Zootaxa 4991 (1): 185–191
https://www.mapress.com/j/zt/

Article

ISSN 1175-5326 (print edition)
ZOOTAXA
ISSN 1175-5334 (online edition)

https://doi.org/10.11646/zootaxa.4991.1.11
http://zoobank.org/urn:lsid:zoobank.org:pub:B74D7881-915D-47C2-A9D3-82634048E753

Another new exotic bark beetle in Florida: *Ernoporus parvulus* (Eggers, 1943) (Coleoptera: Curculionidae: Scolytinae), with additional taxonomic changes

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Abstract

The bark beetle, *Ernoporus parvulus* (Eggers, 1943) was collected from Pinellas County, Florida, USA representing the first North American record of the genus. Two species previously described from the Caribbean were examined and are synonymous: *Ernoporus minutus* (Bright & Torres, 2006) **syn. nov.** and *E. exquisitus* (Bright, 2019) **syn. nov**. This beetle is likely an overlooked exotic from Africa, known only from sea hibiscus, *Taliparitiliaceum* (L.) Fryxell (Malvaceae). There is no evidence that this is a threat to commercial or ornamental *Hibiscus* and related species.

Key words: Taxonomy, alien species, Ernoporini, adventive species, *Hibiscus tiliaceus*

Introduction

Bark and ambrosia beetles are some of the insects most frequently intercepted at international ports of entry, accounting for an estimated 60% of intercepted woodborers in the United States (Haack 2006). There has been a steady accumulation of adventive species being reported in North America, facilitated by the investment in monitoring schemes, and to the development of resources and expertise for identification. These reports are important because bark and ambrosia beetles play a disproportionate role in catastrophic diseases in forests and are establishing at an alarming rate.

The process of collecting new exotic scolytines often relies on extensive trapping programs (e.g., Rabaglia *et al*. 2019). However, many of these species are not attracted to such traps, and it is not economical to develop and utilize specific traps for all possible species. Therefore, discovery of these new exotics sometimes relies on reports of damage or incidental discoveries by experts, growers, or regulatory officials.

At Fort De Soto Park, Pinellas County, Florida, several hanging twigs of sea hibiscus or mahoe, *Taliparitiliaceum* (L.) Fryxell (Malvaceae) had numerous tiny circular holes, indicating the presence of a small bark beetle with non-communal galleries. There are no known species in Florida which make such galleries on this particular host. When viewed by peeling back the bark, the identity of the genus was unmistakable. The stout body shape, brownish color, and erratic movement is typical of *Ernoporus* Thomson, 1859, a small genus in the tribe Ernoporini. These beetles are common in Eurasia and Africa, and there are several recent records in the Caribbean, but are not known from North America. The taxonomic identity of this bark beetle was further investigated.

Materials and methods

Two hundred and thirty-nine specimens were collected at Fort De Soto Park (Pinellas County, Florida, USA) in April, 2021 from twigs (0.5–2.0 cm diameter) and immersed in 95% ethanol.

Specimens were photographed with a dSLR (Canon m50) mounted on a compound microscope (Olympus BX53). Photographs were focus-stacked using Helicon Focus (Helicon Soft), and edited in Photoshop (version CC2020, adobe.com). Twenty-five specimens were point mounted and distributed to the National Museum of Natu-

Accepted by S. Smith: 2 Jun. 2021; published: 23 Jun. 2021

ral History, Washington D.C. (USNM) and the Florida State Collection of Arthropods, Gainesville, Florida (FSCA), the synoptic collection at the Department of Primary Industries, Gainesville, Florida, and the University of Florida Forest Entomology collection, Gainesville, Florida (UFFE).

Two specimens were processed to obtain DNA sequences. These specimens were photographed as above, the DNA was extracted and amplified using the same protocols and primers as Johnson *et al*. (2017), obtaining sequences for the partial Cytochrome Oxidase I gene (COI) and the large nuclear ribosomal subunit gene (28S). Sequence databases were searched using BLAST web platform (https://blast.ncbi.nlm.nih.gov/Blast.cgi), using megablast to search the NCBI Nucleotide collection (nr/nt), and the BOLD data system (Ratnasingham & Hebert 2007).

