was added from Algarve in Corley et al. (2020).

It was however already known to the author before 2015 that this treatment was unsatisfactory because external characters (head colour, thorax colour, wing markings) indicated additional species. The problem was that the treatment of *A. mediopallidum* in Gozmány's (2008) monograph on the family Symmocidae (now part of Autostichidae) was inadequate. In that work

(plate 4: fig. 8) figures of male genitalia of this species showed four clearly different examples of the aedeagus, all supposedly belonging to the same species. These figures were taken from two specimens from Morocco and one each from Croatia and Sardinia. Furthermore the colour paintings of moths (plates 114 fig. 8 and 115, figs 8a and 8b) show at least two different species under the name *mediopallidum*, probably none of them being true *mediopallidum*. These were from Spain (Almeria), Sardinia and Greece. Synonyms of *A. mediopallidum* listed by Gozmány (2008) include *Apatema bifasciatum* Chrétien, 1922 from Morocco, *Oegoconia phanerodoxa* Meyrick, 1926 from Cuenca, Spain and *O. proteroclina* Meyrick, 1938 from Lozère, France. As none of the figured aedeagi were from Corsica, the type locality of *A. mediopallidum*, it was not possible to establish which, if any, of the four figures represented the true *A. mediopallidum*.

Falck et al. (2021) in their work on *Apatema* in the Canary Islands figured male genitalia of the holotype of *A. mediopallidum*, thus providing a starting point for the unravelling of this taxonomic tangle.

Nel et al. (2024) distinguished the *Apatema* species of France and northern Italy. This has provided additional information enabling recognition of further species in the Portuguese *Apatema* fauna.

As almost all earlier Portuguese records were assigned to *A. mediopallidum*, all such records must be validated, or if this is not possible they should be disregarded. Only new and re-examined specimens can provide acceptable records. There are three species which can safely be accepted as Portuguese. The remaining taxa remain unconfirmed. In addition there are species which require further research, therefore a full revision of all Portuguese *Apatema* is not yet possible and must be delayed until such time as sufficient material has accumulated to allow clear understanding of the remaining taxa. This paper is therefore not a full revision but brings up to date what is known about the genus in Portugal.

Methods

This investigation mainly relies on examination of genitalia and external features, particularly forewing markings. Some information has also been obtained by DNA barcoding and also from the results of DNA metabarcoding.

Evaluation of characters and techniques

In the male genitalia, the majority of *Apatema* species are remarkably similar in most characters. Only the aedeagus, particularly the group of small cornuti, and the shape of the saccus provide useful distinguishing characters in most species, although the shape of the valva is occasionally important. Nel et al. (2024) also used the shape of the uncus as a distinguishing character. It is not used here because differences are small, there is variation within some species and in most genitalia preparations the uncus is seen laterally.

Separation of species based on female genitalia is difficult: characters of the ductus bursae are potentially useful but this is subject to variation within species. The signum might be expected to provide good characters, but also shows much variation within species. For these reasons identification of females is for the most part too uncertain for records to be reliable.

Rather few Portuguese *Apatema* have been DNA barcoded. Theoretically DNA barcodes should provide clear distinctions between species, but this fails if misidentified material has been included, in which case safe identification by DNA barcode is lost. This appears to have happened in some cases within *Apatema*.

DNA metabarcoding allows the identification of species from traces of DNA collected by indirect means, using DNA barcodes even when the relevant DNA has been partially fragmented. It has multiple applications. In the context of Portuguese *Apatema*, species were identified from bat droppings and to a greater extent from bulk sampling of material collected from light traps as described by Mata et al. (2021), but those results are now unconfirmed due to the problem of misidentified records in databases.

Accepted species

***Apatema mediopallidum* Walsingham, 1900**

Brief description (figs 1, 4): Wingspan 8–12 mm. Face whitish-buff, vertex blackish Thorax blackish, often partly whitish. Forewing blackish to dark grey-brown with irregularly shaped yellowish white median fascia containing a black dot adjacent to or touching outer edge of fascia, additional irregular whitish markings in basal part of wing and two spots at three-quarters wing length, all the white areas variable in shape and extent, frequently partly dusted with blackish scales.

