

SCIENTIFIC NOTE

REVIEW OF LESS-STICK BAG MOTH *TRIGONOCYTTARA CLANDESTINA* TURNER (LEPIDOPTERA: PSYCHIDAE), AN AUSTRALIAN NATIVE IN SOUTH EASTERN AUSTRALIA

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Summary

Australia's biosecurity system includes surveillance for early detection of exotic insect incursions at high risk sites and ports-of-entry. These surveys often add to the knowledge of endemic and native species. A biosecurity survey in southern New South Wales detected less-stick case moth, *Trigonocyttara clandestina*, on a single *Pinus radiata* tree. We reviewed the known records on *T. clandestina* and host range in south eastern Australia. This Australian native insect was detected sporadically (42 times) over 90 years and records indicate it was distributed in south eastern Australia. There were two likely populations, in the north and south of the eastern coast. The recent detection between these populations may be a link between these two known populations.

Keywords: forestry pest, *Pinus radiata*, biosecurity surveillance, early detection

INTRODUCTION

Australia's 123 million ha of native forest and woodlands provide a wide range of benefits, including social (recreation), environmental (conservation) and commercial (e.g. forestry, tourism, honey) (MPIG and NFISC 2013). The forest products industry contributes \$21 billion to the national economy, employs around 120,000 people across the value chain, and is a vital part of rural and regional communities in Australia (MPIG and NFISC 2013). Exotic pests and diseases have the potential to threaten the productivity and conservation value of these forests and plantations. Pests that are already established in Australia and causing impact include *Phytophthora cinnamomi* Rands (phytophthora dieback) and *Austropuccinia psidii* (G. Winter) Beenken (myrtle rust) in native ecosystems (Weste 1994; Carnegie *et al.* 2016a, b), *Sirex noctilio* F. (sirex woodwasp) and *Essigella californica* (Essig) (Monterey pine aphid) in *Pinus* plantations (Eyles *et al.* 2011; Carnegie and Bashford 2012).

There were 49 exotic plant pests detected in Australia between 2006 and 2014 (Anderson *et al.* 2017). The current incursions into Australia exceed 100 per year (S.Wade. *pers. comm.* 2019). Annual forest health surveys are conducted over plantations across Australia to protect Australia's plantation resources and for early detection of exotic incursions (Carnegie 2008).

Surveys include aerial, drive-through and ground surveys that map the extent and severity of damaging agents, including insect pests, fungal diseases and vertebrate pests (Carnegie *et al.* 2008; Carnegie *et al.* 2016a). Here, we report on the detection of a less-stick bag moth, *Trigonocyttara clandestina* Turner, found on *Pinus radiata* at a port near Eden, NSW, during

reconnaissance surveillance and review the past records of this insect. We reviewed the 42 records of incidence since 1930 and host range of *T. clandestina*. We compared the known distribution with the 2019 – 2020 extensive bushfires in New South Wales.

DETECTION, IDENTIFICATION AND REPORTING

On 29 November 2016, an opportunistic survey (i.e. not part of a structured program) was conducted by Dr Angus Carnegie in port-environs near a woodchip/log export wharf at Eden, southern NSW. The survey was part of a reconnaissance visit to Eden to gather data on the need and practicality of conducting biosecurity surveillance for forest pests in the region. Eden was identified as a high-risk port-of-entry for Asian gypsy moth (J. Nielson, Department of Agriculture and Water Resources, August 2015, *pers. comm.*, Dominiak *et al.* 2006), but trapping has not been conducted there since about 2014. A 1-hr biosecurity-bltz survey was conducted of all arborescent hosts at the site, including *Pinus radiata* (D. Don), *Eucalyptus globulus* (Labill.), *Callistemon* sp. and *Syzygium* sp. Two cocoons (Figure 1) were detected on a single, young (~6 m tall) amenity *P. radiata* tree (37° 06' 10.7" S, 149° 56' 00" E). Moderate levels of herbivorous damage (chewed needle tips) were evident on the lower branches of the tree. Also, the tree was inhabited by pine woolly aphid *Pineus pini* (Macquart), an exotic pest long established in Australia (Froggatt 1923). Several mature *P. radiata* at the site did not have evidence of feeding damage, nor did mature *P. radiata* and *P. pinaster* ~1.5 km south of the wharf.

Additional potential hosts were inspected at the wharf and had no evidence of bag moth damage. The area is

surrounded by native bush and scrub. The location is labelled “2016 AC” in Figure 2.



Figure 1. *Trigonocyttara clandestina* cocoon on *Pinus radiata* at Eden, New South Wales. Source Angus Carnegie.

A larva within a single bag-like shelter was originally feared to be *Liothula omnivora* Fereday (Lepidoptera: Psychidae), an exotic from New Zealand. The specimen was subsequently identified as *T. clandestina* using a combination of published materials, PaDIL data (www.padil.gov.au/), and comparison with specimens in the NSW Department of Primary Industries Insect Collection. The specimen has been lodged in NSW DPI's Biological Collections Unit, voucher number ASCT00181417. A preliminary notification was sent to the Australian Chief Plant Protection Office on 2 December 2016.

