



Lesser auger beetle *Heterobostrychus aequalis* (Coleoptera: Bostrichidae) in Australia: absent or elusive?

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Abstract

The lesser auger beetle, *Heterobostrychus aequalis* (Waterhouse), is a serious pest of seasoned hardwood timber throughout the Oriental region and several areas beyond. Some early collection records of *H. aequalis* from Australia in the 1950s and 1960s indicated that the insect was present in northern Queensland, but no confirmed breeding population has been found in the past few decades suggesting either that it may have not established permanently or it is difficult to detect. The ambiguity about the breeding status of the pest in Australia has caused confusion for regulating authorities needing to respond to each new post-border detection. We examined records of *H. aequalis* in Australian insect collections and from intensive plant pest surveillance activities in Queensland and northern Australia over the past 48 years to resolve this confusion. Until very recently, available evidence suggested that *H. aequalis* was not established in Australia, despite multiple introductions and apparently suitable climate and hosts. Collection records of the pest are predominantly linked to intercepted items or are recorded as of unknown origin, and no established populations have been found during many years of targeted surveillance. However, a detection of *H. aequalis* in suburban Cairns, north Queensland, in late 2013 and two more in mid-2015 in the same general locality do not appear to be linked to any imported material, indicating that there is at least a tenuously established local population. Investigations are underway to confirm this, but the insect is not widely established in Australia and, if present, remains elusive. Our recommended response to any future detection of *H. aequalis* is to fumigate or destroy the infested material, conduct tracing enquiries and limit surveys to the immediate vicinity of the detection.

Key words collection record, quarantine, seasoned hardwood timber, surveillance.

INTRODUCTION

Heterobostrychus aequalis (Waterhouse, 1884), variously known as a boxwood borer in India (Beeson & Bhatia 1937), trunk borer in Bangladesh (Rahman *et al.* 1995), false powderpost beetle in Malaysia (Singh *et al.* 2011), oriental wood borer in the United States (Woodruff & Fasulo 2012) and lesser auger beetle in Australia (Naumann 1993), is a serious pest of seasoned hardwood timber. It has a wide host range and damages logs, sawn timber, packing cases, pallets, plywood, furniture and other manufactured wooden articles. It is confined to wood containing starch, which in heavy infestations, is often reduced to powder through re-infestation. This species is very widely distributed in the Oriental region, from India and China to the Indonesian archipelago and Papua New Guinea (Sittichaya *et al.* 2009), but there are also records from Africa, Europe, North America, Central America and Caribbean, South America and Oceania, including Australia (Azmi *et al.* 2011; CABI 2008). It is these records from Australia purporting establishment which are the subject of this paper since reported presence does not necessarily imply that the insect is established, or if it was established, that it did not die out subsequently.

Heather (1966) advanced the first evidence for the establishment of *H. aequalis* in Australia. He noted that while the insect

had long been an important pest species in Papua New Guinea and was frequently intercepted during quarantine inspections of imported timber, it was not until 1958 that it was recorded from Thursday Island in the Torres Strait and until 1962 from mainland Australia. He lists the records from Australia as: THURSDAY ISLAND: ex red silkwood timber *Palaquium galactoxylum*, 24.i.1958, Department of Primary Industries record; NORTH QUEENSLAND: Bamaga, Cape York, ex *Garuga floribunda* timber, Nov. 1962, Department of Forestry record; Yarrabah, ex timber species silky celtis *Celtis paniculata*, silver quandong *Elaeocarpus grandis* and white cheesewood *Alstonia scholaris*, 7.v.1965, origin of timber, Bamaga and other unnamed sources on Cape York, Department of Forestry record. Heather (1966) stated that these records ‘...indicate the establishment of *H. aequalis* in Australia’.

For more than two decades, this view was generally accepted and cited in several publications (e.g. Wylie & Yule 1977; Creffield & Howick 1979; Wylie & Peters 1987). However, for reasons that we outline here, Wylie (1992) and Peters *et al.* (1996) again refer to *H. aequalis* as being of quarantine concern for Australia. The Pest and Disease Image Library website (PaDIL) (Walker 2005) now gives the status of *H. aequalis* as ‘Exotic species – absent from Australia’, and a CSIRO (2004) website notes that ‘Lesser auger beetle was recorded from Cairns and Thursday Island in 1959. It is believed to have died out’. CABI (2008) categorises it as ‘absent, formerly present’.

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Nevertheless, recent papers (such as Borowski & Węgrzynowicz 2007; Azmi *et al.* 2011; Woodruff & Fasulo 2012) continue to report the insect as established here. This has engendered some confusion, particularly among regulating authorities; is it established, is it restricted to north Queensland or is it absent? Each new post-border detection of the pest has reignited the debate about its status because the answer to those questions determines how authorities respond to the detection viz. ignore, eradicate locally or undertake a full incursion response. The resources that would be required for each of these options differ greatly, hence the need for a consensus on the pest's status. In this paper, we examine records of *H. aequalis* in Australian insect collections and intensive plant pest surveillance activities in Queensland over the past 48 years to resolve this confusion.