Male genitalia (fig. 5): Saccus longer than wide, slightly tapering to rounded apex. Aedeagus with small cornuti very numerous in a long narrow band.

Female genitalia: Ductus bursae parallel-sided towards corpus bursae; base of ductus seminalis sclerotised.

Confirmed Portuguese records: **Algarve**, Loulé, Fonte de Apra, 20.x.1990, M. Corley, GP 54 male; Loulé, Boliqueime, 20.v.2009, M. Dale, GP MD01185 male; **Alto Alentejo**, Évora, Herdade da Mitra, 14.ix.2024, J. Rosete, GP JR842 male; **Estremadura**, Almada, Trafaria, 8.viii.2025, J. Fabião, GP 101-4627m; **Beira Litoral**, Condeixa-a-Nova, Casmilo, 8.ix.2006, M. Corley; Pombal, Louriçal, 11.vii.2014, J. Rosete, Corley GP4313 male; Penela, Castelo de Germanelo, 4.viii.2022, J. Rosete, GP JR345 male.

Thorax and forewing markings very variable, but the black discal dot in the median fascia appears to be a constant feature, although sometimes touching outer margin of fascia.

DNA barcoded *A. mediopallidum* is placed in BIN BOLD:AAV4815, but this BIN also includes misidentified *A. baixerasi* Vives, 2001.

The species occurs in Spain, France including Corsica, and Italy. Current evidence suggests that it can be safely identified by the dark head and thorax and the central fascia with a black dot on or near its outer margin. Such specimens are very common in Algarve. In the female genitalia the base of the ductus seminalis is sclerotised. According to Nel et al. (2024) this character is shared by *A. confusella* Nel, Huemer & Varenne, 2024, only known from the south of France and *A. apolausticum* Gozmány, 1996, now considered not to be present in Portugal, see below. While it might appear to be safe to identify females showing this character as *A. mediopallidum* there are at least two other species present in Portugal with females not known.

***Apatema albifasciella* Nel, Huemer & Varenne, 2024**

Brief description (figs 2, 4): Wingspan 12–12.5 mm. Head with frons pale cream, vertex white, collar blackish. Thorax white, narrowly edged blackish anteriorly. Forewing white with blackish markings: a basal fascia, a pair of large spots, sometimes joined, at two-fifths, the dorsal beyond the costal, an irregularly shaped broad fascia at three-fifths, sometimes interrupted in middle, whole of terminal area; fringes light grey.

Male genitalia (fig. 6): Saccus an equilateral triangle with rounded apex; aedeagus with small cornuti rather few, up to about 20, forming an oval or elliptic group.

Female apparently unknown (Nel et al., 2024).

Algarve, Olhão, Serra de Monte Figo, 19.v.2002, M. Corley, GP 1715 male. Two specimens in Corley collection. This record was published as *A. apolausticum* in Corley et al. (2020).

DNA barcoded *A. albifasciella* is placed in BIN BOLD:AAV7598 (Nel et al., 2024).

According to Nel et al. (2024) the species occurs in France, Spain and Italy. The location of the only Portuguese record is a steep south-facing limestone slope.

The habitus of *albifasciella* is quite different from other *Apatema* species with nearly 50% of the forewing white. Male genitalia similar to *A. apolausticum*, but saccus broader. This specimen was recorded as *apolausticum* in Corley et al. (2020) based on the aedeagus characters. At the time *albifasciella* was still undescribed.

***Apatema proteroclina* (Meyrick, 1939)**

Brief description (figs 3, 4): Wingspan 8–13 mm. Head with frons whitish, vertex blackish. Thorax whitish posteriorly. Forewings blackish with whitish markings: a small spot near base, a fascia in middle, not always reaching dorsum and a pair of small marks at three-quarters, the costal larger than the dorsal.

Male genitalia (fig. 7): Saccus from broad base abruptly narrowed to almost parallel-sided apical half. Aedeagus with about 40 small cornuti (larger than in *mediopallidum*) forming an oval patch.

Female genitalia: Ductus bursae expanding towards corpus bursae; base of ductus seminalis not sclerotised. Signum usually with one or more teeth on plate, in addition to those on margins.

