

Heterobostrychus aequalis (Waterhouse, 1884) (Coleoptera: Bostrichidae): Its interception at the Harbor of Rio de Janeiro and relevance as a quarantine pest (A1)




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ABSTRACT

Heterobostrychus aequalis (Waterhouse, 1884) (Coleoptera: Bostrichidae) is considered a severe pest for wood and wood products in regions where it is established. In Brazil, so far, there are no records of its establishment. Therefore, this work reports the interception of this Bostrichidae in the Harbor of Rio de Janeiro, on pallet wood from India. It also defends the maintenance of this insect as an absent quarantine pest (A1), by the Ministry of Agriculture, Livestock and Supply. It also conducts a discussion that addresses the efficiency of wood treatments, usually used to prevent the spread of quarantine pests in environments where there is international transit of wood, demonstrating that they may not be efficient in this regard, especially for insect species that have the capacity to lay eggs on dry wood. In this context, it also suggests population monitoring, combined with inspections, as an aid measure for the early detection of this pest in an environment where there is international transit of wood.

Keywords: Wood boring; wood pest; methyl bromide.

Bostrichidae are among the insects belonging to the order Coleoptera; they are featured by their small size and habit of building galleries inside wood. Some species damage stressed trees and recently cut logs (LUNZ et al., 2010). On the other hand, there are species characterized by critically damaging dry wood; they even have the ability to reinfest it for several generations, such as the case of bostrichid species *Heterobostrychus aequalis* (Waterhouse, 1884) (Coleoptera: Bostrichidae) that, based on WYLIE; PETERS (2016), damages log, dry wood, wooden boxes, pallets, plywood, furniture and other processed-wood goods.

So far, there is no record on the distribution of this bostrichid species in Brazil; therefore, Normative Instruction (NI) No. 42, from July 1, 2008 (BRAZIL, 2008) and NI No. 59, from December 18, 2013 (BRAZIL, 2013), classified it as a nonquarantine pest. However, NI No. 39, from October 2018 (BRAZIL, 2018) changed its status—this decision was kept when the document was updated, back in 2020 (BRAZIL, 2020). Normative Instruction is the document used by the Ministry of Agriculture, Livestock and Supply—also known as MAPA—to update the list of both quarantine pests and pests that are not distributed in the national territory. Given the aforementioned reclassification, *H. aequalis* is now in the list of insects whose action can be significantly hazardous for wood, and wood-derived goods, in locations where it is established (WOODRUFF; FASULO, 2012). This bostrichid species has high dispersion potential and a vast range of hosts; moreover, it can also contribute to substantial economic losses (AGUILERA, 2006). Therefore, it is reasonable to take into consider the efforts and public policies set to avoid this insect to establish in Brazil—the quarantine barriers stand out among these efforts. According to AZMI et al. (2011), the successful *H. aequalis* establishment in a new region is related to insufficient inspection, quarantine and inadequate log treatment.

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Accordingly, bostrichid pest establishment must be worrisome; the case of the bostrichid species *Sinoxylon unidentatum* (Fabricius, 1801) which, although exotic, established in Brazil, is an example of it. However, currently, it is the cause of a significant economic loss for teak wood (*Tectona grandis* L. f.) production and sales in the state of Mato Grosso (LUNZ et al., 2010).

Heterobostrychus aequalis is widely distributed in Eastern countries, including India, China, Indonesia and Papua New Guinea (SITTICHAYA; BEAVER, 2009); however, there are also records of its distribution in Africa, Europe, North and Central America, and in the Caribbean and Oceania, including Australia (CABI 2008; AZMI et al., 2011).

Thus, log coming from these regions, or that have crossed it, even temporarily, due to customs procedures, can be open to infection caused by *H. aequalis*. Therefore, its crossing and permanence in some areas can be the means for its outspread in regions where it is not yet established. Accordingly, wooden pallets are cargo packages often used for goods' exports, and these cargo supports can be the vehicle for intense transit of insects, including *H. aequalis*, between different geographic regions (PERES FILHO et al., 2006).

