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Josef Vlasak
josef_vlasak@merck.com

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Josef Vlasak
207 Silverbrook Dr.
Schwenksville, PA 19473, USA

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Josef Vlasak
207 Silverbrook Dr.
Schwenksville, PA 19473, USA
josef_vlasak@merck.com

Abstract. The life history of *Enaphalodes archboldi* Lingafelter and Chemsak (Coleoptera: Cerambycidae) is described in detail based on observations from Marion County, Florida. Notes on the life history of *Enaphalodes bingkirki* Lingafelter and Santos-Silva from Honduras are also provided. *Enaphalodes bingkirki* is reported from Honduras for the first time.

Key words. Elaphidiini, Florida, Honduras, larvae, life history, stem girdling.

Introduction

The genus *Enaphalodes* currently contains 16 species (Bezark 2018), with eight found in the United States, and the rest in Mexico, Central and South America. The genus was recently reviewed and four new species were described from Central America and Mexico (Lingafelter and Santos-Silva 2018).

Most species found in the United States develop in oaks. *Enaphalodes atomarius* (Drury), *E. hispicornis* (Linnaeus), and *E. niveitectus* (Schaeffer) develop in dead oaks, typically in the basal parts of trunks (Craighead 1923; Cope 1984; Solomon 1995; Swift 2008). *Enaphalodes rufulus* (Haldeman) develops in trunks and sometimes branches of living oaks (Craighead 1923). *Enaphalodes cortiphagus* (Craighead) develops in the outer bark of living mature oaks (Craighead 1923), which is a relatively uncommon strategy among Cerambycidae. *Enaphalodes taeniatus* (LeConte) has been reared from dead branches of *Citrus* L. (Dean 1953) and adult beetles have been found under dead bark of *Salix* L. (Linsley and Martin 1933) but it is not clear whether *Salix* actually represents a larval host. The larval host of *E. seminitidus* (Horn in Leng) is apparently unknown but adult beetles have been collected on declining *Prosopis* L. near Tucson, Arizona (Hovore and Giesbert 1976). The host plant of *E. archboldi* Lingafelter and Chemsak was unknown.

The natural history of species found south of the United States is mostly unknown. Based on the specimen label, an individual of *E. senex* (Bates) from Guatemala was reared from bark of *Quercus* L. (Lingafelter and Santos-Silva 2018). *Enaphalodes coronatus* (White) develops under bark of dead tropical hardwoods (author's unpublished observation).

Materials and Methods

Images of the habitat and larval workings were taken with an iPhone 7. Rearing occurred under in-house conditions. Reared specimens are deposited in the following collections:

DJHC – Daniel Heffern Collection, Houston, Texas, USA
JVC – Josef Vlasak Collection, Schwenksville, Pennsylvania, USA
RAAC – Robert A. Androw Collection, Gibsonia, Pennsylvania, USA
RLAC –Ronald L. Alten Collection, Alta Loma, California, USA

Results and Discussion

Enaphalodes archboldi. Observations on the life history of *E. archboldi* were made in March 2018 in Marion County, Florida. Larval workings were initially noticed as cut-off stems of scrub oaks felled on the ground. The size of the larvae and the unique larval workings suggested that it may belong either to *Romulus globosus* Knull or *E. archboldi*. Rearing revealed that it was the latter species.

E. archboldi develops in living stems (typically 2-5 cm in diameter) of scrub oaks (habitat and cut oak in Fig. 1-2) and pupates in the roots. Larvae were found in *Quercus myrtifolia* Willd., *Quercus inopina* Ashe, and *Quercus geminata* Small. Oviposition occurs in lower portions of the stem, about 50 cm or so above ground, although the height is quite variable. This statement is based on tracking larval galleries to their beginning. The young larva works its way down, usually circling the stem initially (Fig. 3) and then continues boring straight down just beneath the bark (Fig. 4). This relatively small and gradually widening subcortical gallery causes various perturbations in the bark such as cracks and swellings (Fig. 3). Sometimes the portion of the stem with the gallery inside becomes recessed as the surrounding living tissue grows and gains in circumference (Fig. 5). Slightly above the ground the larva completely severs the stem. Judging by the significant amount of expelled granular frass, it probably spends considerable time in this area (Fig. 6-8). Below this girdle, the larva constructs a short tunnel (10-20 cm long) into the roots. The tunnel is kept empty (Fig. 9) and it is later used for pupation. Girdled stems break off and can be readily seen in the vegetation (Fig. 2, 7). Both girdled ends are covered with tightly packed granular frass left by larval activity (Fig. 8). Prior to pupation the larva seals the tunnel with a fibrous plug. Adult beetles emerge through this tunnel after removing larval frass. Empty emergence holes from previous years can be seen in the field (Fig. 10).

