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A taxonomic revision of the seed-harvester ant genus *Pogonomyrmex* (Hymenoptera: Formicidae) on Hispaniola

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Abstract

We revise species of seed-harvester ants in the genus *Pogonomyrmex* (subfamily Myrmicinae) that occur on the Caribbean island of Hispaniola. Three species are recognized: *P. aterrimus* Wheeler (new status), *P. saucius* Wheeler and Mann, and *P. schmitti* Forel. *Pogonomyrmex schmitti sublaevigatus* Wheeler (= *schmitti*) and *P. schmitti darlingtoni* Wheeler (= *aterrimus*) are synonymized. We also describe the queen of *P. aterrimus* and *P. saucius*, and provide information on biology, distribution maps, and a key to workers and queens.

Key words: disjunction, Dominican Republic, Greater Antilles, Haiti, myrmicinae, Pogonomyrmecini

Introduction

The seed harvester ant genus *Pogonomyrmex* is a moderate-sized New World group that currently consists of 68 described species that occur as three disjunct faunal groups, one in North America, one in South America, and one on the Caribbean island of Hispaniola (containing Haiti and Dominican Republic) (Bolton 2014); no species are common to any two areas. North American species of *Pogonomyrmex* were the focus of a revision by Cole (1968), which set the stage for numerous studies of ecology, biogeography, territoriality, mating behavior, communication, caste determination, and foraging behavior that have greatly facilitated our understanding of ant biology (Anderson *et al.* 2006; Gadau *et al.* 2003; Gordon & Kulig 1996; Hölldobler 1976a, 1976b; Johnson 2000, 2001, 2002, 2006; Taber 1998). As a result, the taxonomy of North American species is stable with 32 described species (Bolton 2014).

In comparison, the taxonomy and biology are poorly known for *Pogonomyrmex* in Hispaniola and South America. South American species were last revised by Kusnezov (1951), with five species having been described since his revision (Cuezzo & Claver 2009; Fernández & Palacio 1998; Lattke 1991, 2006). Likewise, the *Pogonomyrmex* of Hispaniola have not been reviewed since treatments by Wheeler & Mann (1914) and Wheeler (1936). These authors divided the *Pogonomyrmex* of Hispaniola into two species and three infraspecific taxa: *P. saucius* Wheeler and Mann, *P. schmitti schmitti* Forel, *P. schmitti aterrimus* Wheeler, *P. schmitti darlingtoni* Wheeler, and *P. schmitti sublaevigatus* Wheeler and Mann. These matters have stood until recent trips to Hispaniola by several collectors made available enough new *Pogonomyrmex* specimens to facilitate re-examination of the genus.

Methods

Measurements and indices. Morphological characters were photographed using a Spot Insight QE camera attached to a Leica MZ 125 microscope. Images were then projected onto a computer monitor, and characters were measured using ImageJ (available at <http://rsb.info.nih.gov/nih-image/>). Measurements were calibrated using

photographs of an ocular micrometer scaled in 0.1 mm increments. All measurements are given in mm (minimum–maximum). The following standard measurements were used:

HL	Head Length: length of the head capsule excluding mandibles, in full-face view, from the midpoint of the anterior clypeal margin to the midpoint of the posterior margin.
HW	Head Width: maximum width of the head immediately behind the eyes, measured in full-face view.
CI	Cephalic Index: $(HW/HL) \times 100$.
MOD	Maximum Ocular Diameter: maximum diameter of the eye measured with the head in full lateral aspect.
OI	Ocular Index: $(MOD/HW) \times 100$.
OMD	Oculo-Mandibular Distance: minimum distance from the anterior eye margin to the nearest point of the malar area (base of mandible).
SL	Scape Length: maximum straight line length of the antennal scape from apex to base.
SI	Scape Index: $(SL/HW) \times 100$.
PNW	Pronotal Width: maximum width of the pronotum, as seen from above, measured at a right angle to the longitudinal axis of the mesosoma.
HFL	Hind Femur Length: measured along the dorsal margin from the articulation with the trochanter to most distal tip of the femur.
HFI	Hind Femur Index: $(HFL/HW) \times 100$.
ML	Mesosoma Length: diagonal length of the mesosoma in profile from the point at which the pronotum meets the cervical shield to the posterior base of the metapleural lobe.
PW	Petiole Width: maximum width of petiolar node, as seen from above, at a right angle to the longitudinal axis of the mesosoma.
PPW	Postpetiole Width: maximum width of postpetiole, as seen from above, at a right angle to the longitudinal axis of the mesosoma.

