False Powderpost or Auger Beetles

Assessor—Michael Haverty

Scientific names of pests—*Bostrychopsis jesuita* (F.), *Mesoxylion collaris* (Erichson), *Sinoxylon anale* (Lesne), *Xylion cylindricus* Macleay, *Xylobosca bispinosa* (Macleay), *Xylodeleis obsipa* Germar, *Xylopsocus gibbicollis* (Macleay), *Xylothrips religiosus* (Boisduval), *Xylotillus lindi* (Blackburn) (Coleoptera: Bostrichidae)

Scientific names of hosts—*Eucalyptus amygdalina*, *E. cloeziana*, *E. delegatensis*, *E. dunnii*, *E. globulus*, *E. nitens*, *E. obliqua*, *E. ovata*, *E. regnans*, *E. saligna*, *E. viminalis*, *Corymbia calophylla*, *C. citriodora*, and *C. maculata*. These species are listed because they are not resistant to bostrychid infestation due to the xylem vessel diameter. Numerous hardwood and softwood species could be susceptible to attack. Other species of interest are resistant because pores are too small to allow insertion of the female's ovipositor (Erskine 1965).

Distribution—*Bostrychopsis jesuita*: Queensland, New South Wales, Victoria, South Australia, Western Australia, and Northern Territory; *Mesoxylion collaris*: New South Wales, Northern Territory, and Tasmania; *Sinoxylon anale*: South Australia and Northern Territory; *Xylion cylindricus*: Queensland, New South Wales, Northern Territory, and Tasmania; *Xylobosca bispinosa*: Queensland, New South Wales, Western Australia, Tasmania, and Northern Territory; *Xylodeleis obsipa*: Queensland, New South Wales, Western Australia, and Northern Territory; *Xylopsocus gibbicollis*: Queensland, New South Wales, Tasmania, Western Australia, and Northern Territory; *Xylothrips religiosus*: Queensland, Western Australia, and Northern Territory; *Xylotillus lindi*: New South Wales and South Australia.

Summary of natural history and biology of the pest—Three families of beetles, Lyctidae, Bostrichidae, and Anobiidae, are often collectively referred to as powderpost beetles because their larvae reduce wood to a mass of powdery or pelleted frass (Ebeling 1975). There is no general agreement among specialists as to exactly which beetles should be classified as "powderpost beetles" or even that the term should be used (Moore 1979). However, to distinguish the Bostrichidae from the others the bostrichids are known as false powderpost beetles in the United States (Ebeling 1975). In Australia they are known as auger beetles because of the neat, drill-like holes the adults bore into wood (Peters and others 1996).

These insects make their presence known by numerous entrance and exit holes [3 to 9 mm (12 to 0.35 in.) in diameter] on the surface of wood. They attack mainly freshly felled logs and unseasoned sawn lumber (Peters and others 1996, Elliott and others 1998). Beneath the surface of the infested wood are frass-filled galleries or tunnels, usually following the grain of the wood. Unlike the platypodids, scolytids, and lymexylids, bostrichid galleries and exit holes are not discolored or pigmented. The false powderpost beetles tightly pack their galleries with a boring dust, often containing small wood fragments. The frass in bostrichid galleries is somewhat coarser than that of the lyctids and tends to stick together.

False powderpost beetles range in size from small [3 mm (0.12 in.) in length] to large [20 mm (0.79 in.) in length] with a considerable number of large species. They are usually elongate and cylindrical, and are brown, reddish brown, or black. In most bostrichid species the head is not visible from above, being hidden from view beneath a large thorax that gives the beetle a humpbacked appearance. The thorax is noticeably roughened in most species. Bostrichids and lyctids both have short antennae, but the bostrichids have three or four enlarged, sawtoothed, terminal segments, compared with two more rounded terminal segments for the lyctids. The tibiae of bostrichids have distinct spurs.