Therefore, the current study registered *H. aequalis* intercepts in wooden pallets used as cargo package coming from India, at the Harbor of Rio de Janeiro and to gather information to help highlight the need of reestablish the status of nonquarantine pest (A1), for this bostrichid species, in Brazil. This study also allowed suggesting the implementation of this insect's population monitoring in international log transit locations as a support measure to other quarantine actions already in place in these locations.

Heterobostrychus aequalis was intercepted during MAPA inspect audits in containers full of wooden pallets coming from India at the Harbor of Rio de Janeiro (22°52'33.0"S, 43°12'36.8"W) by federal tax auditors. The inspection found sawdust, at *baby powder* consistency, falling off the log used in pallets' manufacturing. Given such a finding, the material was collected by cutting little sections from different parts of the pallets presenting sawdust—it was done with the aid of a hand saw. These samples were stored in transparent plastic bags, which the mouths were sealed with masking tape. This material was inspected in a laboratory environment after its identification—specimens found inside the samples were collected.

Subsequently, the collected insects were placed in transparent glass containers filled with 50 mL of 70% alcohol. They were labeled as sample 14,627 and protocol No. 97,050/2017. This material was sealed and sent to a laboratory accredited in the National Network of Agricultural Laboratories of the Unified Agricultural Health Care System, in the city Porto Alegre, state of Rio Grande do Sul, Brazil, for taxonomic identification purposes.

It is worth informing that the insects were collected from wood belonging to forest species that are exotic to the national flora and to the botanic group Angiospermae; therefore, it was not possible to confirm the species' identification. The analysis of cargo documents also allowed to identify that these wooden packages were treated with methyl bromide in the country of origin.

Heterobostrychus aequalis occurrence in this type of material complies with that of PENTEADO et al. (2010), who have listed the most likely materials for this bostrichid species introduction. They informed that the log used in packages and supports for goods is among these materials. MONTEFERRANTE et al. (2018) also carried out a *H. aequalis* intercept in imported wood, at the Harbor of Santos, state of São Paulo, Brazil. These authors have reported that bostrichid was the most frequently intercepted insect taxon in the Harbor of Santos, between 2015 and 2017, compared to the other intercepts. This record highlights the relevance of this group of insects due their ability to disperse in wooden packages, which are used as a substrate for their development.

Back on August 11, 2017, the taxonomic identification carried out by the laboratory accredited in the National Livestock laboratories confirmed *H. aequalis* as a nonquarantine pest (A1). With respect to this register, it essentially specifies NI No. 41, which was in place at that time; therefore, this bostrichid species was classified in this group and it allowed implementing all procedures concerning the intercept of a quarantine pest. Nowadays, it would not happen because of this pests' nonregulation. Thus, based on NI No. 32, goods and wood supports must be subjected to quarantine phytosanitary treatment and sent back to the country of origin, in case a quarantine pest is detected. This procedure was applied to pallets coming from India, which housed the collected insects.

It is also important to pinpoint that the taken actions were in compliance with the International Convention for the Protection of Plants —Brazil is a member of it. Therefore, the country was in line with the International Standards for Phytosanitary Measures (ISPM) No. 15 (BRAZIL, 2010). Yet, standards, among them NI No. 36/2006 (BRAZIL, 2006), NI No. 32/2015 (BRAZIL, 2015), NI No. 28/2016 (BRAZIL, 2016a) and NI No. 33/2016 (BRAZIL, 2016b), as well as standard physical inspection procedures carried out by MAPA inspectors, are put in place to prevent pests A1 and A2 from outspreading.

Thermal treatment and methyl bromide fumigation in wooden packages—both procedures recommended by ISPM No. 15—overall emerge as efficient at healing scope; in other words, they rule out pests found in log when the treatment is applied. However, these procedures do not have residual action, i.e., they do not give biocidal features to wood after their application (ADAPAR, 2017). Accordingly, based on such a feature, they do not stop wood from being infested after it is subjected to treatment.

Thus, by taking into account that cargos are stored in harbor and airport sheds while they wait for customs' procedures, it is possible to assume that their reinfestation and infestation can happen since wood does not present biocidal features. It is worth adding to this hypothesis that there is a series of coleopteran capable of laying eggs on dry wood, among them one finds

H. aequalis. With respect to this behavior, it is interesting shining light on the quarantine pest species (A1) *Hylotrupes bajulus* (Linnaeus, 1758) (Coleoptera: Cerambycidae), which has the habit of infesting wood under the aforementioned conditions (QUERNER, 2019).