Collections are referred to by the following acronyms:

ALWC	Alex L. Wild collection, University of Texas, Austin, Texas, USA
AMNH	American Museum of Natural History, New York, New York, USA
CAS	California Academy of Sciences, San Francisco, California, USA
LACM	Los Angeles County Museum of Natural History, Los Angeles, California, USA
MCZ	Museum of Comparative Zoology, Harvard University, Cambridge, Massachusetts, USA
MHNG	Museum of Natural History, Geneva, Switzerland
NMW	Naturhistorisches Museum, Vienna, Austria
RAJC	Robert A. Johnson collection, Tempe, Arizona, USA
UCDC	Bohart Museum of Entomology, University of California, Davis, California, USA
USNM	National Museum of Natural History, Smithsonian Institution, Washington, DC, USA

In regard to specimens examined, the labels on series rarely listed a department (Haiti) or administrative subdivision (Dominican Republic). We obtained this information for most locales using Google Earth or GeoNames Search (<http://geonames.nga.mil/ggmaviewer/default.asp>), from which we also obtained latitude–longitude coordinates that were used to construct distribution maps. However, the primary administrative unit could not be determined for several vague locales, e.g., between Kenscoff and La Visite, and Massif de la Hotte: these locales are listed without an administrative unit. High resolution photographs of lectotypes and other individuals are available at <http://www.antweb.org/> and <http://www.asu.edu/clas/sirgtools/pogonomyrmex/HISPANIOLAPOGOS.htm>. A database with specimens examined and available label information is posted at <http://www.asu.edu/clas/sirgtools/pogonomyrmex/webchaptersforPogos.htm>.

Results

Synonymic list of Hispaniola species of *Pogonomyrmex* and castes described

P. aterrimus Wheeler 1936: 197 (w.q). **NEW STATUS**

= *P. schmitti darlingtoni* Wheeler 1936: 197 (w). **NEW SYNONYMY**

P. saucius Wheeler & Mann, 1914: 29 (w.q.m).

P. schmitti Forel, 1901: 339 (w.q).

= *P. schmitti* var. *sublaevigatus* Wheeler & Mann, 1914: 29 (w.q). **NEW SYNONYMY**

Species accounts

Pogonomyrmex aterrimus Wheeler 1936 **NEW STATUS**

(Figures 1–3)

Pogonomyrmex (Epehebomyrmex) schmitti aterrimus Wheeler, 1936: 197 (worker). Syntypes examined: 3 workers [MCZ]; HAITI, between La Visite and Kenscoff, 5,000–7,000 feet (Dr. Darlington leg., autumn 1934) (MCZ worker here designated **LECTOTYPE** [CASENT0217240]).

Epehebomyrmex schmitti aterrimus (Wheeler); Kempf, 1972: 106. First combination in *Epehebomyrmex*.

Pogonomyrmex schmitti aterrimus Wheeler; Bolton, 1995: 339. Revived combination in *Pogonomyrmex*.

Pogonomyrmex (Epehebomyrmex) schmitti darlingtoni Wheeler, 1936: 197 (worker). Syntypes examined: 6 workers [MCZ]; HAITI, northeastern foothills of Massif de la Hotte, 2,000–4,000 feet (Dr. Darlington leg., 10 October, 1934) (MCZ worker here designated **LECTOTYPE** [CASENT0217241]). **NEW SYNONYMY**

Epehebomyrmex schmitti darlingtoni (Wheeler); Kempf, 1972: 106. First combination in *Epehebomyrmex*.

Pogonomyrmex schmitti darlingtoni Wheeler; Bolton, 1995: 340. Revived combination in *Pogonomyrmex*.

Worker. Diagnosis. Small (HW = 1.11–1.35 mm), dorsum of mesosoma rugoreticulate to vermiculate; posterior surface of petiolar node viewed from behind and above elongate, clearly longer than wide, petiolar node notably narrower than postpetiole (PW/PPW = 0.78–0.90); anterior surface of petiolar node partly to completely sculptured, dull to weakly shining; in profile, anterior surface of petiolar node forming a right to weakly obtuse angle with peduncle of petiole; dorsum of postpetiole and first gastral tergum strongly punctate, dull (**Figure 1**).

Measurements. lectotype ($n = 10 + 2$ paralectotypes). HL 1.29 (1.29–1.47); HW 1.11 (1.15–1.33); MOD 0.21 (0.23–0.25); OMD 0.27 (0.25–0.34); SL 0.90 (0.91–1.01); PNW 0.80 (0.81–0.93); HFL 1.23 (1.17–1.36); ML 1.50 (1.47–1.72); PW 0.39 (0.35–0.45); PPW 0.51 (0.45–0.53). Indices: SI 81.08 (69.92–84.87); CI 86.05 (88.32–95.00); OI 18.92 (18.05–20.83); HFI 110.81 (87.97–111.57).

