The Coleopterists Bulletin 78(2): 266–269. 2024.

SCIENTIFIC NOTE

Cryptolestes pusilloides (Steel and Howe) (Coleoptera: Laemophloeidae) Infesting Commercial Dried Mushrooms

Tyler E. Golbus
210 Rolling Creek Circle
Irmo, SC 29063-8383, USA
tylergolbus@gmail.com

and

Michael L. Ferro*
Clemson University Arthropod Collection
Department of Plant and Environmental Sciences
277 Poole Agricultural Center
Clemson University, Clemson, SC 29634-0310, USA
spongymesophyll@gmail.com
*Corresponding author

DOI.org/10.1649/0010-065X-78.2.266

The lined flat bark beetle *Cryptolestes pusilloides* (Steel and Howe) (Laemophloeidae) is a minor stored product pest. The species was originally described in the genus *Laemophloeus* Dejean within the family Cucujidae (Steel and Howe 1952) and can be found in the literature under any combination of the above. *Cryptolestes pusilloides*, which probably originated from Australia, was unknown prior to the 1940s but had spread throughout the Southern Hemisphere by the end of, and probably because of, the Second World War (Howe and Lefkovitch 1957). Currently, *C. pusilloides* has been reported from 39 countries (Hagstrum *et al*. 2013; Obretenchev 2013) but is probably not established in all of them—the species requires humidity above 50% to successfully reproduce (Lefkovitch 1964) and cannot survive outdoors in cold regions (individuals failed to live longer than 16 days in an unheated building during November in Slough, England) (Solomon and Adamson 1955). *Cryptolestes pusilloides* has been reported to infest the following commodities: almond; aniseed (anise spice); barley; basketware, wicker; bean; betel nut (areca nut); carob; carob meal; cashew; cereal (cereal product); coffee bean; date; grain product; grain, cereal; maize; maize cob; maize meal; mushroom, dried; oilseed; oilseed product; peanut; pepper, pod dried chili; plum; rice; seafood, dried; seaweed, dried; sorghum (broomcorn); spice; wheat; wheat bran (pollard); wheat flour; and wheat product (Hagstrum *et al*. 2013).

A retailer in Greenville, South Carolina, USA discovered an infestation of *C. pusilloides* (Fig. 1) in Nagrani brand Gourmet Wild Dried Mushrooms Forest Blend. The blend consists of "Oyster, Shiitake, Porcini, Boletes" mushrooms: **presumably** *Pleurotus ostreatus* (Jacq. ex Fr.) P. Kumm. (Agaricales: Pleurotaceae), *Lentinula edodes* (Berk.) Pegler (Agaricales: Omphalotaceae), *Boletus edulis* Bull. (Boletales: Boletaceae), and other members of the order Boletales, respectively. Assuming the mushrooms were accurately identified, this represents the first species-level record of mushroom commodity use by *C. pusilloides.*

Specimens were identified to *C. pusilloides* using Halstead (1993). Additional keys to adults are found in Banks (1979), Delobel and Tran (1993), Lefkovitch (1962), and Thomas (1988, 1993). Hossain *et al.* (1986) provided a key to mature larvae and Kučerová and Stejskal (2002) described the eggs. Adult specimens were cleared of soft tissue by immersion in a warm 10% aqueous solution of potassium hydroxide as needed (Halstead 1986) [Banks (1979) provided an alternative, but much more complicated, clearing protocol]. Two male and two female specimens were cleared, then immersed in alcohol and the elytra and flight wings were removed to visualize the genitalia from a dorsal

Fig. 1. *Cryptolestes pusilloides*, adult female, dorsal view (top) and mature larva, ventral view (bottom).

aspect. Setal patterns of the head and elytra matched *C. pusilloides* as well.

