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Abstract. Host plants of *Romulus globosus* Knull (Coleoptera: Cerambycidae) are described for the first time. Notes on its natural history are provided. The larvae of *R. globosus* feed in living roots of scrub oaks, including *Quercus geminata* Small, *Quercus myrtifolia* Willd., and *Quercus laevis* Walter. Field observations show that the beetle emerges below ground, and females may burrow to lay eggs on the roots.

Key words. Longhorned beetles, Florida, *Quercus geminata*, *Quercus myrtifolia*, *Quercus laevis*, root feeders.

Introduction

Florida-endemic *Romulus globosus* Knull is a large longhorned beetle in the tribe Elaphidiini. Only a small number of specimens have ever been captured, and knowledge of its natural history has remained elusive. Thomas (1991) summarized information about this species and, based on collection localities, suggested that the beetle may be associated with sandy, scrub-oak habitats in Florida. In the spring of 2019, I visited Polk County, Florida with the aim to look for larvae of *R. globosus*.

Materials and Methods

Images of the habitat and larval workings were taken with an iPhone 7 and a Canon EOS Rebel T5i DSLR. Most field work was conducted near Lake Wales, FL. Rearing occurred under in-house conditions as previously described (Vlasak 2014). Reared specimens are deposited in the author's collection.

Results and Discussion

I began by searching for signs of larval activity at the base of living scrub oaks, such us expelled frass or old emergence holes. I also looked for dead leaves on stems—a sign that the plant was in distress. During the search (conducted in the first week of April) I noticed a stem of *Quercus geminata* Small with dead leaves (Fig. 1). The stem was small, only about 1 cm in diameter and only about 50 cm tall. There were no signs of larval activity above ground but pulling on the stem broke it far underground, and the broken end revealed a gallery tightly packed with fine frass. The end that remained in the ground had a small larva in it. The size of the larva and the size of the stem and its root (both at most 1 cm in diameter) seemed too small for *R. globosus*. Careful examination of surrounding areas and other similar places resulted in finding additional stems with dead leaves (always *Q. geminata*) with living roots containing larvae (Fig. 2, 3). The roots usually ran parallel with the ground, not more than 10 cm deep. The galleries always started below the ground, some as far as 1 m from where the root connected to the stem with dead leaves. All larvae were generally small and immature. One stem, however, had its root connected to a larger root (about 2 cm in diameter), which contained a large prepupa. The part of the root with the pupal cell had no obvious connection to above ground, suggesting that the beetle would emerge below ground and then burrow out through the sand. The prepupa was transferred into a rearing vial, where it eventually transformed into an adult *R. globosus*.

Stems of similar size are often inhabited by *Aneflomorpha delongi* (Champlain and Knull). Its larva girdles the stem, causing the leaves to die and thus have a similar appearance. These stems, however, almost always contain some living leaves below the girdle and often have fine frass expelled by the larva around the base of the stem. Together with the presence of the girdle – a key characteristic, this allows for a clear differentiation from stems that had died due to larval activity of *R. globosus* in the root.

Since following stems with dead leaves yielded mostly young larvae, I then focused on dead, leafless stems (Fig. 5), which, presumably, would have been worked on by the larva for a longer time. This search was only possible in areas that had not been burned in recent years (Fig. 4) because burned areas contain too many leafless, dead stems. Initially, I was finding only Prioninae larvae, which turned out to be *Archodontes melanopus melanopus* (Linnaeus), but I eventually discovered several additional prepupae and two pupae (Fig. 6, 7) of *R. globosus* that were subsequently reared to adulthood. Pupal cells were again constructed entirely underground, either in roots (1.5 to 3 cm thick), typically close to or directly within the root crown. One old exit hole positioned a few centimeters below ground was also discovered (Fig. 8). No obvious pre-made emergence holes were observed, suggesting that the beetle chews its way out through the bark of the root. The Prioninae larvae were typically in slightly thicker roots, and the gallery always contained an empty portion where the larva could move freely. In contrast, the galleries of *R. globosus* were tightly packed with fine, granular frass. Portions of the frass were often noticeably yellow.

I returned on 11–12 May and found several teneral adults (Fig. 9–11) and additional pupae. Of those, two were found in *Quercus myrtifolia* Willd. and one in *Quercus laevis* Walter, so these two oaks and probably others are also used by *R. globosus*. Two adult beetles were found in thicker roots of *Q. geminata* that were not connected to any dead stem, suggesting that even seemingly healthy oaks may harbor larvae of *R. globosus*.

The fact that all pupal cells as well as the old emergence hole were below ground (Fig. 6, 8–11) shows that emerging beetles must burrow out through the sand. Similarly, the clear absence of larval galleries in stems above ground and the beginning of larval galleries often far from the root crown would suggest that the females may burrow below ground to lay eggs on roots.

