



*Agonoxena argaula*

## Elachistidae: Agonoxeninae: Agonoxenini

### Palm Moths, Grass-Miner Moths

## Biosecurity

### BIOSECURITY ALERT

This Family is of Biosecurity Concern

## Occurrence

This family occurs in Australia.

## Background

Palm moths are a small group of 31 genera that belong to the Agonoxeninae, a sub-family of the family Elachistidae (grass-miner moths). This sub-family is divided into two tribes the Agonoxenini and the Blastodacnini, twenty species of which are native to Australia. Agonoxenini are globally known as pests of palms, and consist of, and typified by, the four species belonging to the genus *Agonoxena*: *A. argaula*, *A. phoenicia*, *A. pyrogramma* and *A. miniana*. The Australian native representative of this genus is *Agonoxena phoenicia* (palm moth), which feeds on Alexandra or northern bangalow palm (*Archontophoenix alexandrae*).

The taxonomy of this group has recently undergone major changes from studies incorporating new molecular and morphological data. Firstly, the former family Blastodacnidae was retained under the Agonoxenidae (Hodges, in Kristensen 1999), and then the latter treated under the Elachistidae to become the subfamily Agonoxeninae (Heikkilä *et al.* 2014, Sohn *et al.* 2016), relegating the Blastodacnidae and the *Agonoxena* group to tribal status, Blastodacnini and Agonoxenini respectively.

Palm moths are the only members of the Elachistidae, currently considered to be of biosecurity importance to northern Australia.

## Diagnosis

### Diagnostic Features of Agonoxenini (Palm Moth Caterpillars)

1. Secondary setae present. *Agonoxena argaula* has numerous **secondary setae** that are much smaller than the **primary setae**. However, *A. pyrogramma* only has secondary setae on the **prolegs** and A10 but it is still likely that secondary setae are characteristic of *Agonoxena* (see *Agonoxena* diagnosis and description below). Caterpillars in the Blastodacnini also have secondary setae, but they are much more abundant, over the entire body, than most of *Agonoxena* at least (Stehr *et al.* 1987). On this characteristic, Agonoxeninae (Agonoxenini and Blastodacnini) caterpillars are similar to the Pterophoridae (plume moth) **larvae**. However the two groups of larvae differ on the following features:
  - a. Palm moth caterpillars do not have secondary setae grouped into **verrucae**, or the like (some pterophorids do).
  - b. Palm moth caterpillars have a single SV **seta** on T1 and T2, whereas pterophorids have two. (Note: the SV setae may be difficult to distinguish from secondary setae in *A. argaula*).
2. Agonoxenini caterpillars differ from those of Blastodacnini by having the L group of T1 included in the prothoracic **shield**.
3. Prolegs with **crochets** in a **uniordinal circle**. In *Blastodacna curvilineela*, crochets form a **mesoseries**.

## Species of Biosecurity Concern

**THE FOLLOWING SPECIES IS OF BIOSECURITY CONCERN TO NORTHERN AUSTRALIA**

### *Agonoxena argaula* (palm moth) (Elachistidae: Agonoxeninae: Agonoxenini)

The main palm moth of biosecurity concern to northern Australia is coconut flat moth or coconut leaf moth (*Agonoxena argaula*), which is a pest of coconut and other palms (Fig. 1). Damage is principally exerted on young palms. The species is spread through artificial means and often by commerce.

*Agonoxena pyrogramma* is considered to be of relatively minor concern as a pest of palms that causes much less damage than *A. argaula*. However *A. pyrogramma* occurs geographically closer to Australia as it has been introduced into Papua New Guinea.

### Biology and Feeding Damage

- Feeding occurs in the epidermis on the leaf underside, underneath webbing.

- The feeding scar is long and narrow when the **larva** is small and immature, developing into characteristic long, thin, grey patches of damage as the **caterpillar** becomes larger (Fig. 2).
- Infestations may be heavy with at least several thousand larvae feeding in a single palm tree.
- Caterpillars become active when disturbed and may drop to the substrate below on silk threads. Both species are more active in dry weather.
- The caterpillar pupates beneath a close, elongated, white web on the leaf surface (either the upper or lower) of the **host** plant or understorey.

### Key to species of *Agonoxena* larvae

This key has been adapted from Bradley (1966).