False powderpost beetles attack and infest the sapwood of both hardwoods and softwoods that have high moisture content (above 30%) and contain starch (Ebeling 1975, Peters and others 1996). However, bostrichids mainly attack hardwoods, which is their preferred wood. A few species also infest stressed living trees, weakening branches and stems and contributing to the general debilitation of these trees (Elliott and others 1998). The bostrichids differ from lyctids in that the adult beetles bore into the wood, preparing "egg tunnels" instead of ovipositing in surface cracks or pores. The adult beetles bore (auger) circular tunnels in branches and stems, sometimes making large cavities in which several beetles may live as a small colony (Brimblecombe 1956). Eggs are laid in the walls of the cavities or in branch tunnels (Elliott and others 1998). The female deposits eggs into pores leading from the tunnels (Ebeling 1975, Robinson 1990). After hatching, the larvae feed and tunnel in the sapwood, obtaining their nourishment from the starch in the wood (Peters and others 1996). Thus, bostrichid tunnels vary greatly in size and shape. Pupation takes place in a pupal cell, and the newly emerged adult bores a round exit hole to the exterior (Peters and others 1996). The life cycle varies between 3 and 12 months, depending on beetle species and time of year (Peters and others 1996).

Like the lyctids, bostrichids can continue to develop in a piece of wood for long periods. Only one Australian species, *B. jesuita*, has been recorded as being able to reinfest seasoned lumber (Elliott and others 1998). Some species attack and breed in both hardwoods and softwoods. The bostrichids are most abundant in the tropics and are not as economically important as the lyctids, especially in temperate regions.

Specific information relating to risk elements

A. Likelihood of introduction

1. Pest with host-commodity at origin potential:
   Logs—*High* (MC) (Applicable risk criteria, from Ch. 1: b, c, d, ê, f, g, h)
   Chips—*High* (MC) (Applicable risk criteria, from Ch. 1: b, c, d, e, f, g, h)

   A majority of the commercial eucalypt species could supply harborage for all stages of false powderpost beetle. The likelihood of false powderpost beetles ovipositing in freshly cut logs is great. However, as the outer sapwood dries in log decks, either in the bush, at ports, or in chipping mills, the likelihood of adults finding the wood suitable for oviposition decreases. Chips average only 30 to 40 mm square by 10 mm thick (Gadgil and others 1996) and are drier than freshly cut logs. Therefore, they are not likely to be selected by adult bostrichids for tunneling or oviposition, even though they have a plethora of open pores and ample starch to support larval development. Bostrichid eggs and early instar larvae that are already in logs would likely survive the chipping process.

2. Entry potential:
   Logs—*High* (RC) (Applicable risk criteria, from Ch. 1: b, c, d)
   Chips—*High* (RC) (Applicable risk criteria, from Ch. 1: b, c, d)

   False powderpost beetles could survive quite well during transit. In log decks, adults could easily be concealed between the logs or within galleries below log surface. Eggs and early instar larvae could survive in the sapwood and would be nearly impossible to detect. Normal transit time from the bush to the port and transit to the United States would normally not exceed 1 month, so false powderpost beetles would still be in the larval stage of the first generation. Beetles are unlikely to complete development and emerge as adults before logs are off-loaded at the port of entry, unless the logs have been held for a long time before shipment. Characteristic emergence holes and powdery frass would not be present to aid in identification of infested logs; however, entry holes (and the wood shavings resulting from their construction) should be visible on the surface of logs. The presence of eggs or larvae would easily go undetected in shipments of chips. The greatest danger of introducing false powderpost beetles would result from logs that are shipped from plantations or ports in Australia with these species present, and then remain in storage at the import site for extended periods of time.

3. Colonization potential: *High* (MC) (Applicable risk criteria from Ch. 1: b, c, d, e)

   False powderpost beetles are generally polyphagous. The presence of an acceptable host is not the critical factor, because these beetles can infest numerous tree species and occasionally wood in service. The factors limiting host acceptability are moisture content (Erskine 1965) and starch content in the sapwood (Peters and others 1996). If logs arriving at a port are not immediately utilized or are left in a refuse pile, false powderpost beetles can reinfest the parent material or disperse to find other suitable materials. The adults are strong fliers and are attracted to lights. They could easily become established in dead wood in live trees in the vicinity of ports of entry. Once established, these beetles could infest dead wood in exotic trees grown as ornamentals (Bockerhoff and Bain 2000). The greatest danger would be in warmer, subtropical areas of the United States.