Diagnostic characters given are based on close examination of the specimens listed, and examination of subsequent photos. The size range is based on the smallest and largest samples picked out by eye from the sample.

The host plant name usage, *Taliparitiliaceum*, is based on the accepted name in the Tropicos database (Tropicos.org, accessed 2021-May-25), and The Plant List (theplantlist.org accessed 2021-May-25). The basionym *Hibiscus tiliaceus* L. is also widely used in current literature.

Results

Ernoporus Thomson, 1859

Diagnosis. This genus can be distinguished from all other North American genera by the combination of the eye, which is entire, with its center slightly below level of the antennae, and the concentric rows of asperities on the pronotum. Some *Pseudothysanoes* Blackman, 1920 (Micracidini) are superficially similar but do not have concentric rows of asperities, and the center of the eye is above the level of the antennae. *Trypolepis* Bright, 2019 (Corthylini), a monotypic genus from the Caribbean, is somewhat similar based on the small size, concentric asperities and abundant scale-like setae, but has a broadly emarginated eye. Several *Pityophthorus* Eichhoff, 1864 (Corthylini) have concentric asperities, but also have an emarginated eye.

Ernoporus parvulus (Eggers, 1943)

(Figs. 1A–B, 2A–H, 2J–L)

Margadillius parvulus Eggers, 1943: 75.
Ernoporus parvulus (Eggers, 1943): Johnson *et al*. 2020a: 56.
Allothenemus minutus Bright & Torres, 2006: 400.
Ernoporus minutus (Bright & Torres, 2006): Johnson *et al*. 2020a: 56. **syn. nov.**
Allothenemus exquisitus Bright, 2019: 105.
Ernoporus exquisitus (Bright, 2019): Johnson *et al*. 2020a: 56. **syn. nov.**

Type material examined. MOZAMBIQUE • 1 ♀ **Lectotype *Margadillius parvulus* Eggers, 1943**. "Zembeze", "Nova chomupanga pres Chemba" [Mozambique, Sofala Province, Marromeu District, Chupanga] [label not directly transcribed]; Naturhistorisches Museum Wien, Vienna, Austria.

DOMINICAN REPUBLIC • 1 ♀ **Holotype *Allothenemus exquisitus* Bright, 2019**; La Altagracia, "DOMINICAN REPUBLIC // Prov. La Altagacia // Nisbon, "Papagallo", 16-19-VI-98// R.Woodruff-P.Freytag // Blacklight trap" (FSCA).

Other material examined. UNITED STATES • 3 ♀♀, 4 ♂♂; Florida, Pinellas County, Fort De Soto; 27.6313°N,-82.7238°E; 28 Apr. 2021; A. J. Johnson leg.; ex. *Taliparitiliaceum*; Walking on recently snapped branch; UFFE:36836 • 1 ♂; Florida, Pinellas County, Fort De Soto; 27.6313°N,-82.7238°E; 29 Apr. 2021; Andrew J. Johnson leg.; ex. *Taliparitiliaceum*; under bark of twigs; dissected; UFFE:36823 • 1 ♀; Same collection data; imaged and DNA destructively extracted; UFFE:36821 • 1 ♂; Same collection data; imaged and DNA destructively extracted; UFFE:36822 • 9 ♀♀, 16 ♂♂ Same collection data; labeled: "USA: Florida: Pinellas Co. // Fort De Soto, 27.6313°N, // -82.7238°E; 2021-Apr-29// ex. *Taliparitiliaceum* //twigs. A. J. Johnson coll." (point mounted and distributed to USNM, FSCA, DPI synoptic collection, and UFFE).