Cryptolestes pusilloides has been reported from dried mushrooms (Archibald and Chalmers 1983; Delobel and Tran 1993; Hagstrum *et al.* 2013; Hagstrum and Subramanyam 2009; Halstead 1993; Halstead and Mifsud 2003; Imura 2003) but only five original reports of *C. pusilloides* infesting mushrooms could be found in the literature. Howe and Lefkovitch (1957) reported *C. pusilloides* from "dried mushrooms bought from shops in Sydney, N.S.W. [Australia]". Richardson (1979) reported *C. pusilloides* was intercepted at New Zealand ports in "dried mushrooms" from Japan, Hong Kong, and Singapore. Keall (1981) reported *C. pusilloides* intercepted at New Zealand ports in "dried mushrooms" from Australia, Hong Kong, Malaysia, and Taiwan. Zimmerman (1990) reported *C. pusilloides* in dried mushrooms from Hong Kong intercepted at the US border at California and (or) Arizona. Champ (2003) reported *C. pusilloides* from Australia, stating: "Most current records are from dried Asian mushrooms". Other than the Zimmerman (1990) interception, *C. pusilloides* has only been reported within the continental United States once, based on a specimen from Minneapolis, Minnesota collected during 1941 (Howe and Lefkovitch 1957).

Within the current infestation reported in this paper, specimens of *C. pusilloides* were found uniformly throughout the sample of dried mushrooms, with damage to all mushrooms following a non-specific pattern, not appearing to show a preference for a specific mushroom type. Specimens of *C. pusilloides* were found alive in all stages of development, with hundreds of eggs and numerous live larvae, pupae, and adults throughout the sample. One wonders how dry the dried mushrooms could have been if the species requires 50%+ humidity to reproduce. Specimens were deposited in the Clemson University Arthropod Collection (CUAC), Clemson University, Clemson, South Carolina.

The mushroom blend was a "Product of: Bulgaria, China & Chile". The final product was shipped from China, but no additional information is available on the origin of the specific mushrooms used. Hagstrum and Subramanyam (2009) reported *C. pusilloides* as "introduced" in China but its establishment there is unclear. The species was collected in Bulgaria

once during 1974 from wheat (Obretenchev 2013); however, it has not been determined to be established there. The species has never been reported from Chile but has been reported from other South American nations with similar climates including Argentina, Brazil, Colombia, Guyana, and Uruguay (Aguirre and Gaigl 2022; Hagstrum *et al*. 2013). Conceivably, the infestation could have originated in any of the three countries.

The non-specific pattern of damage across various mushroom types implies a lack of preference for a particular species, indicating that *C. pusilloides* may exploit a diverse array of stored mushrooms. As climate changes due to global warming the species may continue to capitalize on global trade and, if not stopped at the border, could establish populations in new regions including within the United States.

Acknowledgments

We thank Ward Watson and Olga Katic for discovering the infestation and sharing the specimens. The project would have been greatly diminished without Biodiversity Heritage Library (www.biodiversitylibrary.org) and Resource Sharing (Interlibrary Loan and Scan & Deliver) at Clemson Libraries. Technical Contribution No. 7273 of the Clemson University Experiment Station (Project # 1700596).

References Cited

Aguirre, L. R., and A. Gaigl. 2022. First record of *Cryptolestes pusillus* and *Cryptolestes pusilloides* (Coleoptera: Laemophloeidae) in Colombia. Journal of Agricultural and Urban Entomology 38(1): 16–20. doi.org/10.3954/1523-5475-38.1.16.

Archibald, R. D., and I. Chalmers. 1983. Stored product Coleoptera in New Zealand. New Zealand Entomologist 7: 371–397.

Banks, H. J. 1979. Identification of stored product *Cryptolestes* spp. (Coleoptera: Cucujidae): A rapid technique for preparation of suitable mounts. Journal of the Australian Entomological Society 18(3): 217–222. doi.org/10.1111/j.1440-6055.1979.tb00842.x.

Champ, B. R. 2003. Insect pests of stored products in Australia [pp. 89–141]. *In*: Insect Pests of Stored Products: A Global Scenario (A. Prakash, J. Rao, D. S. Jayas, and J. Allotey, editors). Applied Zoologists Research Association, Cuttack, India, 281 pp.

Delobel, A., and M. Tran. 1993. Les Coléoptères des denrées alimentaires entreposées dans les régions chaudes. Faune Tropicale 32: 1–425.

Hagstrum, D. W., T. Klejdysz, B. Subramanyam, and J. Nawrot. 2013. Atlas of Stored-Product Insects and Mites. AACC International, St. Paul, Minnesota, USA, 589 pp.

