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Contribution to the knowledge of Chilean Gelechiidae
(Lepidoptera: Gelechioidea)

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Contribution to the knowledge of Chilean Gelechiidae (Lepidoptera: Gelechioidea)

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Abstract. A synopsis of the Chilean Gelechiidae (Lepidoptera: Gelechioidea) is presented, including an annotated list of species with geographic distributions and a compilation of previous references. New distribution records for four species are provided.

Key Words. Gelechiinae, Gnorimoschemini, Gelechiini, *Apothetoeca*, Neotropical.

Resumen. Se presenta una sinopsis de los Gelechiidae de Chile (Lepidoptera: Gelechioidea), que incluye un listado, con su distribución geográfica y una recopilación de antecedentes bibliográficos previos. Se entregan nuevos registros de distribución para cuatro especies.

Palabras Clave. Gelechiinae, Gnorimoschemini, Gelechiini, *Apothetoeca*, Neotropical.

Introduction

The Gelechiidae are small moths whose larvae feed on more than 82 plant families (Hodges 1999). Several species are of economic importance and are primary pests on valuable crops, especially Solanaceae (Hayden et al. 2013). In Chile, the family was thought to be represented by a total of 16 genera and 29 species, most of which belong to subfamily Gelechiinae, with a few species in Chelariinae and Dichomeridinae (Becker 1984; Povolný 1986, 1987, 1989a, 1989b; Artigas 1994; Lee and Brown 2010; King and Viejo 2012a 2012b). Artigas (1994) treated the species of economic importance in Chile, and presented a comprehensive compilation of bibliographic references, descriptions, life cycles, and diverse biological observations. This paper is an initial contribution to the knowledge of Gelechiidae present in Chile, containing an annotated list of species with geographic distributions, along with a compilation of known records. Some previous records are here recognized as misidentifications, reducing the known gelechiid fauna of Chile to 15 genera and 26 species. New provincial distribution records are provided for four species.

Materials and Methods

The specimens examined in this study, including permanent slides, are deposited in:

MEUC: Luis Peña Entomological Museum, Department of Plant Protection, College of Agronomic Sciences, University of Chile.

Results

The following annotated list of Neotropical Gelechiidae from Chile is modified from Becker (1984) and Lee and Brown (2010). Species are listed in rough phylogenetic order, following Lee and Brown (2010) unless indicated otherwise in the annotations.

Gelechiinae: Gnorimoschemini

***Phthorimaea operculella* (Zeller).** Species distributed from Arica and Parinacota Region through the Los Lagos Region, and the Juan Fernandez and Easter Islands. Considered a primary pest of potato; more details appear in Artigas (1994).

***Tuta absoluta* (Meyrick).** Species distributed from the Arica and Parinacota Region through the Los Lagos Region, and the Juan Fernandez and Easter Islands. A widespread pest of tomato that is of great economic importance in Chile; see also Artigas (1994).

***Eurysacca chili* (Povolný).** A species described from Chile based on a single female specimen without a precise location, and doubtfully placed under genus *Scrobipalopsis*, with no further details by Povolný (1967). Later it was transferred under the genus *Eurysacca*, and the male described; in addition, it was recorded from several locations in Southern Argentina and Peru (Povolný 1986, 1994).

New distribution. Chile, with specimens identified from the Province of Curicó, Maule Region, associated with tobacco crops (*Nicotiana tabacum* L., Solanaceae).

Material examined. MEUC. 13 specimens. Rauco, Curicó, 20-Feb. 1970. Coll. T. Poch, en tabaco; Fdo. Todos los Santos, Curicó, 4 - Feb. 1970, en tabaco. Coll. R.H. González. Permanent slides n° 736 ♂ and 737 ♀.

***Eurysacca media* Povolný.** A species described from males and females distributed in several locations in Argentina; in Chile it is mentioned from the Province of the Andes, Valparaíso Region (Povolný 1986), but it is also distributed from the Coquimbo to the Metropolitan Region. It is considered a significant species on quinoa, *Chenopodium quinoa* Willd. *Chenopodium album* L. Bosc ex Moc. (Amaranthaceae) is also recorded as a host (Lambrot et al. 1999).