Overall, larval habits of *E. archboldi* are similar to several other elaphidiine beetles, for instance, *Neaneflus fuchsii* (Wickham) or *Aneflomorpha subpubescens* (LeConte). In all these species, the larvae start feeding in living stems, then girdle the stem at the ground level and travel down into the roots where they pupate (Heffern et al. 2018).

In early March, large larvae that appeared mature were found in the tunnel. Typically, only one larva was found per stem, although two thicker stems contained two larvae each. The larvae were placed into rearing vials as described previously (Vlasak 2014). Several roots were also removed and placed into rearing containers. Transformation started many months later. The first pupa appeared in the second week of June and most larvae transformed into pupae in early to mid-July. The first adult transformed in the first week of July, followed by most adults in mid to late July and early August. The first adult emerged from the roots in the last week of July, the rest in early to mid-August. Only about 50% of larvae transformed into adult beetles. The rest slowly declined, shrank and, although still alive, were eventually discarded. A similar situation was observed in the roots; in mid-August the remaining roots were opened and, with the exception of one teneral adult, they contained shrunken larvae that did not appear to be in good health. The reason for their decline is unclear.

Although adult beetles are apparently rare, larval workings were seen frequently in the beetle's habitat. Approximately twenty larvae were found along a stretch of a forest trail about 0.5 miles long; most workings were visible directly from the trail. About half as many stems where the beetle emerged in previous years were also encountered. Similar frequency was observed inside the scrub-oak vegetation but the beetle seemed to be more common (or at least was easier found) in open, sandy areas where one could walk relatively freely among oak shrubs (Fig. 1).

It has been reported that most specimens in collections (41 out of 46) are females (Lingafelter and Chemsak 2002). In this study, 12 females and 16 males were reared, suggesting that the apparent sex bias is likely a result of the collection method (specimens were collected at lights) and not a true bias in the population.

Enaphalodes bingkirki. Observations on the life history of *E. bingkirki* were made at Masicarán, Tatumbla, Francisco Mozaran Dept., Honduras. The locality consisted of dry oak forest with interspersed vegetation of various shrubs and smaller trees. The beetle was found to develop in the outer bark of living *Quercus segoviensis* Liebm. Larval habits were similar to those of *E. cortiphagus*. The larva works mostly in the dead bark, sometimes slightly scoring the living tissue beneath. The pupal cell is constructed in the bark and the beetle chews an oval exit hole. Mature trees with thick bark are

strongly preferred (as is typical for beetles developing in the outer bark) and can contain dozens of old emergence holes from previous years.

Enaphalodes bingkirki was described recently from two female specimens collected in Nicaragua (Lingafelter and Santos-Silva 2018) so this collection (two females and one male) extends its distribution to Honduras.