PUERTO RICO • 1 ♀, [photo presented in Bright, 2019, no collection data]; 1 ♂; Arecibo, Arecibo, Site 12,

EDRR, 18.45271, -66.59809, 20.VI-3.VII.2013, C. Torres and H. Rivera (A.J. Cook Arthropod Research Collection, Michigan State University) [Specimen briefly examined by AJJ, November 2014; Photographs by Mark Smith, macroscopicsolutions.com re-examined, and label data from Bright 2019].

SOUTH AFRICA • 30; KwaZulu-Natal, Mtunzuni; -28.96°N,31.77°E; 29 Oct. 2019; Francois Roets leg.; ex. *Talipariti tiliaceum*; FR-0; UFFE:33597; (UFFE) • 1; KwaZulu-Natal, Mtunzuni; -28.9567°N,31.7719°E; 31 Oct. 2019; Andrew J. Johnson leg.; ex. *Hibiscus tiliaceus* [=*Talipariti tiliaceum*]; UFFE:36817; (UFFE).

Diagnosis: Female. Length 0.9–1.1 mm, 2.0 times as long as wide. Frons mostly convex, with a weakly concave area in the middle and a small fovea. Antennae with three funicle segments, 1st about the same size as the 2nd and 3rd combined. Antennal club flat, slightly longer than wide. Antennal sutures weakly procurved, evenly distributed across outer surface (downward facing surface in living beetles). The last (most apical) suture is marked by dense, short setae.

Anterior margin of pronotum with four serrations, the median pair slightly larger. Three concentric rows of asperities on the pronotum, the first and second row often broken into two or three concentric groups. Pronotal summit with a short concentric row or irregular oval of contiguous asperities. Lateral margin of pronotum rounded. Pronotum with some scale like setae, especially along basal margin and along median of pronotal disc. Hypomeron with sparse hair-like setae.

Elytral disc approximately one half of elytral length. Elytral striae visible as rows of shallow punctures and strial setae. Interstrial bristles scale-like, 1.0–2.5 times as long as wide, spaces about the same distance as between rows on elytral disc, and to about half of the distance on the declivity. Very few, often none, scale-like setae in interspaces on declivity (interstrial ground vestiture). Declivity with small, barely discernable granules above each interstrial and strial seta. Protibiae with 3 or four equally sized denticles on the outside edge, on the apical third. Setae on protarsi fine hair-like, bifid at end (Fig. 2E).

Male. Very similar to female except with a concave frons, at about the upper level of eyes, fovea missing from middle, cuticle on upper parts of the frons strigose. Pronotum similar except anterior pronotal margin slightly more forward projected, and spacing from margin to first row larger than on female. Protibiae with feather-like setae (Fig. 2F). Proventriculus (Fig. 2G) typical of genus with short, unarmed apical plate, and tuft of upward pointing setae below masticatory brush. Aedeagus typical of genus, Penis apodemes fused (Fig. 2H). End plate well developed, with a pair of basal sclerites each with a rounded lobe, plus a long projection.

Sequence data. We obtained COI and 28S for this species from two specimens from Florida (UFFE:36821: COI:MZ291629, 28S:MZ289896. UFFE:36822: COI:MZ291628, 28S:MZ289895). One specimen from South Africa was also sequenced as part of a different project (Roets *et al*. unpublished). (COI:MZ291624, 28S:MZ289899). COI had 99.4% identity between samples, 28S was identical. When GenBank and BOLD databases were searched, there were no close matches for COI (all <85% identity). A search of the 28S sequences found that the closest match was *Ernoporus corpulentus* (Sampson, 1919) (97.4% identity). The specimens from Florida and South Africa did not closely match specimens previously determined as *E. parvulus* from Thailand (28S:MT122092, 93.5% identity), corroborated by morphological differences noted below. For all specimens of *E. parvulus*, the 28S was a low read-quality sequence, due to a variable insertion or deletion in the middle of the target region. Consequently, the second half of all sanger reads were partly offset by one base, and not easily discernable, so the 28S sequences are made from only single read coverage over its whole length.