***Scrobipalpula atra* Povolný.** A species described from various locations in Argentina; in Chile, it is cited for the Province of Malleco, Araucanía Region (Povolný 1987).

***Scrobipalpula melanolepis* (Clarke).** Endemic species from Juan Fernandez Islands, originally described under the genus *Gnorimoschema*, based on a male and a female specimen (Clarke 1965). It was later transferred to *Scrobipalpula* by Povolný (1967).

***Scrobipalpula pallens* Povolný.** A species described from various Argentina locations; in Chile is cited by Povolný (1987) for the Province of Malleco, Araucanía Region.

***Scrobipalpula patagonica* Povolný.** Species described in Argentina by Povolný (1977) and in Chile from specimens from the Province of Talca, Maule Region (Povolný 1987).

New distribution. This species was identified from specimens collected in sex pheromone traps for *Tuta absoluta* in the Province of Santiago, Metropolitan Region.

Material examined. MEUC: 45 specimens. Antumapu, La Pintana, Región Metropolitana, 15-20 enero 1988. G. Barría, en trampas feromona tomate y papa. Permanent slides n° 738 ♂ and 748 ♀.

***Scrobipalpula transiens* Povolný.** Endemic species, described from a single male specimen from the Province of Talca, Maule Region (Povolný 1987).

***Scrobipalulopsis hemilitha* (Clarke).** An endemic species from Juan Fernandez Island described originally as *Gnorimoschema*, based on male and female specimens (Clarke 1965). Later transferred to *Scrobipalpula* by Povolný (1967), who afterwards includes it under *Scrobipalulopsis* and with a possible synonymy as *Scrobipalulopsis stirodes* (Meyrick) from Argentina (Povolný 1994)

***Scrobipalulopsis stirodes* (Meyrick)** Originally described by Meyrick (1931) from a single male specimen from the south of Argentina. Later transferred to *Scrobipalpula* by Povolný (1967). Later it was redescribed, including females, from specimens collected in several locations in Argentina by

Povolný (1987). For Chile, it was mentioned by Povolný (1987) from the Provinces of Osorno, Los Ríos Region; Talca, Maule Region; and Malleco, Araucanía Region.

***Ephysteris trinota* (Clarke).** Endemic species described originally under the genus *Echinoglossa*, from male and female specimens from Juan Fernandez Island (Clarke, 1965). Later, Povolný (1967) transferred it to the genus *Ephysteris*, and finally under *Opacopsis*, although with reservations (Povolný 1994). Due to the lack of properly assigned type material, Povolný (1994) also mentioned that it may be an introduced species. *Opacopsis* and *Echinoglossa* are currently treated as junior synonyms of *Ephysteris* (Huemer and Karsholt 2010).

***Symmetrischema nanum* Povolný.** Species described only from males, from several localities in Argentina; in Chile, it is cited for the Province of the Andes, Region of Valparaíso (Povolný, 1989a).

***Symmetrischema striatella* (Murtfeldt).** Species of Nearctic origin, the male and female genitalia were redescribed by Povolný (1967). It has been found in Argentina, and in Chile in the Province of the Andes, Region of Valparaíso (Povolný 1989a).

***Symmetrischema tangolias* (Gyen).** Originally described from Chile by Gyen (1913) under the genus *Trichotaphe* and subsequently cited as such by Becker (1984). Artigas (1994) records it as *Symmetrischema*, citing its distribution from the Arica and Parinacota to the O'Higgins Region. Finally, Hayden et al. (2013) provide several records, and notable figures of adults and genitalia. It is considered a significant pest of potato and tomato crops (Solanaceae).

***Scrobipalpomima obscuroides* Povolný.** Species originally described by Povolný (1989b) from Argentina and cited for Chile from the Province of Malleco, Araucanía Region.