Acknowledgments

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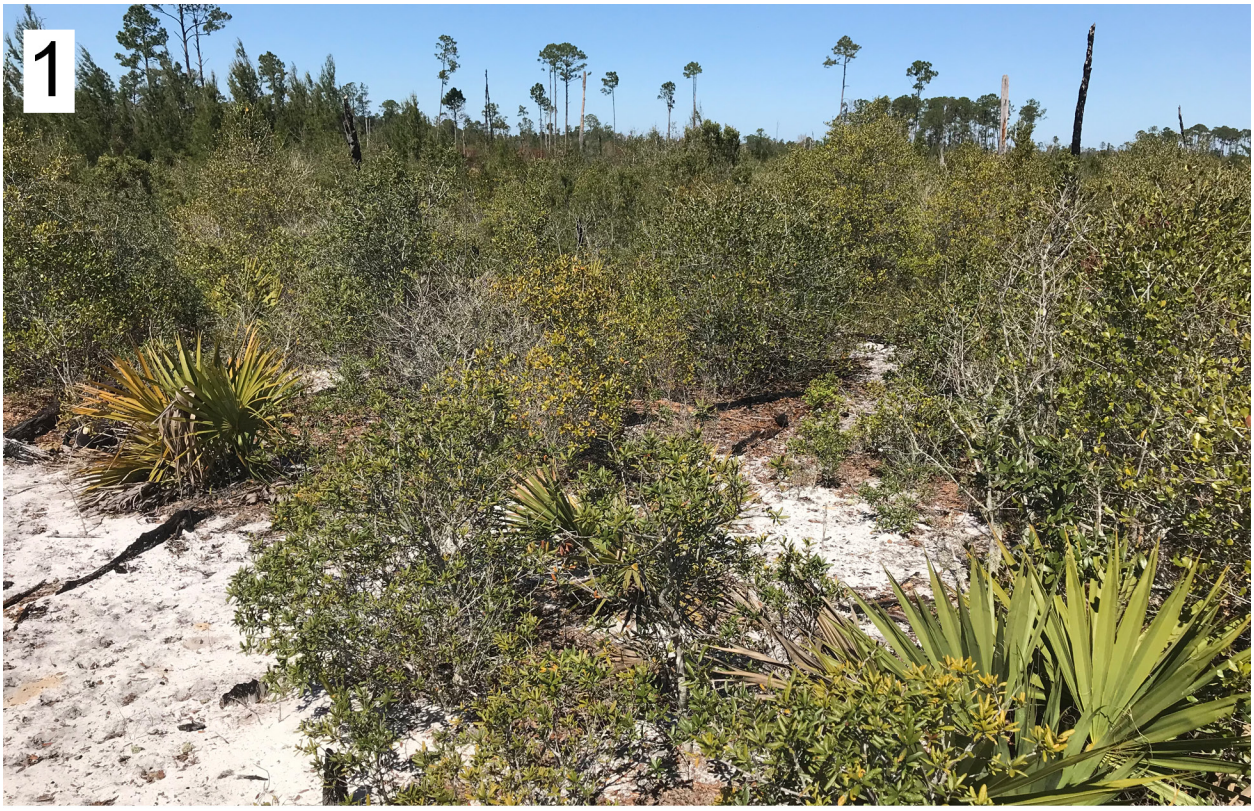
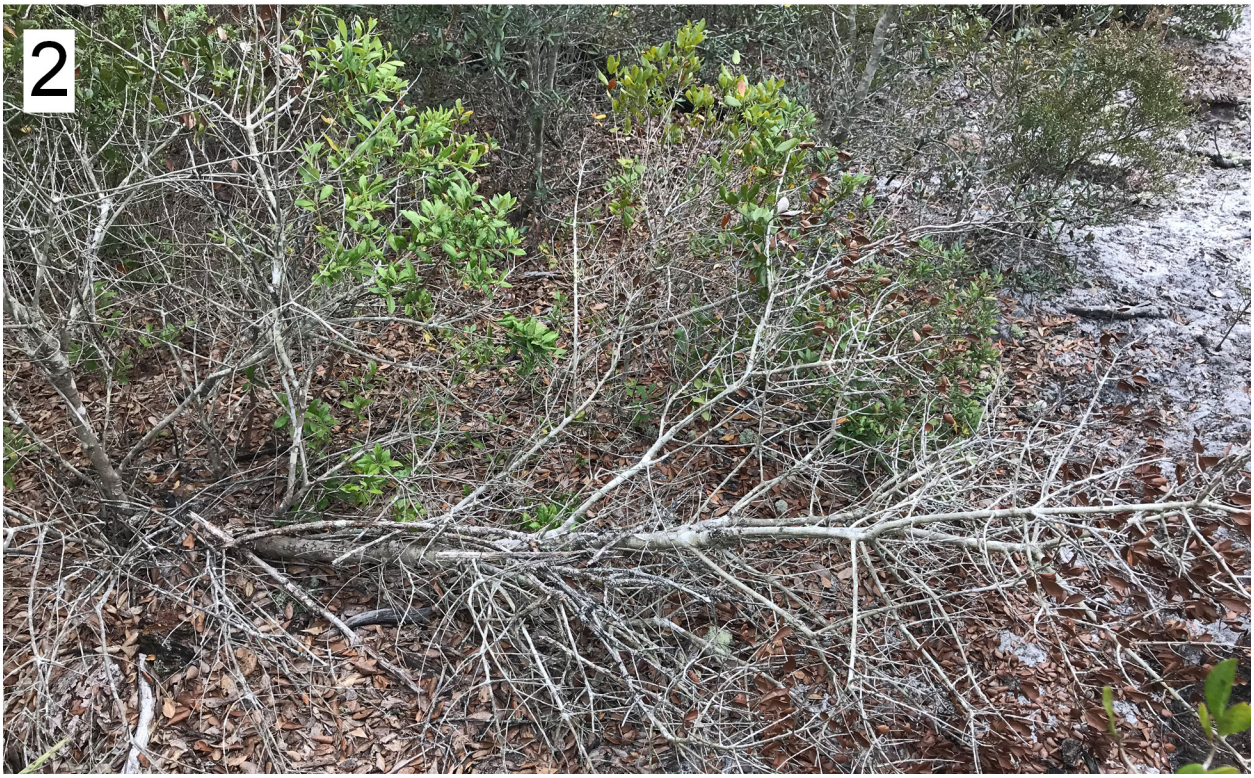