Measurements for *P. “darlingtoni”*. lectotype ($n = 5$ paralectotypes) (see below). HL 1.29 (1.29–1.44); HW 1.21 (1.13–1.35); MOD 0.27 (0.25–0.27); OMD 0.28 (0.27–0.31); SL 0.96 (0.88–1.06); PNW 0.80 (0.79–0.86); HFL 1.32 (1.25–1.46); ML 1.59 (1.58–1.72); PW 0.37 (0.36–0.43); PPW 0.45 (0.44–0.49). Indices: SI 79.34 (77.88–79.03); CI 93.80 (87.60–94.03); OI 22.31 (19.84–22.12); HFI 109.09 (102.22–114.96) (**Figure 2**).

Queen (dealate). Diagnosis. With caste-specific morphology of the mesosoma related to wing-bearing and presence of ocelli on head. Small (HW = 1.32 mm), but notably larger than conspecific workers; in dorsal view, petiolar node elongate (width/length < 0.85), relatively narrow compared to postpetiole (PW/PPW < 0.75); anterior surface of petiolar node moderately sculptured; dorsum of postpetiole and most of first gastral tergum strongly granulate-punctate, dull (**Figure 3**).

Measurements ($n = 1$). HL 1.45; HW 1.32; MOD 0.28; OMD 0.29; SL 1.06; PNW 0.96; HFL 1.36; ML 1.90; PW 0.42; PPW 0.59. Indices: SI 80.30; CI 91.03; OI 21.21; HFI 103.03.

Description. With caste-specific morphology of the mesosoma related to wing-bearing and presence of ocelli on head. In full-face view, head longer than broad (CI = 91.03), posterior margin flat. Longitudinal rugae on cephalic dorsum prominent, wavy to irregular, area posterolateral to frontal carinae and posterior margin weakly to moderately rugoreticulate; interrugae strongly granulate, dull. Mandible with six teeth, dorsal surface coarsely rugose. Eye relatively small, situated anterior to middle of head. Base of antennal scape weakly to moderately granulate, distal portion strongly granulate, dull. Psammophore poorly-developed, consisting of short hairs scattered across ventral side of head.

All mesosomal surfaces with subparallel, weakly irregular rugae to rugoreticulate. Pronotal collar rugoreticulate, mesoscutellum and scutellum with irregular longitudinal rugae. Dorsum of propodeum with wavy to irregular transverse rugae, sides rugoreticulate. Propodeum with long, well-developed superior and inferior spines, inferior spines about 0.6–0.7x the length of superior spines. In profile, petiolar node asymmetrical with

anterior surface notably shorter than posterior surface, apex of node subangulate. In dorsal view, petiolar node longer than wide (width/length < 0.85), widest near middle, tapering to a rounded to subangulate anterior margin. Anterior surface of petiolar node moderately sculptured; sides and posterior surface rugoreticulate and “lumpy” in appearance, interrugae moderately granulate. In dorsal view, postpetiole widest near posterior margin, tapering to anterior margin, maximum width about equal to length, relatively narrow compared to petiolar node (PW/PPW < 0.75), all surfaces strongly granulate, dull. Anterior one-half of first gastral tergum strongly granulate, dull, posterior portion moderately coriarius, weakly shining. Moderately abundant yellowish-brown to brownish hairs on entire body, longest hairs on head and mesosoma approach to slightly exceed MOD. Entire body concolorous dark reddish-brown (**Figure 2**).

Male. Unknown.

Additional material examined. DOMINICAN REPUBLIC: *La Vega*: Constanza, 3,000–4,000', Aug 1938 (PJ Darlington; MCZ). *Pedernales*: Parque Nacional Sierra Bahoruco, 760 m, Sept 2, 2001 (AL Wild; RAJC); Sierra Bahoruco, 1790 m & 1800 m, Mar 29, 2014 (D Lubertazzi; MCZ, RAJC); 16 km ENE Pedernales, 800 m, Sept 10, 1992 (PS Ward; MCZ, UCDC). **HAITI:** *Quest*: Furcy, no date (WM Mann; MCZ, USNM), Petionville, no date (WM Mann; USNM).

Etymology. The specific epithet, *aterrimus* (Latin, *ater* = black; *-rimus* = superlative suffix), was derived from the deep coal black coloration of this species, which Wheeler mentioned in his description.

Discussion and biology. Genetic data are not available for *P. aterrimus*, but bivariate plots demonstrate strong morphological differences between *P. aterrimus* and *P. schmitti* (**Figure 4**). These differences include: (1) workers of *P. aterrimus* are larger (HW = 1.11–1.35 mm) compared to workers of *P. schmitti* (HW = 0.90–1.17 mm), (2) in dorsal view, the petiolar node of *P. aterrimus* is elongate, not broadly fan-shaped as in *P. schmitti*, (3) in dorsal view, the petiolar node width/postpetiole width is lower in *P. aterrimus* (PW/PPW = 0.78–0.90) compared to *P. schmitti* (0.87–1.03), (4) in *P. aterrimus*, the anterior surface of the petiolar node is partly to completely sculptured, not strongly shining, and it forms a right to weakly obtuse angle with the peduncle of the petiole, whereas in *P. schmitti*, the anterior surface of petiolar node is mostly smooth and shining, and it forms a noticeably obtuse angle with the peduncle of the petiole, and (5) the dorsum of the postpetiole and first gastral tergum are strongly punctate, dull in *P. aterrimus*, whereas these structures are smooth and shining to partly or completely punctate and weakly shining in *P. schmitti*.