***Scrobipalpomima pseudogrisescens* Povolný.** Originally described by Povolný (1985) as *S. grisescens* from several localities of Argentina, and later redefined (Povolný 1989b) as *S. pseudogrisescens* and quoted for Chile in the Provinces of Osorno and Valdivia, Los Lagos Region.

New distribution. A specimen collected in shrub and sclerophyll forest areas in the Province of Maipo, central Chile.

Material examined. MEUC: 1 specimen. El Escorial, Provincia de Maipo, Región Metropolitana, CHILE, 25 diciembre 2015 Coll. D.E. Cepeda. Permanent slide n° 747 ♂

***Tecia venosa* (Butler).** Originally described under the genus *Topeutis* by Butler (1883) from Valparaíso, Chile. Meyrick (1914) transferred this species to Oecophoridae under the genus *Orsotricha*. Clarke (1963, 1964) presented figures of female and male genitalia, and transferred *Orsotricha* to Gelechiidae. Becker (1984) cited the same name but in Dichomeridinae. Hodges and Becker (1990) transferred *Orsotricha* as synonyms under genus *Tecia*, and proposed other nomenclatural changes in the genus. However, Povolný (1994, 2002) considered the genus to belong to the tribe Gnorimoschemini, an opinion not shared by Lee and Brown (2010), who treat the genus under Dichomeridinae. In this paper, I follow the taxonomy of Povolný (1994).

***Keiferia dalibori* King and Viejo.** Endemic species, described from males collected in association with *Echium* (Boraginaceae) and *Rumex* (Polygonaceae) ecosystems distributed in the Province of Concepción, Biobío Region (King and Viejo 2012b).

Gelechiinae: Gelechiini

***Chionodes icriodes* (Meyrick).** Endemic species described originally by Meyrick (1931) as *Gelechia*, based on male specimens, from the Province of Llanquihue, Los Lagos Region. Clarke (1953, 1969) transferred it to *Chionodes* and presented a figure of the female genitalia. Cited later by Becker (1984).

***Chionodes meridiochilensis* King and Viejo.** Endemic species described from specimens reared from *Muehlenbeckia hastulata* I.M. Johnst. (Polygonaceae) distributed in the Province of Concepción, Biobío Region. King and Viejo (2012a) also described the last instar larva and provided records of its bionomics on its host.

***Apothetoeca synaphrista* Meyrick.** Endemic genus and species, described by Meyrick (1922) from the Juan Fernandez Islands. Later, Clarke (1965) redescribed the adult and figured the male genitalia. Quoted by Becker (1984) and Lee and Brown (2010) under Dichomeridinae. However, Clarke (1965) says that male genitalia are generally similar to the genus *Gelechia*. Based on Clarke's comment, this paper considers including this species in Gelechiini.

New distribution. This species is reported for the first time for continental Chile; two specimens collected with ultraviolet light trap in the Province of Maipo, Metropolitan Region. Identification was verified by comparison with photographs of adults and male genitalia, from the holotype deposited at the Swedish Museum of Natural History, Stockholm, Sweden.

Material examined: MEUC. 2 specimens. El Escorial, Provincia del Maipo, Región Metropolitana, CHILE, 26 noviembre 2015 Coll. D.E. Cepeda; Same location, but on 25 diciembre 2015. Permanent slide N° 717 ♂.

***Pseudarla miranda* Clarke.** Endemic genus and species, from Juan Fernandez Islands, described by Clarke (1965) from a male specimen. Listed by Becker (1984) and Lee and Brown (2010).

Gelechiinae: Anacampsiini

***Anacampsis humilis* Hodges.** Species described from Uruguay, from specimens reared from its clover host *Trifolium repens* L. (Fabaceae). In Chile, it is cited by Artigas (1994), who gave some biological details and recorded its distribution from the Valparaíso to the Los Lagos Regions, indicating also that it has no economic importance.

***Anacampsis ocelligera* (Butler).** Endemic species described by Butler (1883) under the genus *Gelechia* on the basis of a single specimen, originating from a "mountainous area of Cauquenes" (Maule, Region). Subsequently cited by Becker (1984) under the genus *Compsolechia*, which was later synonymized with *Anacampsis* by Lee and Brown (2010).