Interspecific variation. The arrangement of the asperities on the pronotal slope is variable, with the first and second row often broken into three or two groups respectively, with some specimens having more aberrant patterns. The antennal club is also sometimes variable, with some specimens possessing incomplete or malformed sutures. The scale-like setae on declivital interstriae 4 and 5 are also variable in shape and proportions, from nearly circular (often in smaller specimens) to more than twice as long as wide, with a somewhat pointed tip (usually in larger specimens). The mature color of specimens collected in flight or arriving at new hosts is also variable, from light brown to almost black.

Taxonomic notes. The first report of this species in the Americas was by Bright & Torres (2006), in which two specimens from Puerto Rico did not match any of the Caribbean fauna, and was described as a new genus and species, *Allothenemus minutus*. Later, Bright (2019) described an additional species of *Ernoporus* (as *Allothemenus*) from a single specimen diagnosed by the slightly larger size, and by the arrangement of the first row of asperities. The distinction between the two putative species is unjustified. The photos of *E. minutus* by Bright (2019, pages 451 and 461) show all of the diagnostic characters that are given for *E. exquisitus*. The large series collected in Florida

represents a near continuous range of sizes and variable arrangements of the first row of asperities on the pronotal declivity, with the first row as a contiguous row, or broken into two or three groups, and the second row contiguous or in two groups. The alternative diagnostic characters that vary between other *Ernoporus* spp. are otherwise identical between *E. minutus* and *E. exquisitus*.

Ernoporus minor (Schedl, 1942) is a very similar species, collected from a closely related host plant in Malaysia, *Taliparitimacrophyllum* (Roxb. ex Hornem.) Fryxell. Based on the lectotype (NHMUK) and paralectotype (NHMW), the antennae differ in that the third antennal suture is very close to the top of the antennae, and the gap to the next one is large. The antennae are particularly diagnostic among other *Ernoporus* species, by the club with a varying number and shape of visible sutures, although it is possible that the specimen is malformed and is of the same species as *E. parvulus*.

A species of *Ernoporus* from Thailand was previously identified as *E. parvulus* (Johnson *et al*. 2020a, Figs. 27C, F, 28E), but clearly differs by the abundant scale-like setae between the strial and interstrial rows on the declivity, and by comparing sequence data. Some other *Ernoporus* are similar, particularly *E. corpulentus*, which is much larger (typically greater than 1.4 mm), and males have a much more projected pronotal margin.