Portuguese records from **Estremadura**, Almada, Trafaria, 26.vii.2025, J. Fabião, GP 101-4358m; Marinha Grande, Praia do Samouco, 16.vii.2021, J. Rosete, GP JR165 male; **Beira Litoral**, Pombal, Carriço, Lagoa de São José, 13.vii.2024, J. Rosete, GP JR789 male; **Beira Alta**, Castro Daire, Picão, 1.viii.2020, J. Nunes, Corley GP 6004 male; Praia fluvial de São Roque, Castelo Bom, 16.vii.2023, Rosete GP JR592; **Douro Litoral**, Santo Tirso, Monte Córdova, Valinhas, 28.vii.2006, M. Corley, GP 2600 male; **Minho**, Melgaço, Castro Laboreiro, Podre, 26.vii.2011, M. Corley, GP 3617 male; **Trás-os-Montes**, Alijó, Rio Tinhela, Alto do Coro do Carlão, 13.vii.2023, M. Corley, GP 6117 male. This list of records is incomplete as there are many records from Beira Litoral and Douro Litoral.

The species occurs in Spain, France including Corsica, Italy including Sardinia, Malta (Nel et al., 2024).

DNA barcoded *A. proteroclina* is placed in BIN BOLD:AAP6345.

Apatema proteroclina is clearly distinct in habitus from *A. mediopallidum* and *A. albifasciella* but it is probably not so clearly distinct from the unresolved taxa discussed below.

Excluded species

Based on current knowledge, the two following species have been recorded erroneously from Portugal and must be removed from the Portuguese list. The third species has been mistakenly recorded from Portugal by means of DNA barcodes, but never overtly published.

Apatema apolausticum Gozmány, 1996

The species occurs in France, Italy, Austria, Slovakia and Greece. (Nel et al., 2024). The Algarve record, published as new for the Iberian Peninsula in Corley et al. (2020) has proved to be *A. albifasciella*, see below.

DNA metabarcoding results from bulk sampling of moths collected with light traps in the Tua valley, Trás-os-Montes (Mata et al., 2021), produced records believed to belong to *A. apolausticum* from Trás-os-Montes. In BOLD *apolausticum* is included in BIN BOLD:AAP6345 together with *proteroclina*, while BIN BOLD:ABW5923 also contains *apolausticum*. At that time *proteroclina* was entirely overlooked, presumably because of the synonymy provided by Gozmány (2008). It is clear from Nel et al. (2024) that *apolausticum* does not belong in the same BIN as *proteroclina*.

Apatema parodia (Gozmány, 1988)

Gozmány (1988) described this species from Morocco (type locality) and Spain. He assured me (pers. comm.) that it belonged in *Oegoconia*, which does have a number of differences from *Apatema*, most notably in the wing venation. He gives a wingspan of 15 mm, significantly larger than any Portuguese *Apatema* specimens. Later Sutter (2007) transferred it to *Apatema*. Males are unknown. It was included in the Portuguese list (Corley, 2015) based on records from Algarve and Trás-os-Montes. In Annotation 15 it was suggested that it might be parthenogenetic or perhaps the female of some species for which only males were known.

The characteristic oblique fold of the ductus bursae occasionally occurs to some extent in some other *Apatemas*. I am increasingly sceptical about the status of this species and suspect that it is a variation that appears from time to time in various species, possibly even a preparation artifact. This would explain the absence of males. However, one Algarve specimen has been DNA barcoded (Ludo, 6.v.1995, M. Corley. GP1504 female). It is placed in BOLD BIN AAU3743 with three unnamed specimens from Spain with 2.3% divergence. Until there is greater clarity, *A. parodia* should not be considered to be part of the Portuguese fauna. This idea does not affect Gozmány's original *Oegoconia parodia*, which would merit further investigation, although that was also described from females only.

Apatema baixerasi Vives, 2001

Brief description based on Vives (2001): head whitish yellow. Thorax blackish. Forewing with irregularly shaped yellowish white median fascia containing a black dot on outer margin, another whitish yellow fascia at three-quarters.

Male genitalia distinguished by valva with a protrusion towards middle of costal margin, and with ventral margin curving round at apex meeting costal margin in a point. Saccus triangular, longer than wide. Aedeagus rather short, with a field of about 40 small cornuti.