Pexicopiinae

***Sitotroga cerealella* (Olivier).** A Palearctic species present in Chile since 1962, widely distributed and with recognized economic importance in stored grains (Artigas 1994). This genus is listed under subfamily Chelariinae in Lee and Brown (2010), but is listed here in Pexicopiinae, following Hodges (1999).

Unconfirmed records and misidentifications.

***Scrobipalpula psilella* (Herrich-Schäffer).** Widely distributed species of Palearctic origin. Reported from one locality in Argentina, and erroneously cited for Chile (Povolný 1987). However, Huemer and Karsholt (1988) raise doubts about this record, due to small differences in figures of the male genitalia given by Povolný (1987), in comparison with European specimens. With no further information, its establishment in Chile cannot be confirmed.

***Keiferia lycopersicella* (Walsingham).** Species cited for the northernmost parts of Chile, in the Arica and Parinacota Region, and considered a pest of importance on tomatoes. However, its presence and distribution in Chile has not yet been confirmed (Artigas 1994).

Bryotropha galbanella (Zeller). Species first mentioned in Chile for Santiago, Metropolitan Region, under the genus *Gelechia* by Gyen (1913) and Silva (1913) on first reports on the cultivation of potato. Becker (1984) did not record this species for the Neotropical region. Later Artigas (1994) gave biological details and cited its distribution from the Valparaíso through the Los Lagos Regions. However, Karsholt and Rutten (2005) confirmed this record as a misidentification. Thus, this species is not present in Chile.

Discussion

The moths of the Gelechiidae family are usually small in size, with the proboscis covered by scales at the base and strongly recurved labial palpus upwards, often with a ventral brush on segment 2 and a long, acute segment 3. The forewings are narrow and lanceolate, with CuP absent, and the hind wings are sub-rectangular to trapezoidal, with a prominent groove posterior to the apex. In the genitalia, the gnathos has a pair of articulate symmetrical lateral sclerites; the second sternum presents a pair of venulae and/or apodemes. In the larvae, the frontoclypeus is $\frac{1}{2}$ or $\frac{3}{4}$ away from the epicranial notch, A1 with SV bisetose, and A9 with setiform SD1; an anal comb is present and crochets are either absent or biordinal. In the pupa, the antennae are usually touch mesially, diverge distally and the cremaster is absent (Hodges 1999; Huemer and Karsholt 1999).

The knowledge of the Gelechiidae of Chile is scarce but it largely seems to correspond to the fauna of Argentina, Peru and Bolivia, which have been studied in more detail. This is due to the collections of Lepidoptera made by Danish scientific expeditions during the last century that formed the basis of the species described later (Madsen et al. 1980). Most of the species present in Chile belong to Gnorimoschemini, and since the tribe was proposed by Povolný (1964), it has had a significant increase in the number of species in South America (Povolný 1967, 1985, 1986, 1987, 1989a, 1989b, 1990). Later, the same author summarized all the previous contributions and gave a checklist of the Neotropical Gnorimoschemini, together with an illustrated identification key (Povolný 1994). However, even Gnorimoschemini does not present a clear consensus on systematic definition. Powell and Povolný (2001) present the hypothesis that the evolutionary center of the tribe corresponds to Andean xerophilic zones and Patagonian steppes of South America. This hypothesis deserves a more detailed analysis, due to the lack of knowledge of the group in its ecological habits and trophic relationships. South America also has a richness in biogeography much more extensive in the Neotropical region (Morrone 2014). For example, Chile, despite having little tropical influence, has a wide variety of habitats and biogeographical zones (Morrone 2015).