The size of the roots where immature larvae were found seemed too small to support the development of a large beetle like *R. globosus*. The mature larvae were usually found in thicker roots. As the roots of clonal scrub oaks are connected, it is possible that the larva may travel to a larger, joining root or a root crown to finish development. Two such transfers to a joining thicker root were observed. One may also speculate that some larvae could exit the root and move through the sand towards an adjacent larger root. In one case, I found multiple thin roots in close proximity (not more than 10 cm apart), each containing a short section (ending abruptly on both ends) that was devoured by a larva, but a young larva was found only in one of these roots.

In contrast to *Enaphalodes archboldi* Lingafelter and Chemsak, a related inhabitant of Florida's scrub oak vegetation that also develops in living scrub oaks (Vlasak 2018), the larvae of *R. globosus* leave little evidence of their presence. In the case of *E. archboldi*, looking for the rather conspicuous damage caused by the larvae is an effective tool to monitor the distribution of the beetle. This approach does not seem feasible for *R. globosus*.

Acknowledgments

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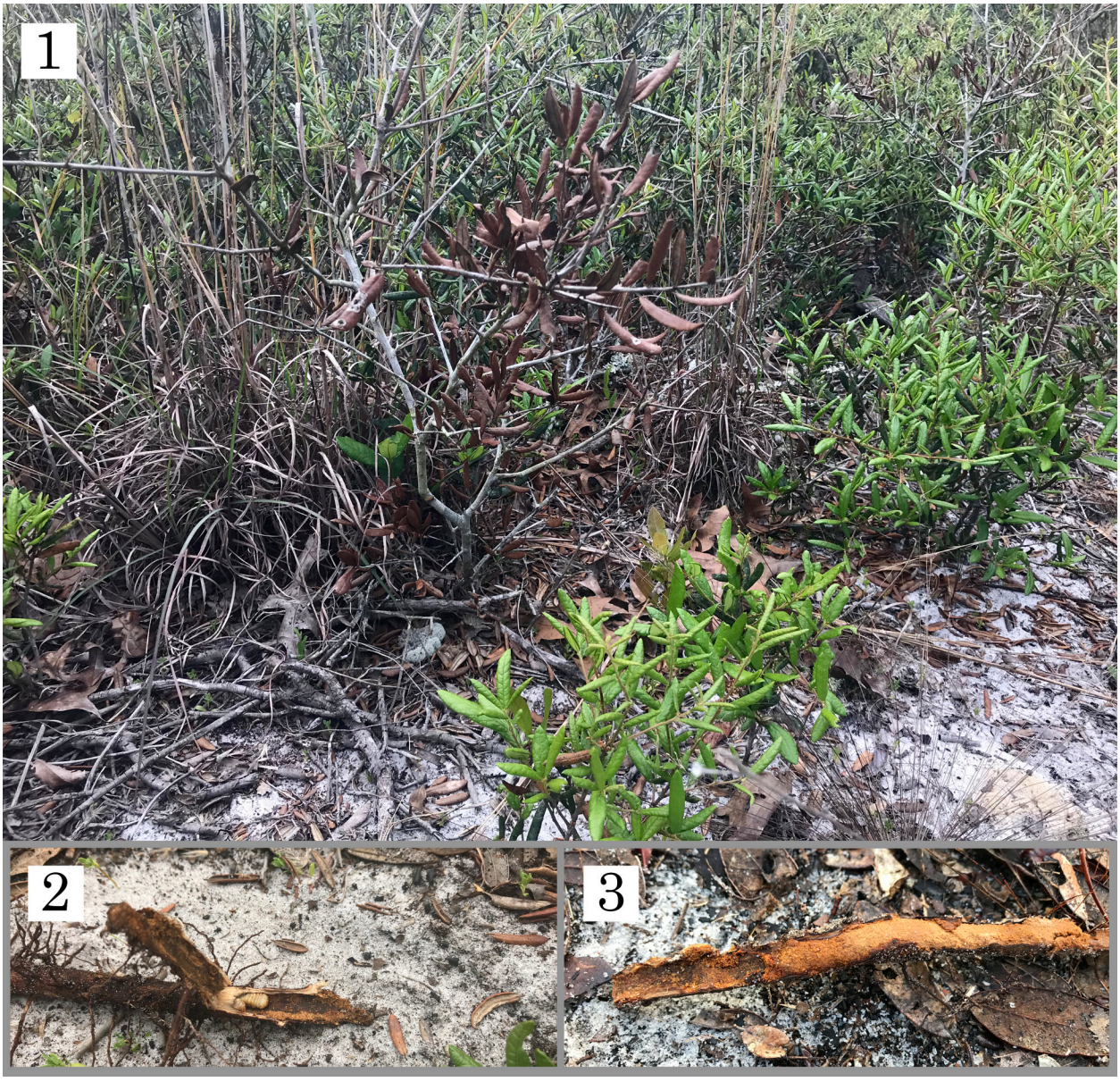
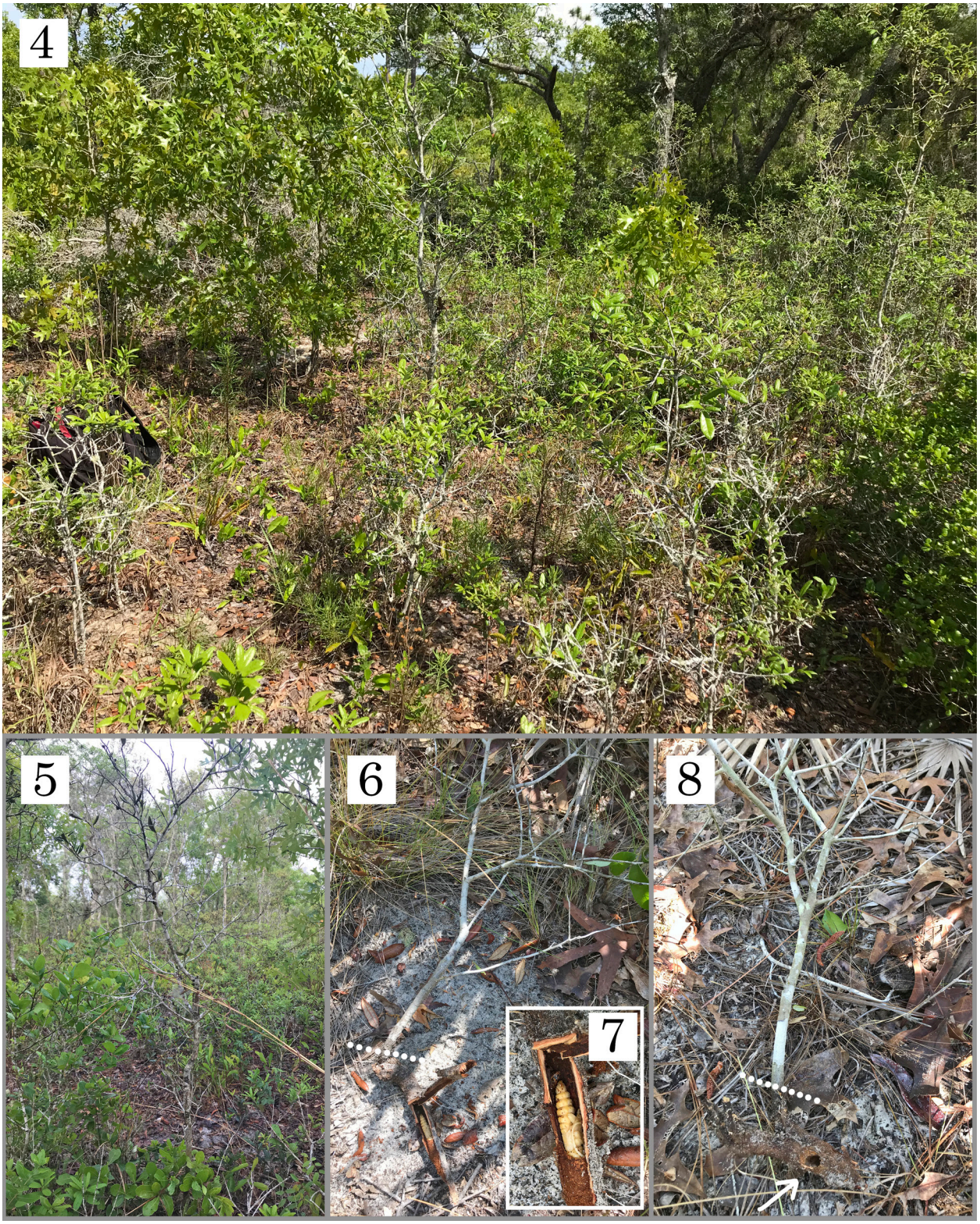
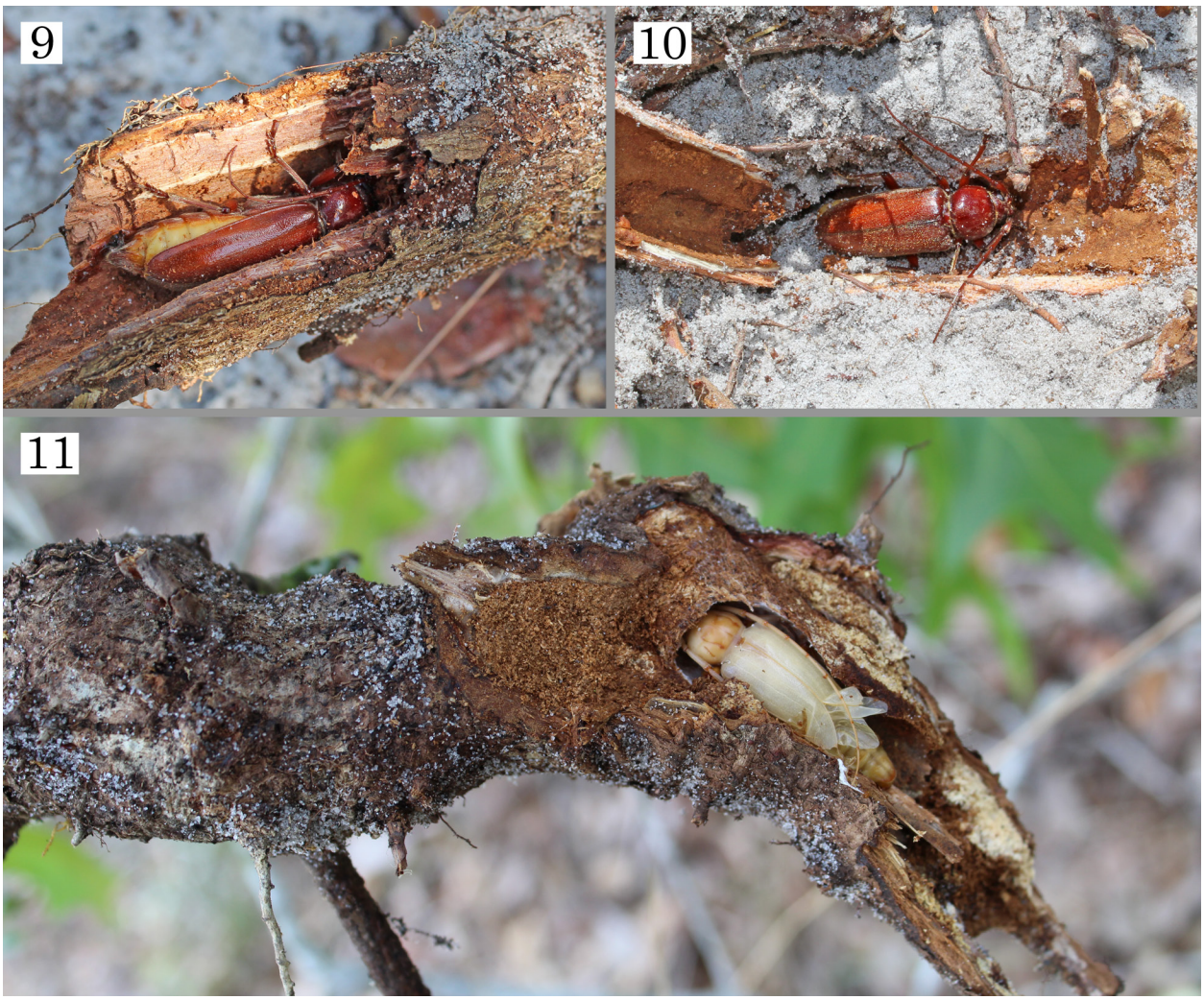


Figures 1–3. The workings of young *R. globosus* larvae. **1)** Small stem of *Q. geminata* with dead leaves. The leaves died due to larval activity of *R. globosus* on its root. **2-3)** Two parts of the root that split after pulling on a stem with dead leaves (different stem than in Fig. 1). The larva is visible in Fig. 2, tightly packed galleries in Fig. 3.



Figures 4–8. Habitat of *R. globosus* with stems containing mature larvae. **4)** Typical habitat where mature *R. globosus* larvae were found. Some stems of *Q. geminata* were dead. **5)** Dead, leafless stem of *Q. geminata* that contained mature larva of *R. globosus* in its root. **6)** Different stem of *Q. geminata* pulled from the ground containing a pupa of *R. globosus* in the root just below the root crown. **7)** Zoom-in on the pupa from Fig. 6. **8)** Root with an old emergence hole indicated by white arrow. The white dotted lines in Fig. 6 and 8 indicate ground level to show that the pupal cell and the emergence hole were underground.



Figures 9–11. Adult *R. globosus* beetles in their pupal cells. **9–10)** Females of *R. globosus* in their pupal cells dug out from the ground. **11)** Freshly eclosed male of *R. globosus* in a pupal cell (apical part of elytra was damaged while removing the bark of the root).