4. Spread potential: *High* (MC) (Applicable risk criteria, from Ch. 1: b, c, d, e, g)

   False powderpost beetles do not fly great distances. However, infested wood, moved by humans in commerce, would spread these insects at a much faster rate than their natural spread. However, once established at the receiving seaport or inland destinations, false powderpost beetles would not likely go undetected when they infest new material because their characteristic entrance holes and piles of powdery frass would be apparent. Before an infestation is noticed, additional wood or trees could be infested and distributed within the continental United States or its territories and possessions. Infested wood can, however, be fumigated or destroyed. Furthermore, Australian false powderpost beetles could be misdiagnosed or confused with native species.

B. Consequences of introduction

5. Economic damage potential: *Moderate* (VC) (Applicable risk criteria, from Ch. 1: a, c, d)

   False powderpost beetles are the least economically important of the three powderpost beetle families in the United States (Ebeling 1975, Anonymous 1986). Most false powderpost beetles do not generally attack dried hardwood lumber, especially if the wood is protected by a treatment of the surface, such as varnish or wax. There are examples, however, of false powderpost beetles that do infest finished wood products in Australia (*B. jesuita*, Elliott and others 1998) and the United States [*Scobicia declivis* (LeConte) and *Polycaon stoutii* (LeConte), Ebeling 1975]. Their damage to wood in structures would be rare and would be restricted to hardwood elements, such as flooring and paneling. Control methods for infestations of false powderpost beetles in structures are currently available and rely on fumigation of the entire structure with methyl bromide. Soon this fumigant will be phased out of production and use. The only available substitute, sulfuryl fluoride, is much more expensive and requires very high dosages to kill the egg stage.

6. Environmental damage potential: *Low* (VC) (Applicable risk criterion from Ch. 1: none)

   Introduced false powderpost beetles would not likely cause large outbreaks nor do they affect live trees. They would breed primarily in dead wood on live trees. They could displace some native species of wood-boring beetles.

7. Social and political considerations: *Low* (VC) (Applicable risk criterion from Ch. 1: none)

   False powderpost beetles do not cause aesthetic damage in forests. Damage to hardwood components in structures or finished hardwood products destined for export would be rare. Control methods for false powderpost beetles are available but can be expensive. Fumigant gases stop infestations but provide no residual protection. Furthermore, one of the fumigant gases (methyl bromide) is being phased out of product due to concerns over adverse effects to environmental quality through depletion of the ozone layer.

C. Pest risk potential:
Logs—*High* (Likelihood of introduction = *High*; Consequences of introduction = *Moderate*)
Chips—*High* (Likelihood of introduction = *High*; Consequences of introduction = *Moderate*)

As the eggs and larvae of false powderpost beetles would likely survive the chipping process and could survive transit, the pest risk potential for chips remains "*High.*"

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Reviewers' comments—"I very much doubt survival in woodchips for any of these species." (Bashford)

"Bostrichidae in Tasmania: *Mesoxylion* (*Xylion*) *collaris* (Erichson) is a common species in *Eucalyptus*, *Banksia* and *Acacia* species; *Xylion cylindricus* (Macleay) is an uncommon species. *Xylobosca bispinosa* (Macleay) is a common species. *Xylopsocus gibbicollis* (Macleay) has been collected in pitfall trap, but is uncommon. *Xylobosca canina* (Blackburn) in *Acacia dealbata* is uncommon." (Bashford)

"*M. collaris* attacks a wide range of eucalypts within a week of the trees being felled, debarking at landing prevents attack. Have not seen any attack in debarked logs. The other species are not a problem from Tasmania." (Bashford)