In addition to the problem mentioned above, Povolný (2002) pointed out how difficult it is to separate and define Gnorimoschemini by its external morphology, and the main foundation for defining the tribe is based on the morphology of male and female genitalia. Regarding its distribution, it has been established that it found worldwide with 40 genera and more than 900 described species. Another important character raised by Povolný is that this group is likely monophyletic. Povolný never defined the tribe with clear synapomorphies, though Huemer and Karsholt (2010) defined the tribe with the following combination of characters: A signum in the form of the strongly sclerotized hook, and a lateral zone of microtrichia near the ostium. With respect to the monophyly of the group, Nazari and Landry (2012) point out the complexity of this assertion, because Povolný (2002) does not specifically define the tribe, nor does he clearly state the characters shared by all members of the group. In addition to the difficulty in dealing with intraspecific variation of wing color, sympatric occurrence of some species with closely allied sister species can complicate the matters even further.

As for other tribes of Gelechiinae, the species cited for Chile are mainly in tribes Gelechiini (*Chionodes*, *Apothetoeca*, *Pseudarla*) and Anacampsini (*Anacampsis*). Dichomeridinae currently has no representatives in Chile, based on the classifications followed here (although Lee and Brown (2010), in contrast, consider two Chilean species to be dichomeridines). A recent supra-generic classification of Gelechiidae based on molecular analyses of 52 genera did not include any representatives from the Neotropical region. However, this is a promising step towards a global classification of the family (Karsholt et al. 2013). In Chile, there are ten species considered endemic, and five of these are distributed in the Juan Fernandez islands (Butler 1883; Meyrick 1922, 1931; Clarke 1965; Povolný 1987; King and

Viejo 2012a 2012b). As most of the species recorded for Chile have a wider distribution in Argentina and Peru, this picture is likely to change over time.

New distribution records for four species (*E. chili*, *S. patagonica*, *S. pseudogrisescens*, and *A. synaphrista*) were added, three species were newly collected in the central Chile provinces Santiago and Maipo, and two species were found in association with shrub and sclerophyll forest ecosystems. For *E. chili*, a precise Chilean locality record was obtained for the first time, and it was recorded in association with tobacco (*Nicotiana*, Solanaceae). For *S. patagonica*, a biological aspect to consider is the attraction to sex pheromone traps for *T. absoluta*, similarly to what was observed for a Nearctic species of the genus *Sinoe* (Lee and Brambila 2012). *Apothetoeca synaphrista* is confirmed for the first time in continental Chile, having only been found previously from the Juan Fernandez Islands (Meyrick 1922). Host plant data are scarce, with the exception of the species associated with Solanaceae that have greater economic importance. The plant families recorded for species present in Chile are Fabaceae, Amaranthaceae, Polygonaceae, and Asteraceae (Table 1).

Recent clarifications of misidentified records have reduced the current number of Chilean gelechiids to 15 genera and 26 species recorded. Of these, 10 are endemic, and immature stages and host records are known for less than half of the recognized species.

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Table 1. Summary of genera, number of species and host records of Gelechiidae cited for Chile.

Genera	Valid species	Host plant records
<i>Phthorimaea</i> Meyrick	1	Solanaceae (Artigas 1994)
<i>Tuta</i> Keifferr and Jörgensen	1	Solanaceae (Artigas 1994)
<i>Eurysacca</i> Povolný	2	Amaranthaceae (Lamborot et al. 1999)
<i>Scrobipalpula</i> Povolný	5	No records
<i>Scrobipalpulopsis</i> Povolný	2	No records
<i>Ephysteris</i> Meyrick	1	No records
<i>Symmetrischema</i> Povolný	3	Solanaceae (Artigas 1994)
<i>Scrobipalpomima</i> Povolný	2	No records
<i>Tecia</i> Kieffer and Jörgensen	1	Asteraceae (Hodges and Becker 1990)
<i>Keiferia</i> Busck	1	Solaneceae (Artigas 1994)
<i>Chionodes</i> Hübner	2	Polygonaceae (King and Viejo 2012a)
<i>Apotethoeca</i> Meyrick	1	No records
<i>Pseudarla</i> Clarke	1	No records
<i>Anacamptis</i> Curtis	2	Fabaceae (Artigas 1994)
<i>Sitotroga</i> Heinemann	1	Stored grains (Artigas 1994)