MATERIALS AND METHODS

Records of the Australian Plant Pest Database (APPD) (Plant Health Australia 2001; National Plant Biosecurity Status Report 2011), which contains data from 19 Australian collections that house economic insect species (Smith *et al.* 2013), were searched for records of *H. aequalis*. Intercept records from the Australian Government Department of Agriculture (formerly Australian Quarantine and Inspection Service (AQIS)) were also examined (Table 1) along with some Queensland Department of Forestry records not included in the APPD.

The Northern Australia Quarantine Strategy (NAQS) was established in 1989 to provide an early warning system for exotic pest, weed and disease detections across northern Australia to help address biosecurity risks facing the region. Surveillance is conducted for targeted organisms in coastal areas in the north from Broome in Western Australia to Cairns in Queensland including Bamaga and Torres Strait. For plant pests, surveillance

is visual and usually crop-focussed; NAQS officers inspect known host plants of the pest for symptoms of disorder or infestation. In the case of wood-boring insects, inspectors look for holes or insect frass/borer dust in logs, sawn timber, timber in buildings, manufactured wooden articles, artefacts and dead wood on trees. Approximately 15–20 surveys are carried out each year across the NAQS survey zone, each survey lasting about 1 week and usually involving 2–3 officers (an entomologist and botanist or pathologist). Light trapping is conducted in some areas where it is believed foreign fishing vessels may have landed. In the 1990s, the Queensland Department of Primary Industries had a similar program, now disbanded, called Northwatch, designed to complement the activities of NAQS. *Heterobostrychus aequalis* is one of the insects targeted by these organisations in the past two decades and remains on the forestry and timber pests watch list of the Australian Government Department of Agriculture (Department of Agriculture 2014a, 2014b). Annual reports are published on the results of these surveys. As well, forestry officers employed by the Queensland government have made specific searches for *H. aequalis* in north Queensland in the 1990s, using methodology described for NAQS, targeting the original collection localities reported by Heather (1966).

RESULTS

Heterobostrychus aequalis continues to be one of the most common pests of timber intercepted pre- and post-border in Australia. The mode of entry and country of origin of these interceptions over the period 2003–2013 are shown in Table 1. Despite the presence of the pest in Australia's near neighbour Papua New Guinea, the overwhelming majority of interceptions are from southern China and southeast Asia (>73%), probably reflecting the volume of trade with countries in this region. Manufactured

Table 1 Mode of entry and country of origin for interceptions of *Heterobostrychus aequalis* in Australia (2003–2013): no distinction between shipping and transshipping made (data supplied by Australian Government Department of Agriculture)

Country of origin	Mode of entry						Total
	Manufactured wooden articles (including furniture)	Personal effects (including artefacts)	Wooden cargo (pallets and containers)	Sawn timber	Ship's dunnage	Other	
Indonesia	36	32	10	4	1	3	86
China	48	23	11	0	0	1	83
Malaysia	58	2	18	2	1	1	82
Thailand	18	28	13	6	7	0	72
Singapore	8	1	9	2	1	2	23
Papua New Guinea	2	13	2	1	0	2	20
Vietnam	10	1	3	1	0	0	15
India	8	2	0	0	0	0	10
South Africa	1	8	0	0	0	0	9
Vanuatu	0	9	0	0	0	0	9
Taiwan	1	1	3	2	0	0	7
Philippines	1	1	2	0	0	0	4
Unknown	27	8	5	1	2	0	43
Other†	8	16	6	2	0	0	32
Total	226	145	82	21	12	9	495

†Afghanistan, Belgium, Cambodia, Ecuador, Fiji, Ghana, Italy, Japan, Lao PDR, Liberia, Maldives, Myanmar, Netherlands, Norway, Pakistan, Peru, Samoa, Sri Lanka, Swaziland, Tanzania, Timor-Leste and United States: interceptions ≤ 3 each.

wooden articles, personal effects and wooden cargo dominate these interceptions (91.5%). No breeding populations of *H. aequalis* have been detected in surveys by NAQS, Northwatch or Queensland Forestry in target areas in Australia over the past 48 years. Collection records of *H. aequalis* from the APPD (over 300 records) and other sources are predominantly linked to intercepted items or are recorded as of unknown origin.