Pogonomyrmex aterrimus is not known to be sympatric with any congener, but collections of *P. schmitti* proximate to those of *P. aterrimus* suggest that the two species may occur sympatrically. Workers of these two species are easily distinguished using characters described above.

Pogonomyrmex darlingtoni is morphologically very similar to *P. aterrimus*. The two forms differ mainly in degree of granulation on the interrugae of the cephalic dorsum and dorsum of the mesosoma (weakly to moderately granulate-punctate in *P. aterrimus*, strongly granulate-punctate in *P. darlingtoni*). These differences are based on very limited material, especially for *P. darlingtoni*, which is known only from the type series of six workers. These types were collected near the western end of the Tiburon peninsula (**Figure 5A**), about 170 km distant from the nearest collection of *P. aterrimus*. At present we believe the most conservative approach is to interpret these sculptural differences as variation between populations of a single species. Additional collecting will clarify whether or not this is correct. Because this is a judgement call, we provide lectotype photographs and morphometric data for both taxa (**Figures 1, 2, 4**).

Little is known about the biology or habitat affinities of *P. aterrimus*. The geographic range of *P. aterrimus* appears to be restricted to mid- to higher elevation habitats of southcentral Hispaniola (**Figure 5A**). The only available habitat data (from collection labels) indicate that workers were taken in secondary montane forest edge (AL Wild #1349), tropical moist forest edge (PS Ward #11744), and a grassy field (D Lubertazzi #DL03790:001, DL03786:001, DL03785:006). These sites range in elevation from 760–1800 m (AL Wild & D Lubertazzi) to 1,515–2,120 m (Wheeler 1936). Nests in the grassy fields had their chambers under a stone.

No information is available on colony size, but it seems doubtful that colonies contain more than 200–300 workers (D. Lubertazzi, pers. comm.). One dealate queen was collected by WM Mann (MCZ), but the collection date was not given. Additional collections are needed to determine microhabitat preference and other aspects of natural history.

