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A new palm seed host and new distribution record for *Caryoborus chiriquensis* (Sharp, 1885) (Coleoptera: Bruchidae)

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Abstract. *Wettinia praemorsa* (Willd.) Wessels Boer is recorded as a new host for *Caryoborus chiriquensis* (Sharp, 1885) and an estimate of damage to the seeds is given. The geographical distribution of this palm bruchid now extends to Venezuela.

Key Words. Palm bruchid, *Wettinia*, Venezuela.

Introduction

Larvae of Bruchidae are seed feeder specialists, and breed mainly in seeds of Fabaceae, Arecaceae, Convolvulaceae, and Malvaceae (Romero et al. 2009). Although many host plants of bruchids are known, considerably more are waiting to be discovered. Recently some specialization has been established. The species of the subfamily Pachymerinae, with a New World origin, are specialized on palm seeds (Delobel et al. 1995; Nilsson and Johnson 1993). For example, the three species of the genus *Caryoborus* Schönherr are specialized on nine genera of palms: *Astrocaryum* G. Mey., *Attalea* Kunth, *Calyptronoma* Griseb., *Dictyocaryum* H. Wendl., *Elaeis* Jacq., *Mauritia* L. f., *Oenocarpus* Mart., *Pholidostachys* H. Wendl. ex Hook. f., and *Phytelephas* Ruiz and Pav. (Borgtoft 1995; Couturier and Kahn 1992; Delobel 1995; Lepesme 1947; Nilsson and Johnson 1993). One of these species, *Caryoborus chiriquensis* (Sharp), has been reported to prey only on palm seeds of the genus *Phytelephas* from Colombia, Costa Rica, Ecuador, Honduras, and Panama (Borgtoft 1995; Bridwell 1929; Nilsson and Johnson 1993). *Wettinia praemorsa* (Willd.) Wessels Boer here is recorded as a new host, damage to seeds is estimated, and an updated geographic distribution of this palm bruchid is given.

Methods

Wettinia praemorsa is a palm that inhabits the mountain cloud forests of the Colombian and Venezuelan Andes. In Venezuela, it is distributed in the Cordillera de la Costa, Serranía de Falcón, and Sierra de Perija (Staufer 2003; Arias et al. 2013). It is an evergreen palm growing up to 15 meters tall, sometimes forming only a single stem but more commonly a clump of up to twelve individuals. A reproductive plant possesses one or two reproductive stems with one or two infrutescences each, and

more than five hundred fruits. The white mesocarp of each fruit is fleshy and surrounded by a hard green exocarp, which softens and develops crevices at maturity. A fruit contains a single elliptical seed measuring 2.0–2.7 mm in polar longitude, and weighs 4.0–8.8 g. The papyraceous endocarp remains attached to the seed, but breaks and separates when the dispersed seed dries. Fruits are indehiscent and fall to the ground intact.

Seeds of *W. praemorsa* were collected at two hilly cloud forest localities separated by the Caracas Valley in Venezuela:

1) Altos de Pipe (10° 24.165' N, 66° 58.812' W, 1650 m). A total of 190 seeds were collected from the ground near adult plants in January 2013. Because the pericarp was totally detached from the seeds it can be assumed that they were dispersed some months earlier. They were maintained in plastic bags at the laboratory, and bruchid emergence from the seeds was registered during four months.

2) Avila National Park (10° 32.502' N, 66° 53.035' W, 2000 m). We collected 26 mature fruits directly from plants, thereby avoiding exposure to post-dispersal seed predators; moreover, 186 recently dispersed seeds (with endocarp intact) were collected from the ground. All seeds were individually stored inside plastic bags for eight months in the laboratory and viewed periodically for bruchid emergence.

Results

After emergence, adults of *Caryoborus chiriquensis* were mounted and labeled, and part of the material was deposited at the Colección de Insectos del Instituto de Fitosanidad, Colegio de Postgraduados, Montecillo Estado de México, México (CEAM); the remainder housed at Museo del Instituto de Zoología Agrícola "Francisco Fernández Yépez", Universidad Central de Venezuela (MIZA).