In October 2013, *H. aequalis* beetles were found in a timber slab being used as a bar at a private residence in suburban Cairns. The timber was red cedar (*Toona ciliata*), a native tree species, and the slab had been cut elsewhere in Cairns (Smithfield) approximately 6 years previously. Surveys at both localities and resident interviews provided no evidence on the source of the infestation. In August 2015, specimens and damage of *H. aequalis* were found in mango (*Mangifera indica*) timber slabs at a private residence at Yorkeys Knob, a suburb of Cairns. The tree from which the timber had been sourced was felled approximately 3 years earlier at a second private residence in the same suburb, and *H. aequalis* was also found in mango timber off cuts and sticks of *Calliandra* sp. (sourced locally) at that residence. Interviews with both residents confirmed that the tree was healthy when felled and there was no visible borer damage in the slabs when cut. There were no links to imported material at either residence.

DISCUSSION

Until very recently, the evidence available suggested that *H. aequalis* is not established in Australia, despite multiple introductions and apparently suitable climate and hosts. The five timber species listed by Heather (1966) as being local to Cape York and Thursday Island also occur in Papua New Guinea and Timor. Heather acknowledges that an informal trade in small round poles occurs spasmodically between the Torres Strait islands and Papua. It is quite possible that *H. aequalis* entered Australia in this manner or was accidentally carried in some other infested wooden item and subsequently cross-infested local timber species. All three localities listed by Heather are

Torres Strait island or aboriginal communities with traditional social and trade linkages. Despite targeted surveys, no *H. aequalis* has been found at these locations since 1965 indicating that the infestation has died out.

Almost all the Australian records of *H. aequalis* are associated with imported items (Table 1).

Given the frequency of *H. aequalis* interceptions pre- and post-border (495 in the past decade), the apparent suitability of climate, particularly in the north of the continent, and abundance of potential hosts, it could be expected that the insect would establish here and, if already established, that it would be widespread by now. That does not appear to be the case, and there is no obvious explanation. There is a parallel to this situation in the United States. *Heterobostrychus aequalis* is accepted as established in Florida (Halbert *et al.* 2001; Woodruff & Fasulo 2012; CABI 2008; Beiriger 2010) based on Woodruff (1967). Following the initial detection in oak lumber in Fort Lauderdale, surveys showed that the insect was established in two lumber yards in Fort Lauderdale and one lumber yard in Miami. Woodruff (1967) mentions that the insect probably occurs in the wild between these points. There have been subsequent, occasional detections by the Florida Department of Agriculture, and it is believed that the insect is established but does not seem to have spread far outside the area that Woodruff originally found it in (R. Beiriger pers. comm. 2014). Again, reasons for this limited spread are not obvious.

In October 2013, on confirmation of a detection of *H. aequalis* in Cairns, the Consultative Committee on Emergency Plant Pests in Australia, the body responsible for coordinating national responses to plant pest incursions, referred the uncertain status of *H. aequalis* in this country to State and Territory jurisdictions for review. The responses from these jurisdictions, based on investigation of their own records and local knowledge, are presented in Table 2. Every jurisdiction reported that there was no evidence of establishment despite many interceptions.

However, given the 2015 detection of *H. aequalis* at two properties at Yorkeys Knob, Cairns and their proximity to

Table 2 Comments from Australian States and Territories on establishment status of *Heterobostrychus aequalis* in their jurisdictions in response to a request in October 2013 by the Consultative Committee on Emergency Plant Pests in Australia (Cheryl Grgurinovic pers. comm. 2014)

Jurisdiction	Comments on <i>Heterobostrychus aequalis</i>
Australian Capital Territory	Absent with no recorded detections.
New South Wales	184 of the 208 records in the NSW Culture Collection are from known exotic origins. The others are recorded as intercepts from imported timber and wood ornaments.
Northern Territory	Absent with many recorded interception detections. Since 1977, there have been eight border interceptions and two detections in the Darwin area, where it was eradicated with no further detections (records from the Northern Territory Exotic Insect Collection database).
Queensland	Absent with several recorded interception detections. Regularly intercepted pre- and post-quarantine (Stanaway <i>et al.</i> 2001). No substantial evidence for establishment with many recorded interception detections.
South Australia	Numerous specimens intercepted pre- and post-border in imported Asian timber and wooden/bamboo souvenirs from Asia.
Tasmania	Absent with several recorded interception detections.
Victoria	Absent with no recorded detections.
Western Australia	Absent with no recorded detections. Absent with single interception recorded detection.

nearby Smithfield, involved with the 2013 detection, none known to be associated with imported material, we believe that there is at least a tenuously established population in that area although this is yet to be confirmed. Visual surveillance for symptoms of *H. aequalis* damage in tree and timber hosts in and around the suburb has been conducted with negative results to date (December 2015). Light trapping and deployment of intercept traps baited with ethyl alcohol as a lure (see Wylie *et al.* 2008) as well as trap billets of susceptible timber at the two properties are underway. Even if the insect is proved to be established in Cairns, it is by no means widespread or damaging and continues to be elusive. Our recommended response to any future detection of *H. aequalis* is to fumigate or destroy the infested material, conduct tracing enquiries and limit surveys to the immediate vicinity of the detection.

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