BIOLOGY AND TAXONOMY

Naumann (1991) claimed Australia was rich in primitive species of Psychidae. *Trigonocyttara clandestina* is one of seven species in the Taleporiinae subfamily. Within these, *T. clandestina* have winged females. The larva is stout bodied and forms a cylindrical case with one or two twigs attached lengthwise.

PREVIOUS RECORDS

The Atlas of Living Australia (ALA) had eight records of *T. clandestina* in 1930 (one record), 1969 (1), 2010 (1), 2013 (1), 2015 (1), 2017 (2) and 2018(1) (Atlas of Living Australia, 2018). The Australian Plant Pest Database (APPD) has 34 records of *T. clandestina* with the earliest record in 1956 (Australian Plant Pest Database, 2018). Of the 34 records, there are 24 records with the one gps coordinate and one date in 1960 – we assume these were samples collected at one site. Of the remaining ten records, the collection years were well spread: 1956 (2 records), 1973 (1), 1974 (1), 1985 (1), 2004 (1), 2012 (1) and 2016 (3). These records are mapped in Figure 2. Detection records range from the months of September to April.

HOSTS OF *TRIGONOCYTTARA CLANDESTINA*

Moore (1962) reported *T. clandestina* was found on *P. radiata*, most *Eucalyptus* spp. and numerous indigenous and exotic trees and scrubs. However, Moore (1962) was not more specific. Damage to foliage could be severe on small trees and moderate on larger trees (Moore 1962). Five other Psychidae were found attacking *P. radiata* (Moore 1962). Naumann (1991) reported that *T. clandestina* feeds on *Eucalyptus*, *Acacia*, the introduced *P. radiata* and several exotic ornamentals. Similarly, Common (1990) reported that larvae feed on *Eucalyptus*, *Callistemon*, *Acacia*, *P. radiata* and various ornamentals.

In the APPD, there are 13 fields with recorded hosts. Eleven of these are *P. radiata*. There is one record in 1974 of paperbark tea-tree and one record in 1985 of ironbark, *Eucalyptus*. The 2016 (Carnegie) sample was detected on a *P. radiata* tree.

DISCUSSION

The original detection was feared to be the exotic *L. omnivora*. Subsequent analysis determined the specimen as *T. clandestina*. *Liothula omnivora* is a native to New Zealand and is found throughout that country, but caterpillars rarely become numerous enough to cause notable damage. *Liothula omnivora* caterpillars are heavily parasitised and well controlled by the tachinid flies *Pales feredayi* (Hutton) and *P. marginata* (Hutton), and the wasp species *Echthromorpha intricatoria* (F.) and *Xanthopimpla rhopaloceros* Krieger also contribute to control (Farm Forestry New Zealand 2009). As such, *L. omnivora* could be a pest in Australian plantations, production and conservation forests, and amenity trees. Insects can travel from New Zealand to Australia under certain wind conditions (Dominiak et al 2009; Hill et al. 2020).

In 2014, a private landowner reported damage to a *P. radiata* plantation in Bombala in south-eastern NSW (36° 55' 11.3" S, 149° 15' 47.6" E). A subsequent inspection in 2014 revealed herbivorous damage associated with the radiata pine shoot weevil (*Merimnetes oblongus* (Blanchard)), an endemic pest of *Pinus* (Neumann and Marks 1976). Subsequent surveys in 2015 and 2016 of this plantation and State-owned plantations in the region revealed no evidence of *M. oblongus* or *T. clandestina* (A. J. Carnegie, pers. obs.). Bombala is ~60 km from the wharf at Eden where *T. clandestina* was detected, with large areas of native forest and *P. radiata* plantation in between these locations. This detection of *T. clandestina* highlights the benefits of, and need for, biosecurity surveillance at high risk entry points for forest pests.

There is little published information on *T. clandestina* since 1930. The 42 known records over 90 years indicates the scarcity of this Australian insect and potentially the challenges to maintain genetic diversity. We overlaid the bush fire areas in the 2019-2020 season to further highlight the possible challenges for the survival of this insect (Climate Council 2019) (Figure 2). During the 2019-2020 season, 5,340,000 ha were burnt out in NSW (since 1/07/19). Of these, 2,696,053ha were National Park and 893,762ha were State Forest.

Superficially before the detection in 2016, it might be inferred that there was a northern mainland population (Sydney and north) and a southern population (southern Victoria). The 2016 detection is the first detection between these two groups. This detection may signal a continuous population between the northern and southern populations. The detections in northern Tasmania were in a light trap and many moths fly across Bass Strait but do not establish in Tasmania (Hill 2014). More surveillance is required to establish if *T. clandestina* is established in Tasmania. The Australian case moths are not well studied; more surveillance and research needs to be conducted to better understand the role of this insect in forestry and the Australian landscape.

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Figure 2. Map of recorded detections of *Trigonocyttara clandestina* in south eastern Australia. Each site is labelled with the year of detection. The site labelled “2016 AC” is the detection reported in this manuscript. Areas of bush fire damage in New South Wales during 2019-2020 are shown in grey.