Like many bruchids, larvae of *C. chiriquensis* feed and pupate inside of an individual chamber excavated within what remains of the endosperm (Fig. 1a, b), from which adults emerge through a circular hole on the testa (Fig. 2).

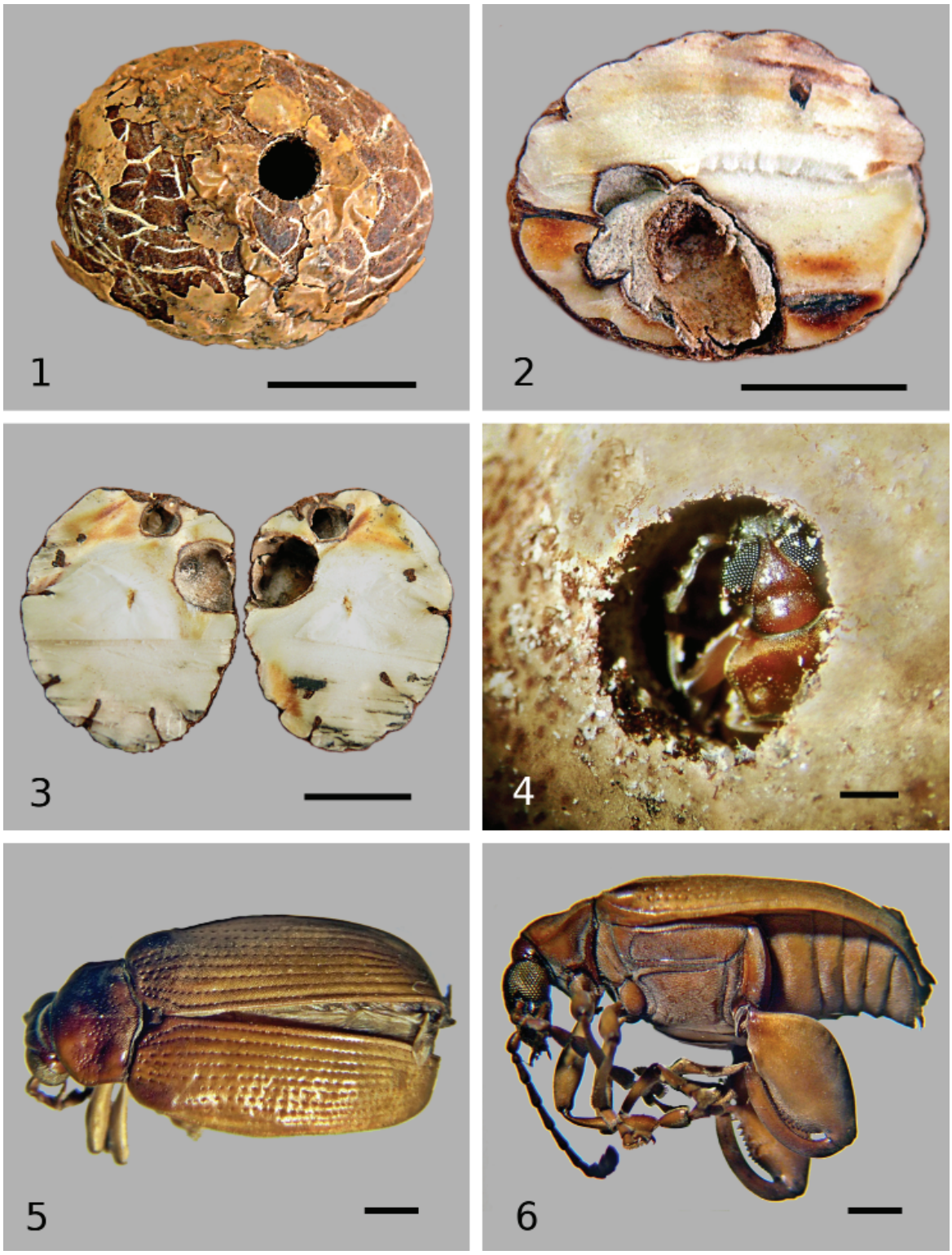
Although the development time for *C. chiriquensis* is unknown, it can be assumed that it should be more than six months, based on the longest registered time for adult emergence since seed collection (Table 1). This development time is comparable to the data given by Borgtoft (1995), as well as records for other Pachymerinae (Panizzi and Parra 2012). Commonly only one emergence hole was observed in an infested seed (Fig. 3–5); however, we observed a maximum of eight holes in one seed.