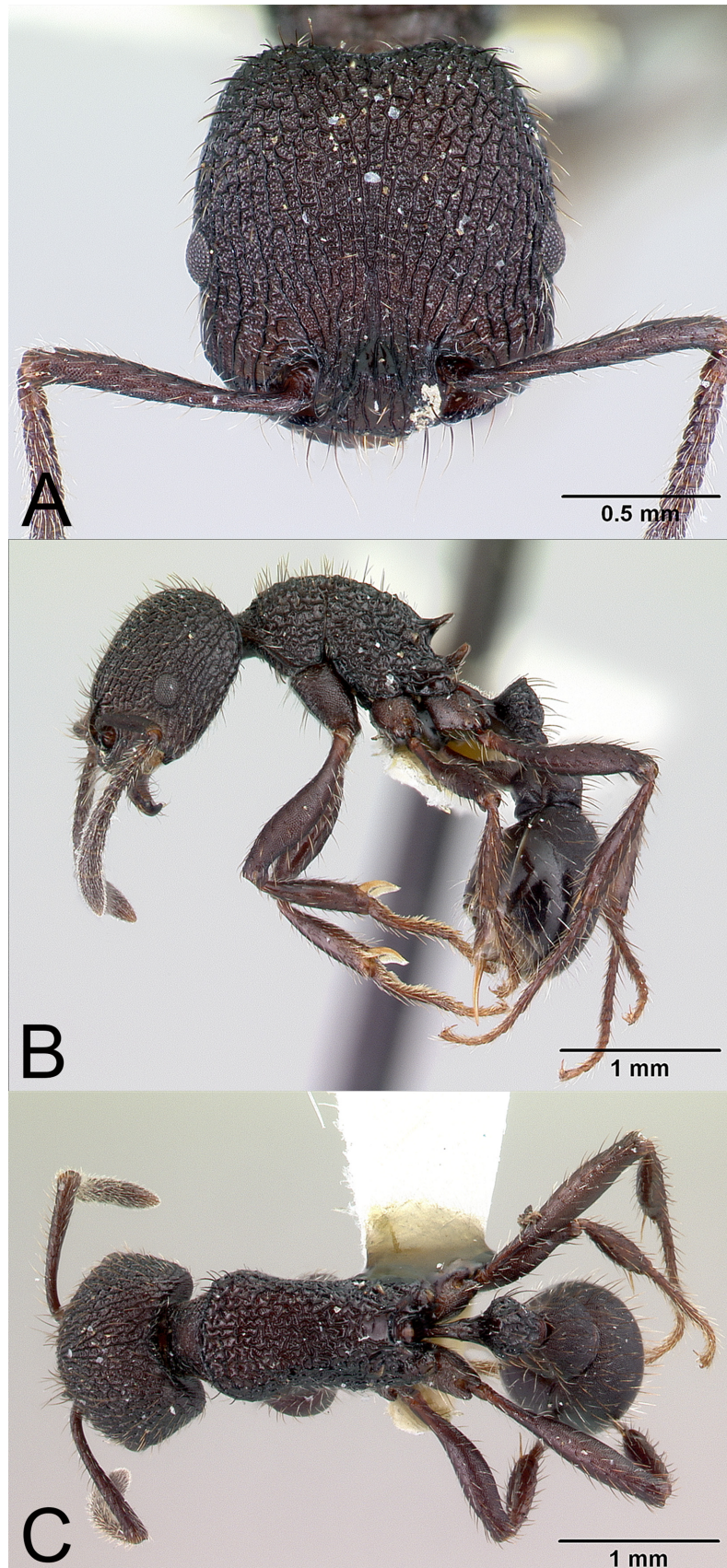


FIGURE 1. Photograph of *Pogonomyrmex aterrimus* Wheeler lectotype worker: (A) frontal view of head, (B) lateral view of body, and (C) dorsal view of body (CASENT0217240). Photographs by Erin Prado from www.antweb.org.

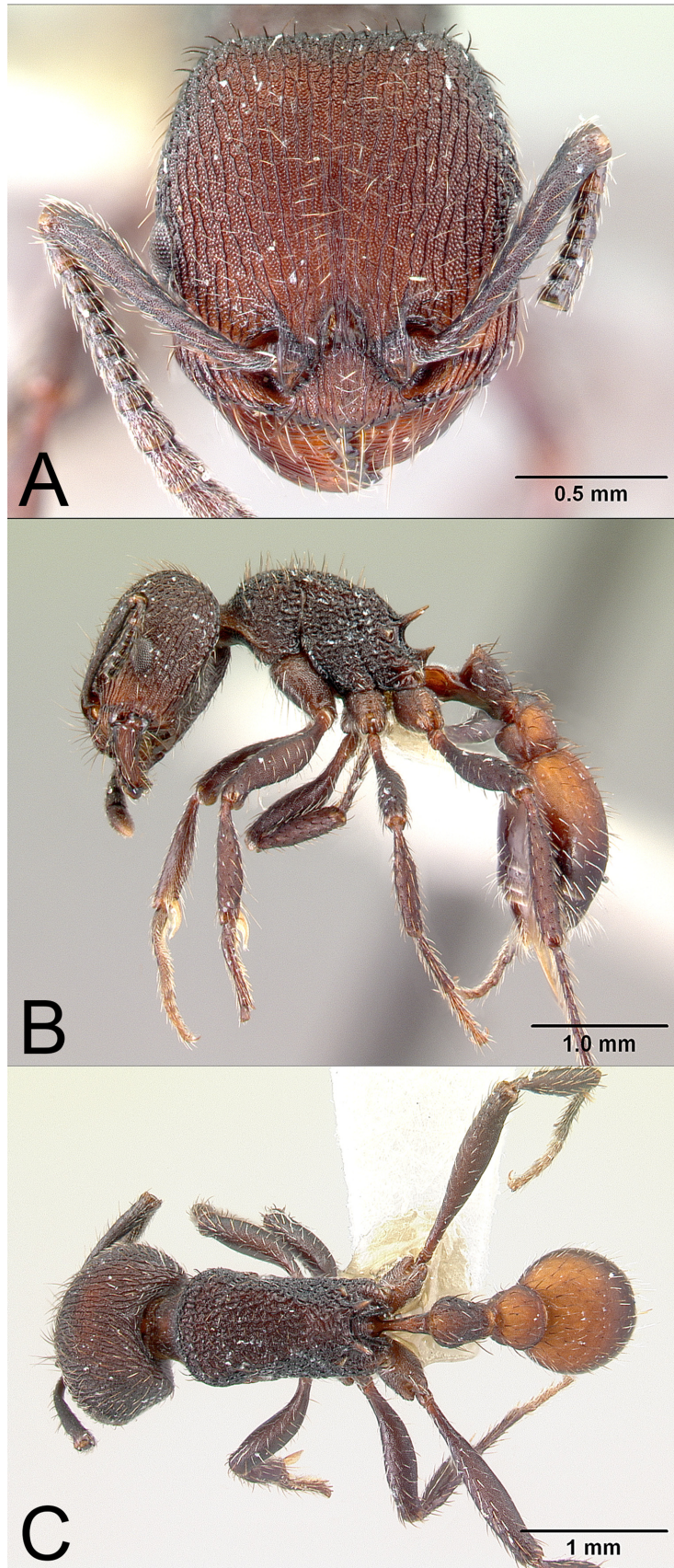


FIGURE 2. Photograph of *Pogonomyrmex "darlingtoni"* Wheeler lectotype worker: (A) frontal view of head, (B) lateral view of body, and (C) dorsal view of body (CASENT0217241). Photographs by Erin Prado from www.antweb.org.