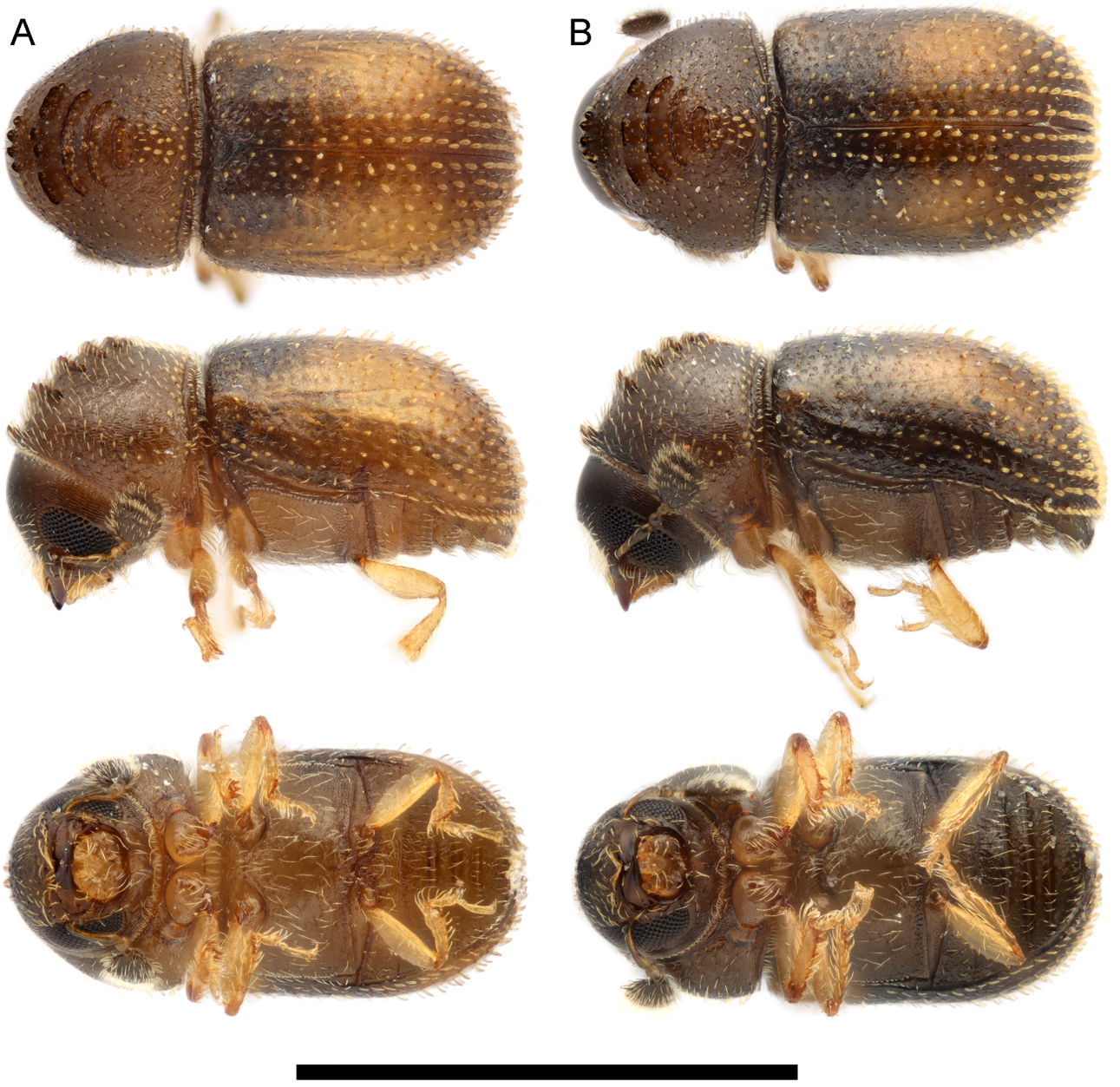

FIGURE 1. *Ernoporus parvulus* (Eggers, 1943). **A:** female, dorsal, lateral, and ventral photographs (UFFE:36956); **B:** male, dorsal, lateral, and ventral photographs (UFFE:36955).