A lower predation ratio was observed in seeds from El Avila (Table 1), but seeds collected there seemed to be dispersed more recently than those at Altos de Pipe; so the difference in predation ratio could reflect difference in exposure time to predation by *C. chiriquensis* instead of actual differences in predation between localities.

On the other hand, none of the seeds collected from fruits still on the plants suffered any predation by *C. chiriquensis*. From these results we may infer that adults lay eggs only on already dispersed seeds of *W. praemorsa* and probability of predation increases as soon as the seed is naked. Thus *C. chiriquensis* presents an oviposition behavior which corresponds to the guild type C, "scattered seed guild" (Johnson and Romero 2004), in which oviposition occurs only on mature seeds after they have fallen to the ground.

Effect of predation by *C. chiriquensis* on seed viability was not evaluated, but it probably depends on the number of larvae that simultaneously prey on the same seed. An individual larva consumes only a fraction of the endosperm, and germination occurs provided that the embryo has not suffered damage. Probability of germination diminishes when more larvae are hosting on the same seed, due to reduction of resources in the endosperm for seedling development. On the other hand, exit holes of *C. chiriquensis* on seeds commonly expose endosperm to fungal infection which penetrates deeply, causing tissue deterioration and embryo mortality.

Based on records of *C. chiriquensis* from Panama, Borgtoft (1995) concluded that *Phytelephas seemannii* O.F. Cook should be included in the list of hosts for this insect, because it is the only species of *Phytelephas* in that country. However, that conclusion lacks empirical evidence since specimens from Panama could be collected from palms of another genus, such as *Wettinia,* which is now included in the list of host plants.



Figures 1–6. *Caryoborus chiriquensis* and *Wettinia praemorsa* seed. **1)** Emergence hole of *Caryoborus chiriquensis* in *Wettinia praemorsa* seed. Scale line = 1 cm. **2)** *Wettinia praemorsa* seed showing pupal chamber. Scale line = 1 cm. **3)** *Wettinia praemorsa* seed showing exit hole and pupal chamber. Scale line = 1 cm. **4)** *Wettinia praemorsa* seed showing emergence hole with adult *Caryoborus chiriquensis* inside. Scale line = 1 mm. **5)** Adult dorsal habitus of *Caryoborus chiriquensis* female. Scale line = 1 mm. **6)** Adult lateral habitus of *Caryoborus chiriquensis* female. Scale line = 1 mm.

Table 1. Predation of *Wettinia praemorsa* seeds by *Caryoborus chiriquensis*. Emergence of adults refers to the time in days since seed collection until emergence of adults from seeds; predation ratio is the percentage of collected seeds that hosted at least one larva of *C. chiriquensis*, and holes/seed refers to the number of emerged adults from infested seeds.

Locality	Number of seeds	Emergence of adults (days)	Predation ratio	Holes/seed
El Avila	212	28-172	4.7%	Mean=1.8 SD=1.0 N=10
Altos de Pipe	197	70-90	14.7%	Mean=2.0 SD=1.8 N=25

Our report of *C. chiriquensis* preying upon seeds of *W. praemorsa* constitutes the first record of this insect species in Venezuela; it is also a new host plant record for *C. chiriquensis* and a new host genus for *Caryoborus*. All known host palms of *C. chiriquensis* are characterized by their large seeds with hard endosperm; therefore it is possible that other species of palms host this insect, especially in the genus *Wettinia*. In order to establish the complete host arrangement of this important seed palm predator, it is important to collect dispersed seeds of other species of *Wettinia* and *Phytelephas*, as well as other palms in the region with large hard seeds.

Conclusions

The expanded distribution of *Caryoborus chiriquensis* includes the following countries: Colombia, Costa Rica, Ecuador, Honduras, Panama, and Venezuela.

The corroborated host plants for *C. chiriquensis* are as follows: *Phytelephas aequatorialis* Spruce, *P. macrocarpa* Ruiz & Pav., and *Wettinia praemorsa* (Willd.) Wessels Boer.

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