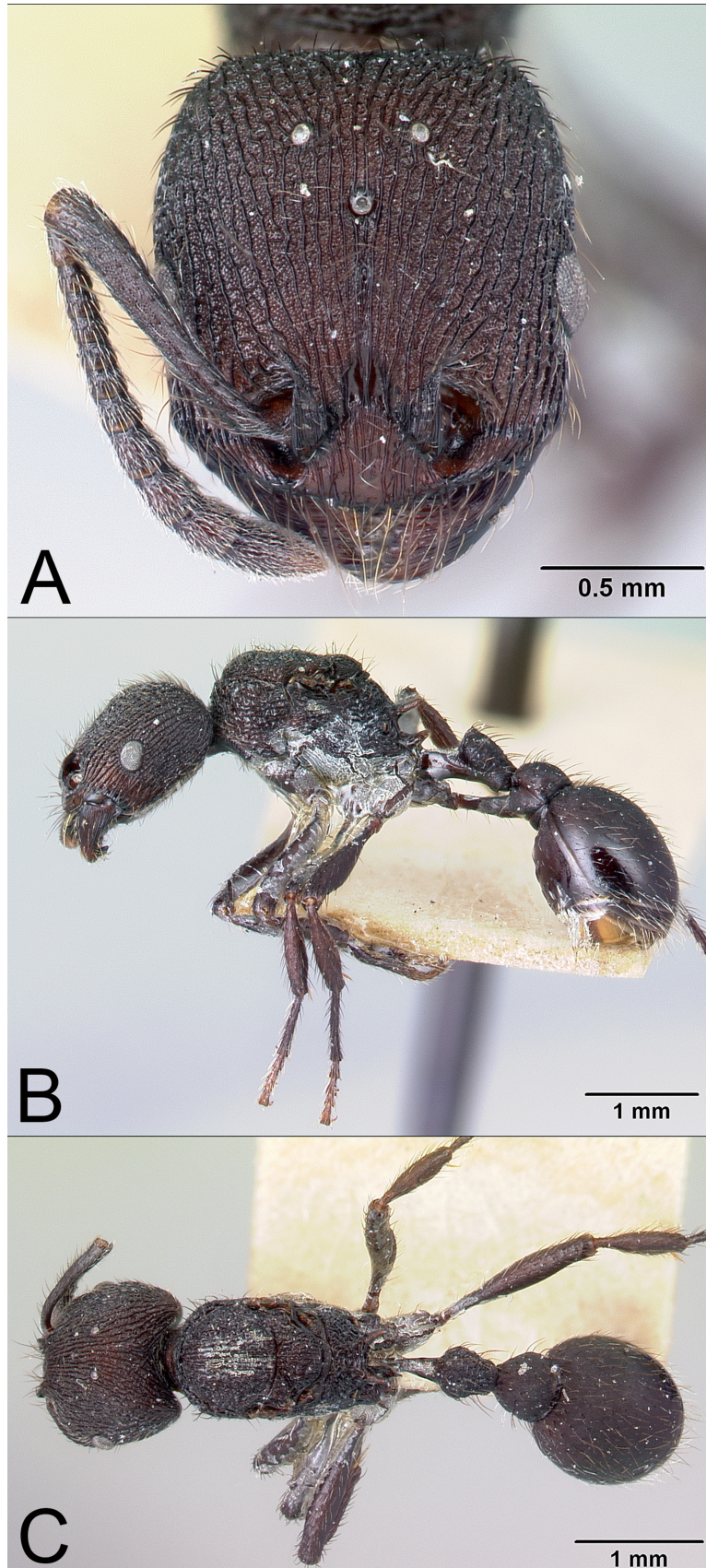


FIGURE 3. Photograph of *Pogonomyrmex aterrimus* Wheeler dealate queen: (A) frontal view of head, (B) lateral view of body, and (C) dorsal view of body (CASENT0217248). Photographs by Erin Prado from www.antweb.org.