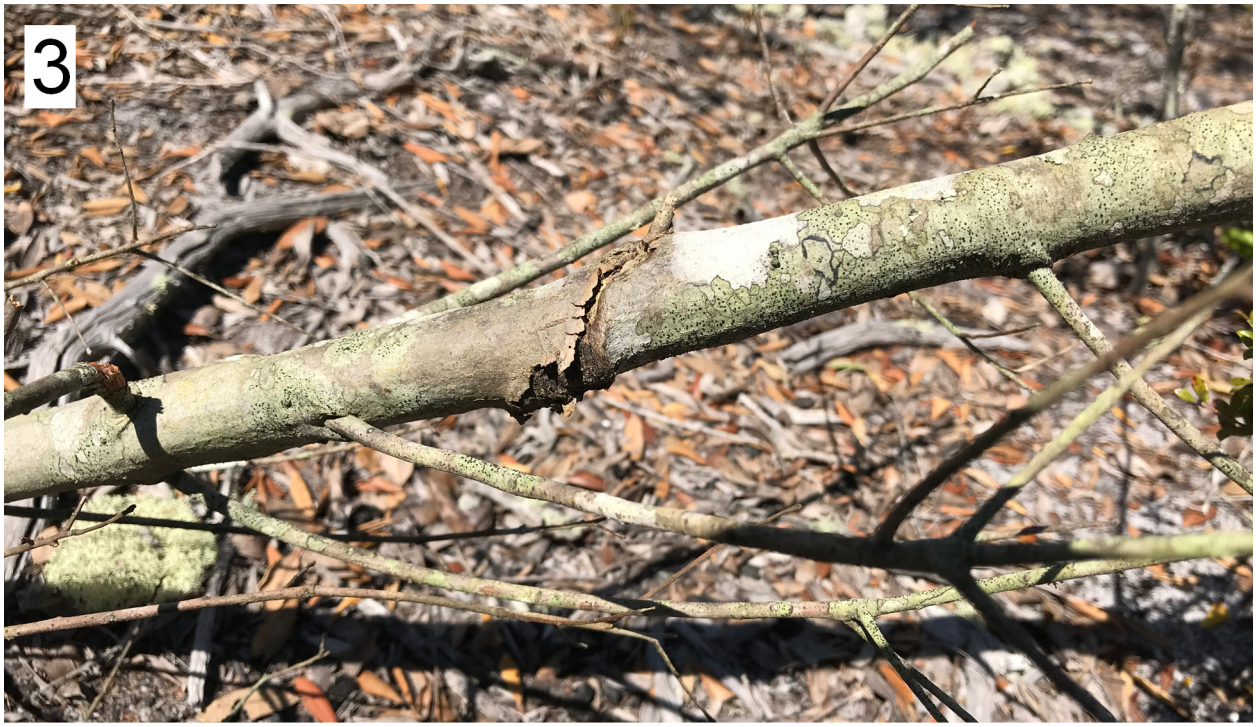
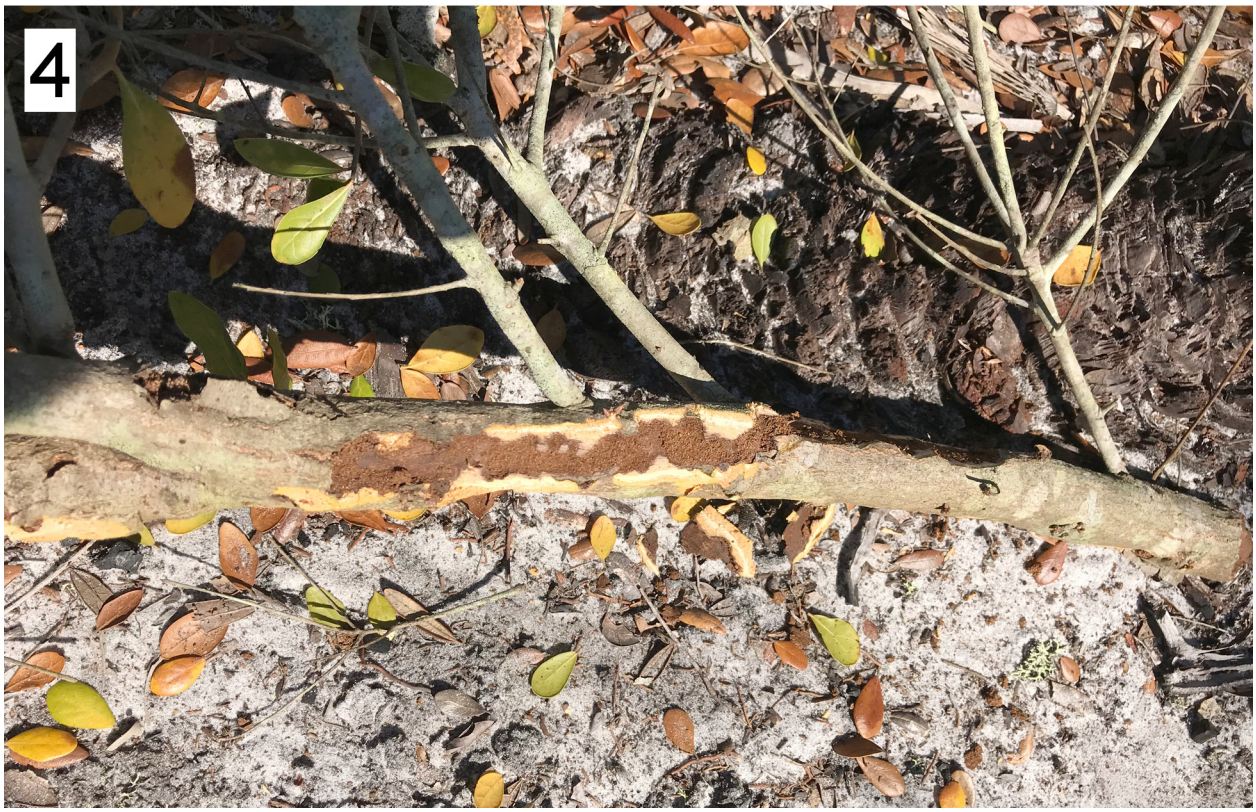