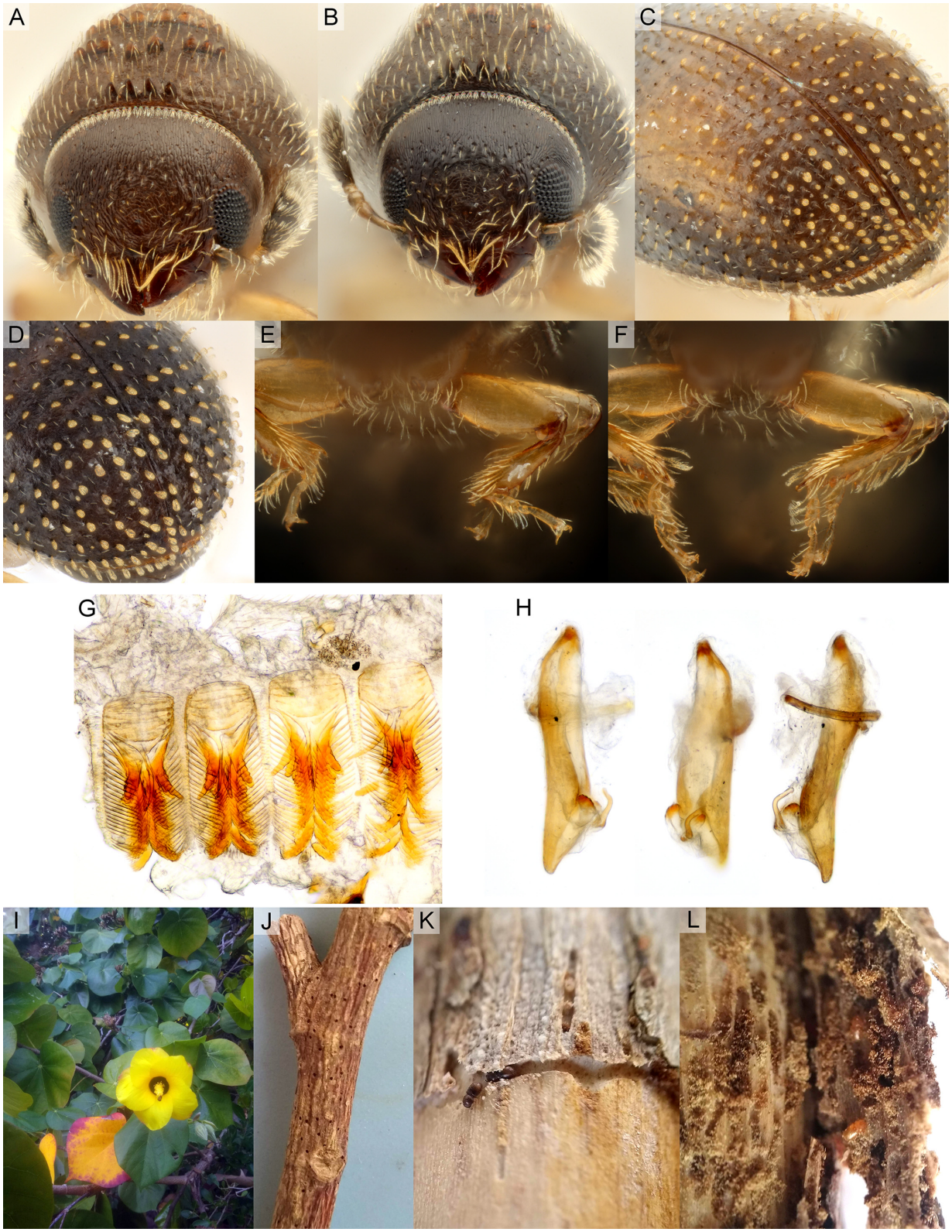

FIGURE 2. Photographs of *E. parvulus* morphology. **A:** frons of female (UFFE:36956), **B:** frons of male (UFFE:36955), **C:** declivity of female (UFFE:36956), **D:** declivity of male (UFFE:36823), **E:** prolegs of female (UFFE:36956), **F:** prolegs of male with feather-like setae (UFFE:36956), **G:** proventriculus (UFFE:36823), **H:** aedeagus taken from three angles (one of the elongate parts of the basal sclerites is missing) (UFFE:36823). Photographs of host material and galleries, **I**: *Taliparitiliaceum* (L.) Fryxell, with snapped twig in lower right where *E. parvulus* were collected, **J:** small twig with abundant, small, circular exit holes, **K:** pair of *E. parvulus* in transverse gallery, with longitudinal larval galleries exposed, **L:** teneral adults under peeled bark.

Biology. Known from *Taliparitiliaceum*. Found on twigs and branches 0.5–2.5 cm, and likely able to breed in larger diameter material. Galleries appear female initiated, joined by a male, and with a transverse gallery (Fig. 2K) almost circumscribing the whole twig in smaller material. Larval galleries run longitudinally, or chaotically in thicker bark (Fig. 2K–L).

Distribution. Mozambique; South Africa; Dominican Republic; Puerto Rico; Florida.

Economic significance. This species shows no behaviors associated with economic damage. There is no indication of these beetles attacking living plants. Their small size and ability to live in twigs may enable them to be transported though horticulture, especially on ornamental *Hibiscus* and *Taliparitiliaceum* species. There is no evidence that this species can live on native or economically important Malvaceae, such as common hibiscus, *Hibiscus syriacus* L., cotton, *Gossypium hirsutum* L., or okra, *Abelmoschus esculentus* (L.) Moench.