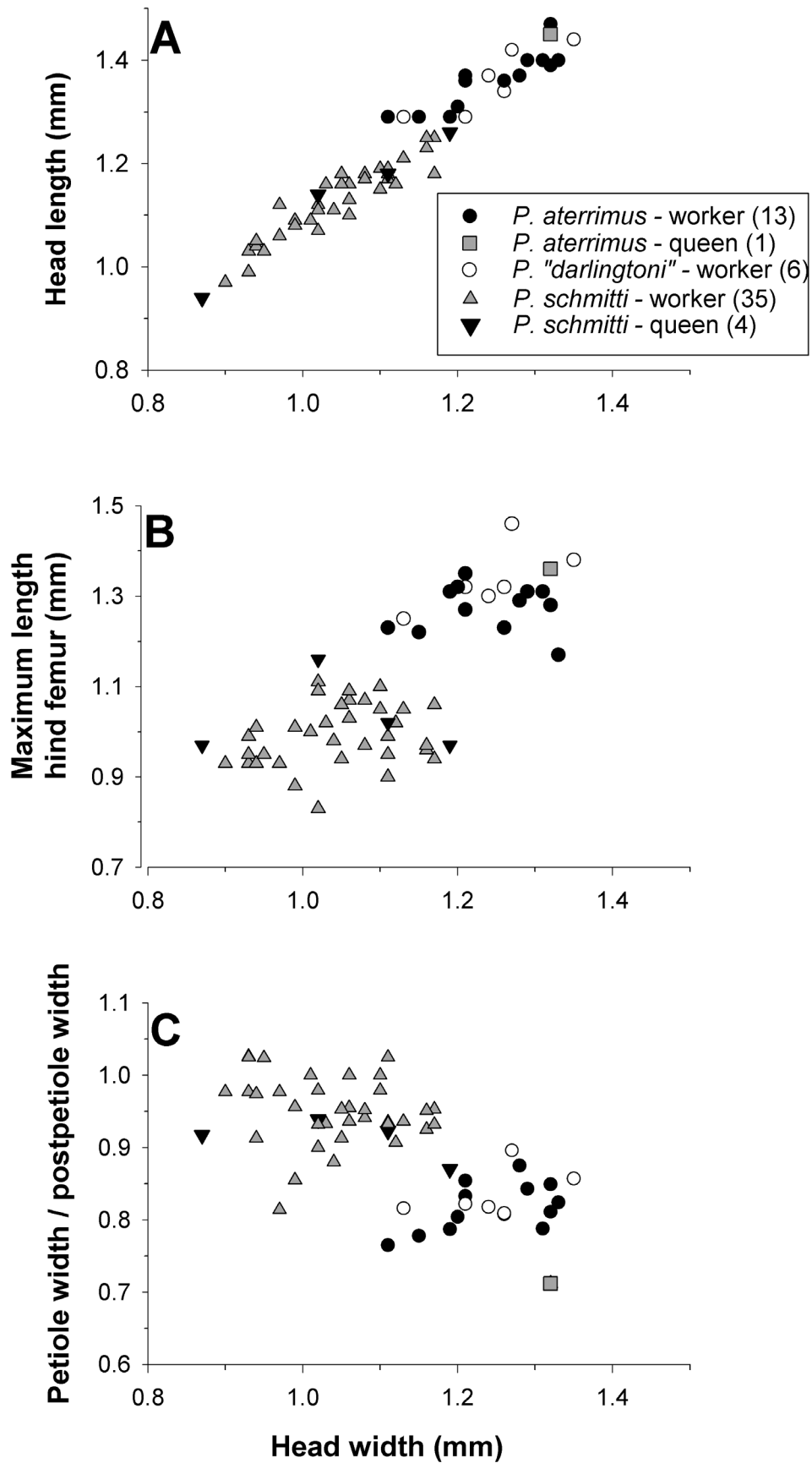


FIGURE 4. Bivariate plots for workers and queens of *Pogonomyrmex aterrimus*, *Pogonomyrmex "darlingtoni"*, and *Pogonomyrmex schmitti*: (A) head width versus head length, (B) head width versus maximum length of hind femur, and (C) head width versus the ratio of maximal petiolar node width/maximal postpetiole width. Sample size for each caste is in parentheses.