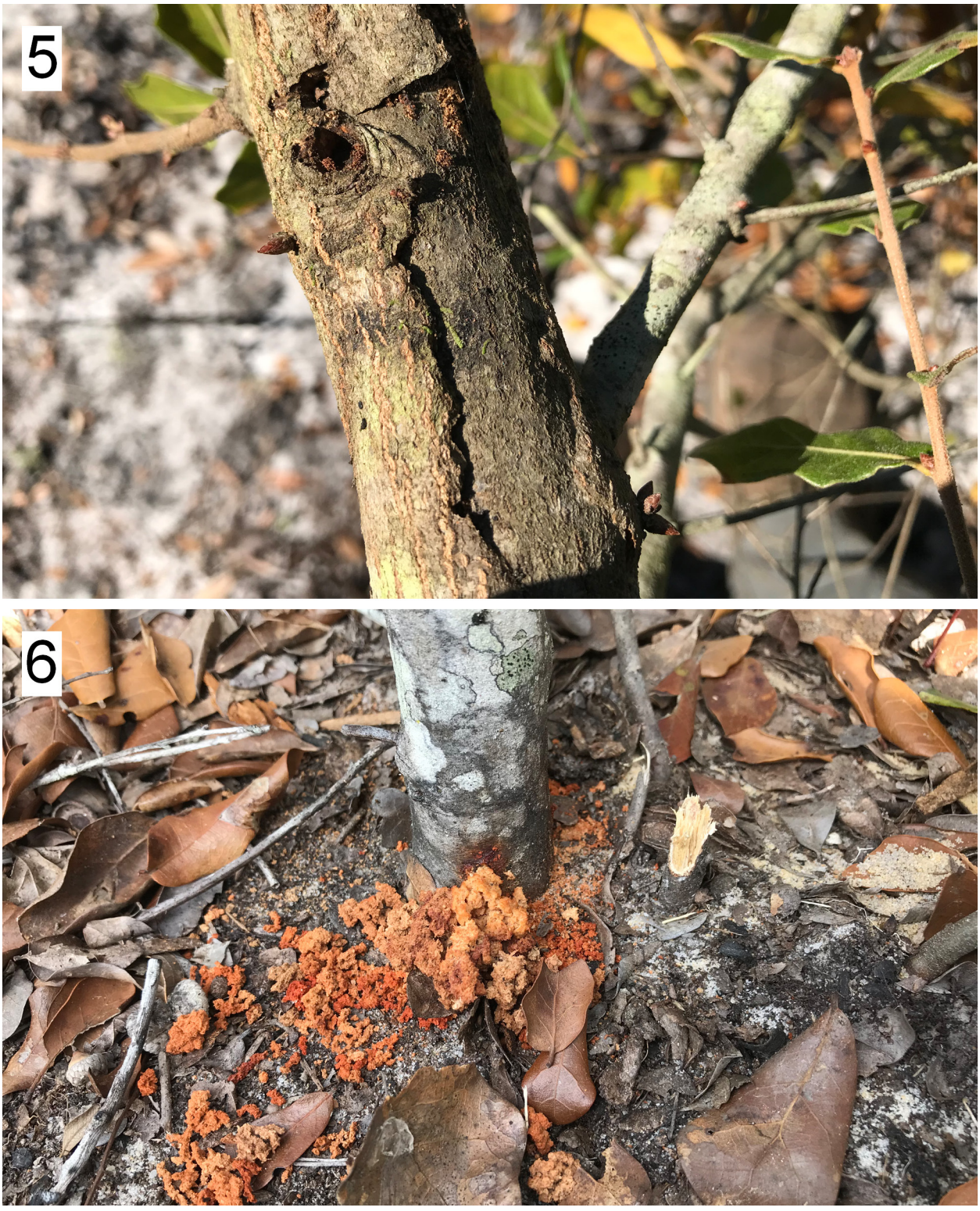


Figures 1–2. Scrub-oak habitat where *Enaphalodes archboldi* was found. **1)** Opened areas with small oak scrubs and sand patches where most specimens were collected. **2)** Severed stem that fell on the ground. These could be seen at a distance.