- a. Tergal (suranal) plate of A10 **truncate** caudally, setae somewhat appressed **anterior puncture** Aa of **epicranium** posteriad of A2; **mesonotum** without spiculi ... *miniana*
  - b. Tergal (suranal) plate of A10 obtusely rounded, setae erect; anterior margin of mesonotum with spiculi; epicranium with puncture Aa **mesad**, antero-mesad or postero-mesad of A2 ... 2
- a. Thoracic and abdominal segments with numerous secondary setae; mesonotum with dense band of spiculi; puncture Aa mesad of A2; **suranal plate** of A10 obtusely rounded, setae erect ... *argaula*
  - b. Thoracic and abdominal segments without numerous secondary setae, at most just on prolegs and A10; mesonotum with two small patches of spiculi, or a weak and comparatively indistinct band; puncture Aa antero-mesad or postero-mesad of A2 ... 3
- a. Mesonotum with elliptical patches of spiculi anterior of setae D1 and D2; puncture Aa antero-mesad of A2 ... *pyrogramma*
  - b. Mesonotum with a weak band of spiculi; puncture Aa posteromesad of A2 ... *phoenicia*

### Diagnosis and Description of *Agonoxena* caterpillars

#### Diagnosis

This diagnosis is based on the description of *Agonoxena* larvae provided in Bradley (1966) and Hodges (1999).

1. *Size*. The mature caterpillars of *A. argaula* are significantly larger than the other three species in the genus. Size 16–18 mm long (Fig. 1). *A. phoenicia* is 7-8 mm; *A. pyrogramma* is 10-12 mm; *A. miniana* is 10-11 mm.
2. *Mid-dorsal line*. Only *A. argaula* and *A. miniana* have a brown **mid-dorsal line** along the body (Fig. 1).
3. *Secondary setae*. Numerous, short secondary setae that are much shorter than the primary setae, are on all thoracic and abdominal segments of *A. argaula* (Bradley 1966). Although Bradley goes on to state that secondary setae are absent in the other species, Stehr *et al.* (1988) noted that secondary setae are present on all the prolegs of *A. pyrogramma* and surmised that they may also be present in the other two species and thus be characteristic of the genus.
4. *Two flattened setae at apex of tarsus*.
5. *Mandible*. The medial 'teeth' on the **mandible** of *A. miniana* are relatively larger and better developed than the other species.
6. *T2 dorsal band of spicules*. In *A. argaula* and *A. pyrogramma*, T2 has a dense **transverse band** of small spines or spiculi on the mesonotum, divided into two separate patches, anterior of the D setal group. In *A. miniana* and *A. phoenicia*, the band is shorter and narrower with no spiculi (*miniana*) or minute spiculi (*phoenicia*).
7. *Head chaetotaxy*.
  - a. Adfrontal seta AF2. In *A. argaula* the adfrontal seta AF2 is slightly above the apex of the **apotome**. In *A. pyrogramma* and *A. miniana* it is level or nearly level, but it is much higher in *A. phoenicia* and about the same distance above the apex of apotome as AF1 is below.
  - b. Adfrontal puncture AFa. The adfrontal puncture AFa is usually directly below AF2 but in *A. phoenicia*, AFa lies approximately midway between AF2 and AF1 because AF2 is relatively more dorsal.
  - c. Distance from F1 to AF1 This is about the same as from AF1 to AF2 in *A. argaula*, but in *A. pyrogramma* and *A. miniana* AF1 is nearer to AF2, but its position is variable in *A. phoenicia*.
  - d. Puncture Aa. The puncture Aa is mesad of A2 in *A. argaula* but is antero-mesad in *A. pyrogramma*, posteriad in *A. miniana* and postero-mesad in *A. phoenicia*.

#### Current Distribution

Oceania and Australasia

#### *Agonoxena argaula*

- Fiji
- Guam
- New Hebrides
- Hawaii
- Tonga

- Samoa
- Ellice
- Wallis
- Futuna
- the Palmyra Atoll
- Tokelau

### *Agonoxena miniana*

- Java

### *Agonoxena phoenicia*

- Northern Queensland, Australia.

### *Agonoxena pyrogramma*

- Guam
- Federated States of Micronesia
- Java
- Northern Mariana Islands
- New Britain
- Papua New Guinea
- Solomon Islands
- Indonesia

### Caterpillar Host Plants

- golden cane palm, areca palm, yellow palm, butterfly palm (*Dypsis lutescens*)
- coconut (*Cocos nucifera*)
- loneliest palm (*Hyophorbe amaricaulis*)
- Kentia palm or thatch palm (*Howea forsteriana*)
- fan palms (*Pritchardia*)



**Fig 1.** Coconut flat moth (*Agonoxena argaula*) mature caterpillar. Photo: Gerald McCormack, Cook Islands Biodiversity & Natural Heritage.



**Fig 2.** Leaf damage in coconut leaves caused by the feeding of mature coconut flat moth caterpillars, probably *Agonoxena pyrogramma*, Solomon Islands. Photos courtesy of ACIAR(2017) [http://www.pestnet.org/fact\\_sheets/coconut\\_flat\\_moth\\_065.htm](http://www.pestnet.org/fact_sheets/coconut_flat_moth_065.htm)

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