Female genitalia: from original drawing ductus slightly expanding towards corpus bursae but without obvious distinguishing features. The description mentions little tooth-like structures on corpus bursae and adjacent part of ductus.

Elsewhere recorded from Spain (Valencia). Nel et al. (2024) mention records from Corsica and Malta based solely on DNA barcodes, but they refer these to *A. mediopallidum*. In their view the species is endemic to Spain.

Although this species has been identified as present in Portugal by DNA barcode, it has not been published as present in Portugal. Putative records from Portugal include one barcoded specimen (INV07682) from **Algarve**, Aljezur, Carrapateira, 8.x.2018, M. Corley, GP 5906 female, now considered to belong to *A. mediopallidum*, and four collected in Lisbon by Malaise trap. The samples from the Malaise traps were sent to the Canadian Barcoding Centre, University of Guelph, Canada, where these four specimens were determined by barcode as *A. baixerasi*. These have now been reclassified as *Apatema* sp.

The BOLD DNA barcode BIN BOLD:AAV4815 includes specimens named as both *baixerasi* and *mediopallidum*. While this could be a case of genuine barcode-sharing, it is more probably a case of one or other species being misidentified. Here it is worth mentioning that forewing markings of these two species are similar but they differ in head colour.

This species cannot be accepted as present in Portugal on present evidence. Male genitalia of this species are very distinctive, therefore males are required for positive identification.

Unresolved taxa

There are undoubtedly more *Apatema* species present in Portugal, that do not have the characters of any of the three accepted species above. At present we are still lacking sufficient information to be able to name these with certainty, indeed it is quite possible that they are undescribed.

They include a male and female from Algarve with very reduced white forewing markings. This might possibly be *A. phanerodoxa* (Meyrick, 1926) which was described from Cuenca, Spain, but there are small differences in male genitalia and habitus from that species that may or may not be significant. A single DNA barcoded female from north-east Portugal has DNA barcode 6.5% divergent from other available DNA barcodes in the genus, but this could possibly also be *A. phanerodoxa* for which no barcode is available. This DNA barcode has also appeared in metabarcoding results from the north-east of the country (Vanessa Mata, pers. comm.) and from Spain (Jan Šumpich, pers. comm.).

In Beira Litoral three males have been found with genitalia close to *A. acutivalva* Gozmány, 2008, known only from Cyprus. It would seem improbable that these are *acutivalva*, but that should be resolved when the Portuguese material has been DNA barcoded.

Remarks

Gozmány's (2008) monograph on Symmocidae (now Autostichidae, Symmocinae) is the standard work on this group. Since its publication few new species have been added to the fauna of mainland Europe, but there are many additions of *Apatema* species from the Canary Islands

(Falck et al., 2021). However, his treatment of *Apatema* is very unsatisfactory. It is extraordinary that he illustrated four clearly different aedeagi for *A. mediopallidum*, at the same time listing four synonyms of *mediopallidum*, yet apparently did not investigate the possibility that some of the synonyms might represent good species.

Conclusions

This preliminary study of Portuguese *Apatema* brings some clarity to knowledge of the genus but still leaves much confusion. Since there are still unanswered questions a full understanding of the genus will require good specimens from many localities from which DNA barcodes and genitalia preparations should be obtained.