"The pest risk assessments for these two groups of insects (true powderpost beetles and false powderpost beetles) are well written and thorough. However, I question whether either powder post beetles or false powder post beetles could successfully complete development in chips. As discussed, chips average only 30 to 40 mm square by 10 mm thick and are not likely to be selected by adult females for oviposition. Is there any evidence that eggs or young larvae that survive the chipping process can complete their life cycle within chips? (It is hard to imagine that a beetle ranging in size up to 20 mm would be able to complete development in a 30 to 40 mm chip.) If larvae are unable to complete development in chips, then the likelihood of their introduction and establishment in the U.S. from chips would be nil. Unless their is strong evidence that powderpost beetle larvae can mature and emerge as adults equally well from eucalypt chips as from logs, I suggest the risk for entry potential (for emerging adults, not larvae) for powderpost beetles in chips be reduced to moderate or low (rather than high) for both groups of beetles. If such evidence exists, it should be cited in the assessment document. The entry potential on logs should retain a 'high' rating. You state 'If logs or chips arriving at a port are not immediately utilized or are left in a refuse pile, powderpost beetles can reinfest the parent material'; is this true for chips?" (Billings)

"Generally, the comments you provide are a good summary of the insect. The only minor additions I would make are that, unlike the pinhole borers (Platypodids, Scolytids, Lymexylids), there is no discolouration of the timber associated with insect activity. You mention that some species breed in both hardwood and softwoods, which is quite correct. However, it is important to state that auger beetles mainly attack hardwoods, their preferred host timber type. You state the boring dust of auger beetles is coarse, often containing small wood fragments—in my experience, the frass is fine and powdery, similar to that produced by lyctids." (Collett)

"There are many other hosts (non-eucalypt) for these beetles, but I assume these are not relevant to importing of logs and chips into the USA. Some additional distributions for false powderpost beetles are: *Xylion cylindricus*—also found in Northern Territory, *Xylobosca bispinosa*—also found in Northern Territory, Western Australia and Tasmania, *Xylodeleis obsipa*—also found in Western Australia and Northern Territory." (Phillips)

Concerning pore size, the reviewer states "Female bostrichids tunnel into wood to oviposit, so I am not sure what the significance of pore size is for these guys." (Seybold)

"Some North American species have extended life cycles (e.g., *P. stoutii*). Not sure about this with Australian species." (Seybold)

"Like the lyctids, I wonder if there is evidence for survival and development in chips." (Seybold)

Response to comments—The distribution information provided by Bashford was included. This IPRA does not address prevention or remediation; however, these comments can be used by whoever develops guidelines for prevention and remediation. Even though there is doubt of survival or continued development in chips, this has yet to be proven or disproven.

All of the suggestions by Collett have been incorporated into the natural history and biology section. Phillips is correct in that our concern is limited to the eucalypt species identified in the scope of the assessment.

Pore size is significant. Bostrichids do construct egg galleries, but they deposit their eggs into the pores. The egg galleries cut across the pores and expose them. This is documented and discussed in Ebeling (1975) on pages 175–176 and Robinson (1990) page 289. There was no mention of an extended life cycle in the literature on Australian auger beetles. There is evidence for survival and development in chips. All we have is one empirical observation that concerns lyctids. The assessor assumed that the same possibility exists for bostrichids. This would be a good research project, both in the laboratory and by sampling chips arriving in Japan.

In response to concerns expressed by Billings, Bostrichids could be transported in chips as (1) adult hitchhikers, (2) eggs or larvae from logs that were later chipped, and (3) as eggs or larvae that started in chips, not logs. To the team's knowledge there is no experimental or empirical evidence of bostrichids selecting chips for ovipositing, eggs or larvae surviving the chipping process (although we strongly suspect they would), oviposition in chips (we strongly doubt this), or larvae completing their development in chips. It should not be assumed that a beetle larva would be restricted to a single chip to complete its life cycle. The chip piles at the originating port and receiving port, as well as during transit, are packed together and could allow larvae to move among the chips as if they were one piece of wood. Because we have no knowledge of the potential for bostrichids to successfully inhabit chips and survive transport, the team chose to err on the conservative side and maintain the pest risk potential at "*High*."