Based on the herein presented intercept context, it is not possible stating whether the treatment with methyl bromide was actually applied to the assessed cargo, as reported in the cargo documents, or whether it was properly applied, or, yet, whether the infestation occurred after treatment application. However, reports, such as the current one, must be taken into consideration, since they point out the need of reasoning about whether healing methods that are currently applied in log used for packaging purposes are actually efficient in stopping quarantine pests from outspreading, and whether the adoption of preservation treatments could be a more efficient alternative for the methods recommended in ISPM No. 15 (BRAZIL, 2009).

Therefore, it is possible assuming that the existing treatments can be revised and changed, and that the new alternative treatments, and treatment protocols for wooden packaging material, can be adopted by the Commission for Phytosanitary Measures. Accordingly, it is essential informing that there is a series of chemical products and processes focused on wood protection; they are classified as safe when it comes to their toxicity in humans and in the environment, as reported by LEPAGE et al. (2017). Thus, these new products and processes can be considered alternative to the ones currently applied in logs used for these packages' manufacturing and, consequently, to promote higher resistance against the action of quarantine xylophagous insects.

Yet, the application of entomological traps for population monitoring purposes stands out among auxiliary actions that can be implemented in locations where there is a transit of international log. Thus, the capture and monitoring of bostrichid species are often carried out in forest entomology studies (CARVALHO; TREVISAN, 2015). XAVIER et al. (2018), by referring to the detection of quarantine bostrichid species *S. unidentatum*; and BOONE et al. (2019), by referring to Cerambycidae belonging to genus *Monochamus*, equally suggested that monitoring, based on entomological traps, was carried out in harbors and airports, mainly in locations where there is storage and transit of log and wooden materials. Therefore, this strategy, along with customs' inspection, can improve the efficiency and early detection of quarantine organisms, a fact that would allow sanitary measures to be taken in anticipation to rule out the insect in question and, consequently, to avoid its outspread in the environment.

After all that said, it is possible to conclude that *H. aequalis* is not established in Brazil, but it is seen as relevant pest for log and wooden derivative products, worldwide. There are reports on intercepts of this species in the Brazilian harbors, and it opens room for the possibility if its dispersion and establishment in the country, as reported in other countries. Thus, it is recommended to reestablish the nonquarantine pest (A1) status for *H. aequalis*. The methyl bromide-based treatment does not give wood any residual action, and it allows insects — that have the ability to use this substrate for offspring development — to lay eggs on it. The healing treatments are widely applied in log used in packages for cargo set for international trade; therefore, it is important to assess the possibility of applying preservation treatments in these wood products to protect them from post-treatment infestation. It is recommended to carry out a population monitoring to prevent and early detect quarantine pests by installing entomological traps in locations where there is international transit of log.

AUTHORS' CONTRIBUTIONS

Conceptualization: Souza, T.S.; Trevisan, H.; Xavier, R.L.; Coimbra, H.T.; Porto, C.M.L. **Data curation:** Coimbra, H.T.; Porto, C.M.L. **Investigation:** Souza, T.S.; Trevisan, H.; Xavier, R.L.; Coimbra, H.T.; Porto, C.M.L. **Methodology:** Souza, T.S.; Trevisan, H.; Xavier, R.L. **Project administration:** Souza, T.S.; Trevisan, H. **Supervision:** Souza, T.S.; Trevisan, H.; Xavier, R.L.; Coimbra, H.T.; Porto, C.M.L. **Validation:** Souza, T.S.; Trevisan, H. **Writing – original draft:** Souza, T.S.; Trevisan, H.; Xavier, R.L.; Coimbra, H.T.; Porto, C.M.L. **Writing – review & editing:** Souza, T. S.; Trevisan, H.

AVAILABILITY OF DATA AND MATERIAL

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CONFLICTS OF INTEREST

All authors declare that they have no conflict of interest.

ETHICAL COMMITTEE

Not applicable.

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