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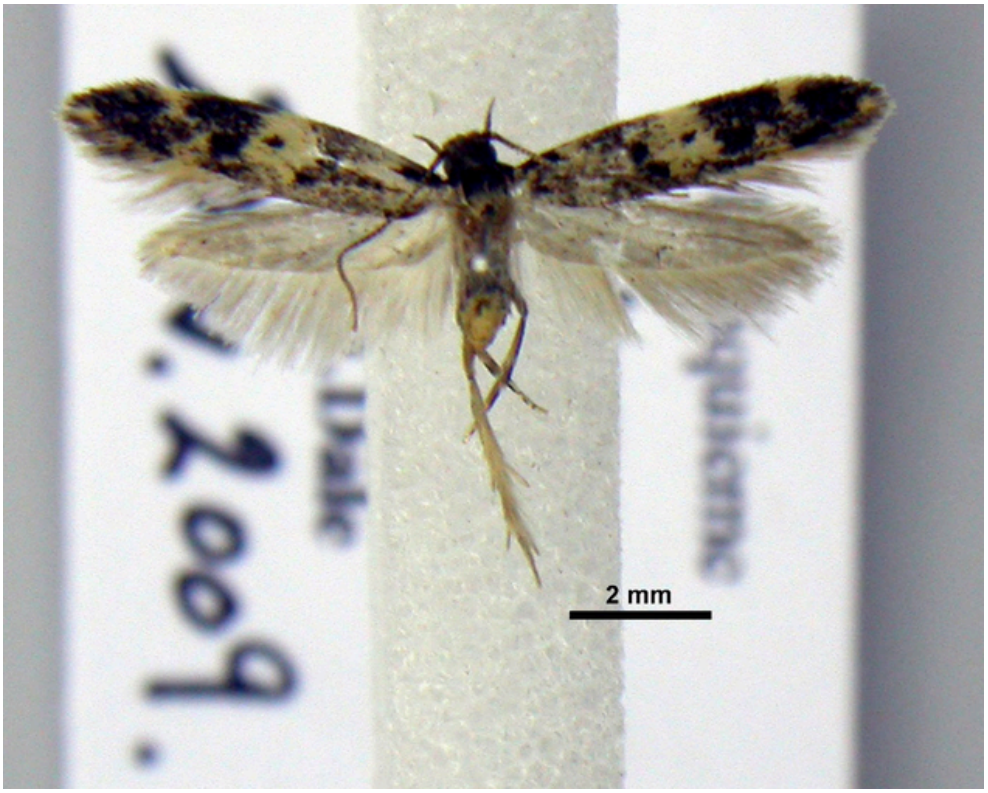

Fig. 1. *Apatema mediopallidum* (Walsingham, 1901). Algarve, Boliqueime, 20.v.2009, M. Dale.

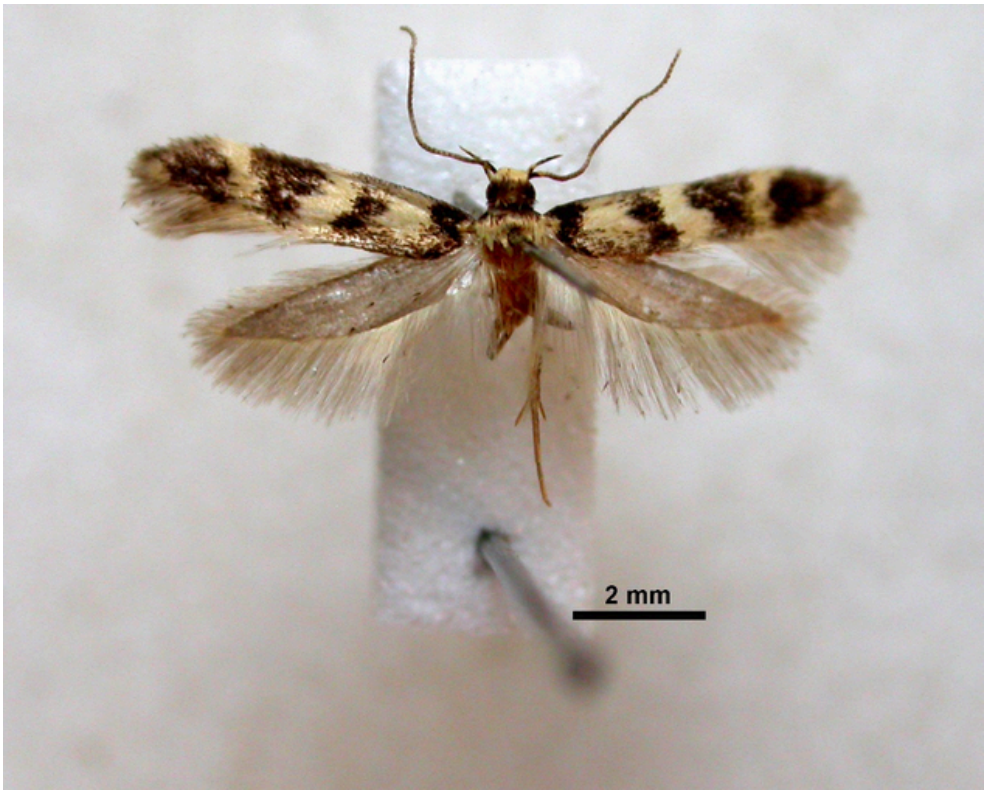

Fig. 2. *Apatema albifasciella* Nel, Huemer & Varenne, 2024. Algarve, Olhão, Serra de Monte Figo, 19.v.2002, M. Corley.