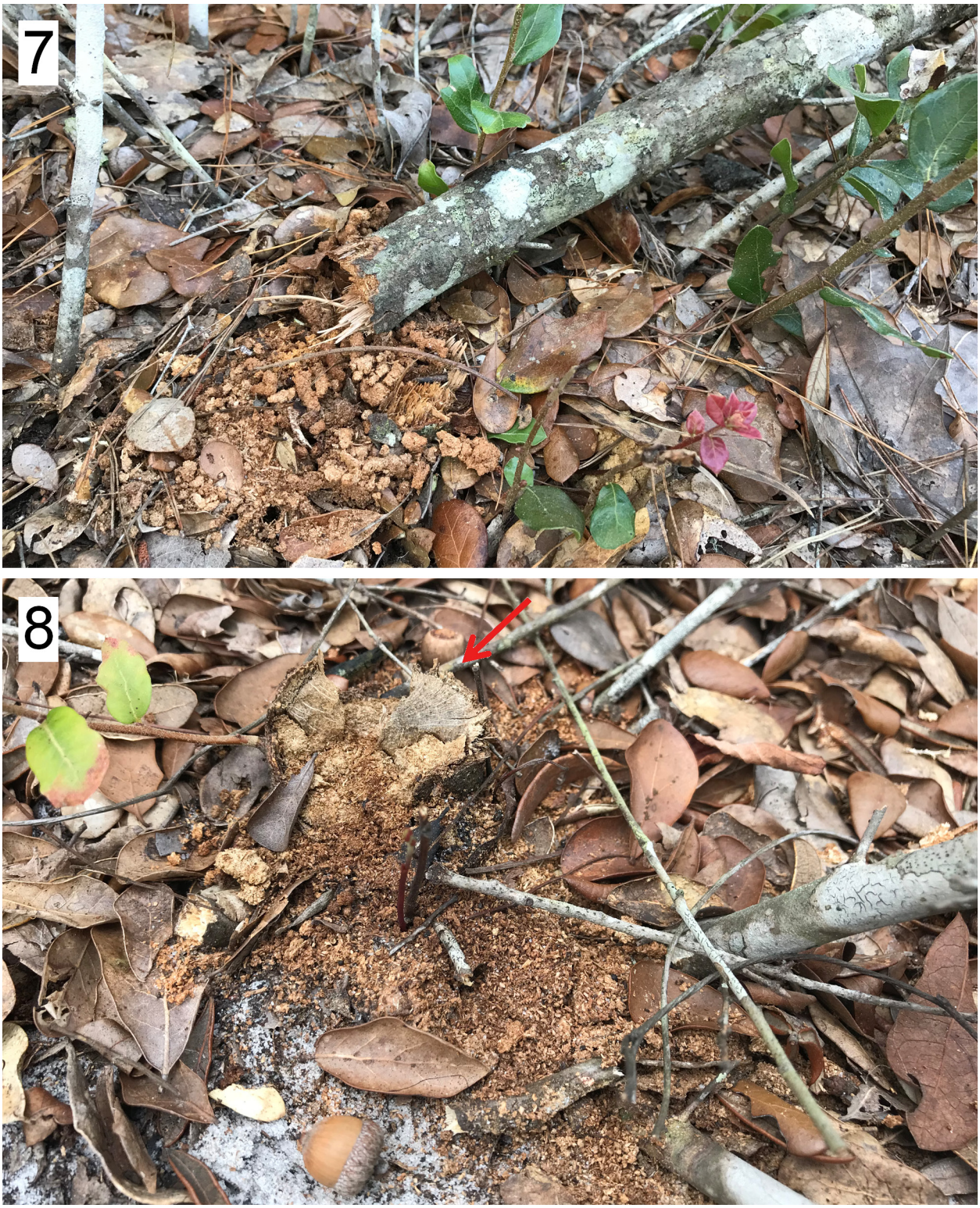




Figures 3–4. Signs of the workings of young larvae. **3)** Crack in the bark where the larva circled the stem. **4)** Subcortical gallery heading down the stem.



Figures 5–6. Signs of the workings of young larvae. **5)** Recessed portion of the stem with a gallery below bark. The shadow in the middle of the stem indicates the ridge between the normally-growing left side and the right side where the growth was stunned by larval activity under the bark. **6)** Granular frass expelled at the ground level. Unlike the frass around already girdled stems (Fig. 7–8) this one is fresh, suggesting that the larva would continue its development until the following year.



Figures 7–8. Expelled frass on the ground. **7)** Severed stem next to a pile of frass. The bottom part is not apparent because it is covered by the frass and leaves. **8)** Bottom part of the severed stem with regions of tightly packed granular frass. The red arrow points to the upper side of the stem.

Figures 9–10. Gallery in the root crown and an old emergence hole. **9)** Beginning of the empty tunnel heading down the roots. **10)** Old emergence hole.