Discussion

The records presented here are the first record of any *Ernoporus* in the continental United States. The addition of *E. parvulus* brings the total scolytine species reported in Florida to 159 species (Atkinson 2021, www.barkbeetles.info, accessed 2021-05-17). The rate of introduction of exotic Scolytinae into the continental United States remains high, with at least ten species introduced in the last decade (Cognato *et al*. 2011; Rabaglia 2011; Rabaglia & Okins 2011; Smith & Cognato 2015; Leathers 2017; Johnson *et al*. 2017; Johnson & Ashman 2019a, 2019b; Rabaglia *et al*. 2020). Several of these species may have been established for some time before discovery.

The host plant, *Taliparitiliaceum* is widespread across tropical regions, and it is likely that *Ernoporus parvulus* is already established or will become established in other areas. In addition to Pinellas County, Florida, this non-native shrub or tree is distributed over much of South Florida, especially near mangroves. Further surveys of coastal areas are needed to understand if this is a recent introduction or a well-established but overlooked species that is not attracted to traps.

Acknowledgements

Two reviewers improved the manuscript. The author was supported by the USDA Forest Service, by the USDA Agricultural Research Service, and by the National Science Foundation.

Literature cited

Atkinson, T.H. (2021) Bark and Ambrosia Beetles. Available from: https://www.barkbeetles.info/ (accessed 18 May 2021)

Blackman, M.W. (1920) North American Ipidae of the subfamily Micracinae, with descriptions of new species and genera. *Mississippi Agricultural Experiment Station Technical Bulletin*, 9, 1–62, pls. I–V.

Bright, D.E. & Torres, J.A. (2006) Studies on the West Indian Scolytidae (Coleoptera) 4. A review of the Scolytidae of Puerto Rico, USA with descriptions of one new genus, fourteen new species and notes on new synonymy (Coleoptera: Scolytidae). *Koleopterologische Rundschau*, 76, 389–428.

Bright, D.E. (2019) A Taxonomic Monograph of the Bark and Ambrosia Beetles of the West Indies (Coleoptera: Curculionoidea: Scolytidae). Studies on West Indian Scolytidae (Coleoptera) 7. *Occasional Papers of the Florida State Collection of Arthropods*, 12, 1–491.

Cognato, A.I., Olson, R.O. & Rabaglia, R.J. (2011) An Asian ambrosia beetle, *Xylosandrus amputatus* (Blandford) (Curculionidae: Scolytinae: Xyleborini), discovered in Florida, USA. *The Coleopterists Bulletin*, 65 (1), 43–45. https://doi.org/10.1649/0010-065X-65.1.43

Eggers, H. (1943) Neue Borkenkäfer (Ipidae) aus Afrika, Nachtrag VIII. *Entomologische Blätter*, 39, 70–76.

Haack, R.A. (2006) Exotic bark- and wood-boring Coleoptera in the United States: recent establishments and interceptions. *Canadian Journal of Forest Research*, 36 (2), 269–288. https://doi.org/10.1139/x05-249

Johnson, A.J. & Ashman, K. (2019a) *Gnathoraptus mandibularis* Bright, a bark beetle, a new Continental USA record. *In*: *Halbert, S.E., Entomology Section*. *In*: Dixon, W.N. & Anderson, P.J. (Ed.), *TRI-OLOGY*, 58 (3), pp. 7–11.

Johnson, A.J. & Ashman, K. (2019b) *Pygmaeoborus cubensis* Bright, a bark beetle, a new Continental USA record. *In*: *Halbert, S.E., Entomology Section*. *In*: Dixon, W.N. & Anderson, P.J. (Ed.), *TRI-OLOGY*, 58 (3), pp. 7–11.