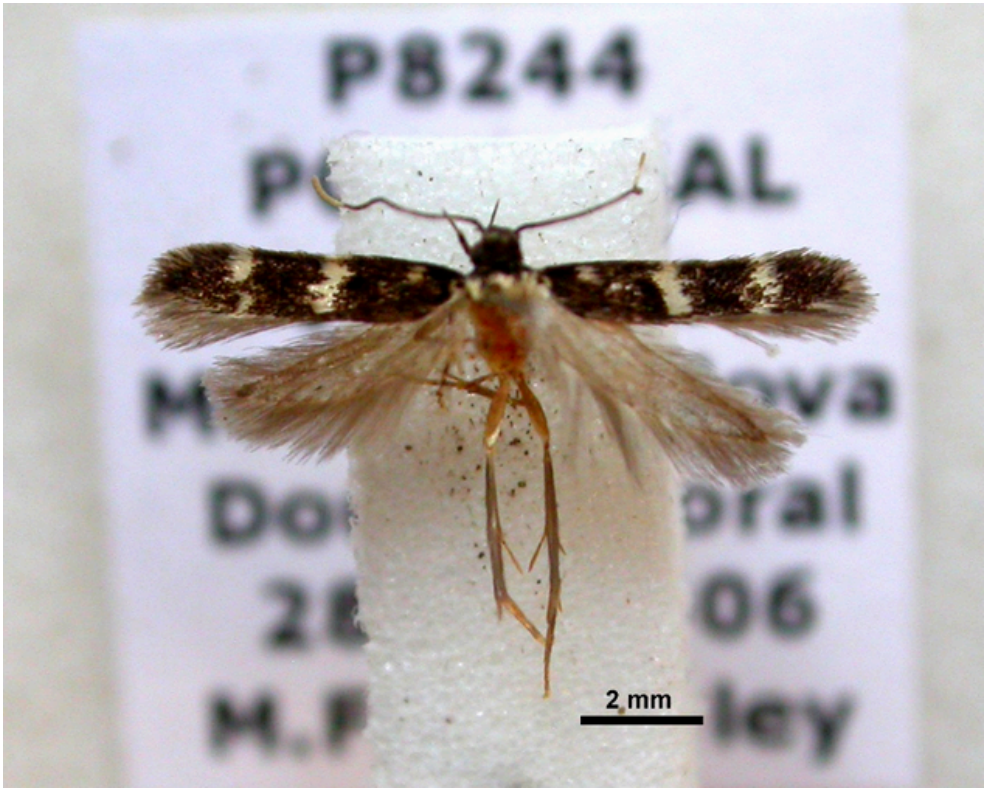

Fig. 3. *Apatema proteroclina* (Meyrick, 1939). Douro Litoral, Santo Tirso, Monte Córdova, Valinhas, 28.vii.2006, M. Corley.

Fig. 4. *Apatema* compared. Left to right: *A. mediopallidum*, *A. albifasciella*, *A. proteroclina*.

Fig. 5. *Apatema mediopallidum* (Walsingham , 1900). Male genitalia. Algarve, Boliqueime, 20.v.2009, M. Dale. MD01185.

Fig. 6. *Apatema albifasciella* Nel, Huemer & Varenne, 2024. Male genitalia. Algarve, Olhão, Serra de Monte Figo, 19.v.2002, M. Corley, GP1715.

Fig. 7. *Apatema proteroclina* (Meyrick, 1939). Male genitalia. Beira Alta, Castro Daire, Picão, 1.viii.2020, J. Nunes, Corley GP 6004.