Hagstrum, D. W., and B. Subramanyam. 2009. Stored-product Insect Resource. AACC International, St. Paul, Minnesota, 509 pp.

Halstead, D. G. H. 1986. Keys for the identification of beetles associated with stored products. I—Introduction and key to families. Journal of Stored Products Research 22(4): 163–203. doi.org/10.1016/0022-474X(86)90011-1.

Halstead, D. G. H. 1993. Keys for the identification of beetles associated with stored products—II. Laemophloeidae, Passandridae and Silvanidae. Journal of Stored Products Research 29(2): 99–197. doi.org/10.1016/0022-474X(93)90030-8ga.

Halstead, D. G. H., and D. Mifsud. 2003. Silvanidae and Laemophloeidae (Coleoptera: Cucujoidea) from the Maltese Islands (Central Mediterranean). The Central Mediterranean Naturalist 4(1): 41–46.

Hossain, M., P. H. Verner, and R. Rezaur. 1986. Taxonomic descriptions of the mature larvae of six species of *Cryptolestes* (Coleoptera: Cucujidae). Bangladesh Journal of Zoology 14(2): 139–148.

Howe, R. W., and L. P. Lefkovitch. 1957. The distribution of the storage species of *Cryptolestes* (Col., Cucujidae). Bulletin of Entomological Research 48: 795–809. doi.org/10.1017/S000748530000290X.

Imura, O. 2003. Insect pests of stored products in East Asia (Japan and Korea) [pp. 203–216]. *In*: Insect Pests of Stored Products: A Global Scenario (A. Prakash, J. Rao, D. S. Jayas, and J. Allotey, editors). Applied Zoologists Research Association, Cuttack, India, 281 pp.

Keall, J. B. 1981. Interceptions of Insects, Mites and Other Animals Entering New Zealand During 1973–78. Plant Health Diagnostic Station, Levin, New Zealand, 661 pp.

Kučerová, Z., and V. Stejskal. 2002. Comparative egg morphology of silvanid and laemophloeid beetles (Coleoptera) occurring in stored products. Journal of Stored Product Research 38: 219–227.

Lefkovitch, L. P. 1962. Revision of African Laemophloeinae (Coleoptera: Cucujidae). Bulletin of the British Museum (Natural History) Entomology 12: 165–245. doi.org/10.5962/bhl.part.5875.

Lefkovitch, L. P. 1964. The biology of *Cryptolestes pusilloides* (Steel & Howe) (Coleoptera, Cucujidae), a pest of stored cereals in the Southern Hemisphere. Bulletin of Entomological Research 54(4): 649–656. doi.org/10.1017/S0007485300049087.

Obretenchev, D. 2013. New insects established in storage biotopes and the processing enterprises of Bulgaria. Acta Entomologica Bulgarica 19(1–2): 109–121.

Richardson, C. A. 1979. Interceptions of Insects, Mites and Other Animals Entering New Zealand During 1966–72. Plant Health Diagnostic Station, Levin, New Zealand, 473 pp. [not consecutively paginated]

Solomon, M. E., and B. E. Adamson. 1955. Powers of survival of storage and domestic pests under winter conditions in Britain. Bulletin of Entomological Research 46(2): 311–355. doi.org/10.1017/S0007485300030947.

Steel, W. O., and R. W. Howe. 1952. A new species of *Laemophloeus* (Col.: Cucujidae) associated with stored products. Proceedings of the Royal Entomological Society of London B 21: 86–88.

Thomas, M. C. 1988. A revision of the New World species of *Cryptolestes* Ganglbauer (Coleoptera: Cucujidae: Laemophloeinae). Insecta Mundi 2(1): 43–65.

Thomas, M. C. 1993. The flat bark beetles of Florida (Coleoptera: Silvanidae, Passandridae, Laemophloeidae). Arthropods of Florida and Neighboring Land Areas 15: 1–93.

Zimmerman, M. L. 1990. Coleoptera found in imported stored-food products entering southern California and Arizona between December 1984 through December 1987. The Coleopterists Bulletin 44(2): 235–240.

(Received 16 January 2024; accepted 14 February 2024. Publication date 21 June 2024.)