Johnson, A.J., Knížek, M., Atkinson, T.H., Jordal, B.H., Ploetz, R.C. & Hulcr, J. (2017) Resolution of a Global Mango and Fig Pest Identity Crisis. *Insect Systematics and Diversity*, 1 (2), 1–10.
https://doi.org/10.1093/isd/ixx010

Johnson, A.J., Hulcr, J., Knížek, M., Atkinson, T.H., Mandelshtam, M.Y., Smith, S.M., Cognato, A.I., Park, S., Li, Y. & Jordal, B.H. (2020) Revision of the bark beetle genera within the former Cryphalini (Curculionidae: Scolytinae). *Insect Systematics and Diversity*, 4 (3), 1 + 1–81.
https://doi.org/10.1093/isd/ixaa002

Leathers, J. (2017) California Pest Rating for *Phloeotribus scarabaeoides* (Bernard): Olive Bark Beetle (OBB) Coleoptera: Curculionidae Pest Rating Proposals and Final Ratings 2017-January-19. Available from: https://blogs.cdfa.ca.gov/Section3162/?p=3248 (accessed 18 May 2021)

Ratnasingham, S. & Hebert, P.D. (2007) BOLD: The Barcode of Life Data System (http://www. barcodinglife.org). *Molecular Ecology Notes*, 7 (3), 355–364.
https://doi.org/10.1111/j.1471-8286.2007.01678.x

Rabaglia, R.J. (2011) *Euwallacea interjectus*, a Western Hemisphere record. *In*: *Halbert, S.E., Entomology Section*. *In*: Dixon, W.N. & Anderson, P.J. (Ed.), *TRI-OLOGY*, 50 (3), pp. 6–9.

Rabaglia, R.J. & Okins, K.E. (2011) *Ambrosiodmus minor*, a Western Hemisphere record. *In*: *Halbert, S.E., Entomology Section*. *In*: Dixon, W.N. & Anderson, P.J. (Ed.), *TRI-OLOGY*, 50 (3), pp. 6–9.

Rabaglia, R.J., Cognato, A.I., Hoebeke, E.R., Johnson, C.W., LaBonte, J.R., Carter, M.E. & Vlach, J.J. (2019) Early detection and rapid response: a 10-year summary of the USDA Forest Service program of surveillance for non-native bark and ambrosia beetles. *American Entomologist*, 65 (1), 29–42.
https://doi.org/10.1093/ae/tmz015

Rabaglia, R.J., Smith, S.L., Rugman-Jones, P., Digirolomo, M.F., Ewing, C. & Eskalen, A. (2020) Establishment of a non-native xyleborine ambrosia beetle, *Xyleborus monographus* (Fabricius) (Coleoptera: Curculionidae: Scolytinae), new to North America in California. *Zootaxa*, 4786 (2), 269–276.
https://doi.org/10.11646/zootaxa.4786.2.8

Schedl, K.E. (1942) Forschungberichte zur Scolytoiden-Fauna der Malayischen Halbinsel (V). 80. Beitrag zur Morphologie und Systematik der Scolytoidea. *Kolonialforstliche Mitteilungen*, 5, 169–218.

Schedl, K.E. (1963) Scolytidae und Platypodidae Afrikas. Band I. (Fortsetzung). Unterfamilie Hylesinae (Fortsetzung). *Revista de Entomologia de Moçambique*, 4 (2), 335–742. [1961]

Smith, S.M. & Cognato, A.I. (2015) *Ambrosiophilus peregrinus* Smith and Cognato, new species (Coleoptera: Curculionidae: Scolytinae), an exotic ambrosia beetle discovered in Georgia, USA. The *Coleopterists Bulletin*, 69 (2), 213–220.
https://doi.org/10.1649/0010-065X-69.2.213

Thomson, C.G. (1859) *Skandinaviens Coleoptera, synoptiskt bearbetade. Vol. 1*. Berlingska Boktryckeriet, Lund, 10 + 290 pp.
https://doi.org/10.5962/bhl.title.138677