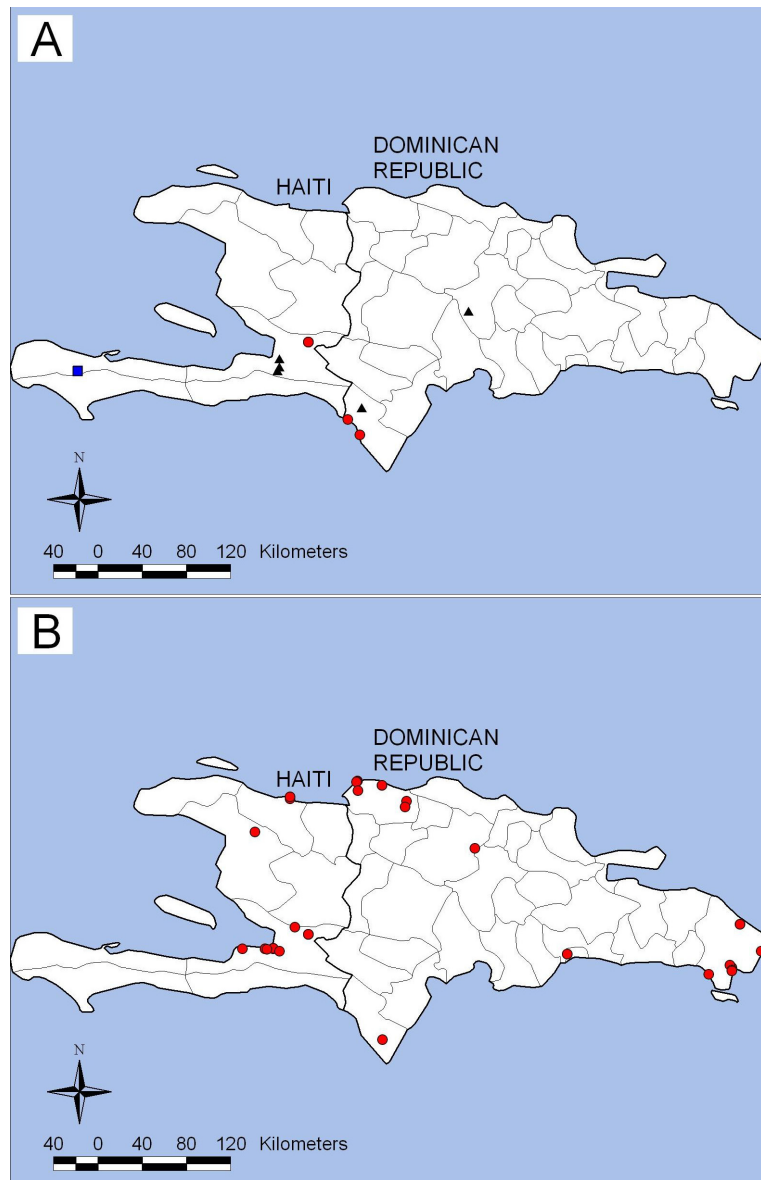


FIGURE 5. Geographic distribution for (A) *Pogonomyrmex aterrimus* (▲), *P. “darlingtoni”* (■), and *P. saucius* (●), and (B) *P. schmitti* (●). The bold line down the left-center of the map is the border between Haiti and the Dominican Republic; lighter lines are the first administrative divisions in each country. Both maps are drawn on the same geographic area so that distribution patterns are directly comparable.

Pogonomyrmex saucius Wheeler & Mann 1914

(Figures 6–8)

Pogonomyrmex (*Ephebomyrmex*) *saucius* Wheeler & Mann, 1914: 29, figs. 10, 11 (worker, male); Olsen, 1934, plate 7, fig. 2.

Syntypes examined: 4 workers, 1 male [AMNH], 1 worker [LACM], 5 workers, 1 male [MCZ], 1 worker [MHNG], 14 workers [USNM]; HAITI, about one-half mile east of Manneville (W.M. Mann leg, winter 1912–1913) (LACM worker here designated **LECTOTYPE** [LACMENT181990]).

Ephebomyrmex saucius (Wheeler & Mann); Kempf, 1972: 106. First combination in *Ephebomyrmex*.

Pogonomyrmex saucius Wheeler & Mann; Bolton, 1995: 341. Revived combination in *Pogonomyrmex*.

Worker. Diagnosis. Small (HW = 1.22–1.33 mm), easily identified by the coarse regular to weakly irregular, subparallel longitudinal rugae on the dorsum and sides of the mesosoma and posterior surface of petiolar node (**Figure 6**).

Measurements—lectotype ($n = 10 + 2$ paralectotypes). HL 1.33 (1.26–1.37); HW 1.33 (1.22–1.33); MOD 0.28 (0.25–0.30); OMD 0.33 (0.28–0.34); SL 1.01 (0.90–1.01); PNW 0.90 (0.87–0.95); HFL 1.22 (1.02–1.31); ML 1.63 (1.56–1.81); PW 0.50 (0.42–0.53); PPW 0.58 (0.51–0.62). Indices: SI 75.94 (68.42–79.51); CI 100.00 (94.57–101.53); OI 21.05 (19.84–24.00); HFI 91.73 (79.07–102.46).

Queen. Diagnosis. With caste-specific morphology of the mesosoma related to wing-bearing and presence of ocelli on head. Small (HW = 1.15 mm), about the same size as conspecific workers; all surfaces of mesosoma and posterior surface of petiolar node with coarse longitudinal rugae (**Figure 7**).

Measurements ($n = 1$). HL 1.23; HW 1.15; MOD 0.29; OMD 0.28; SL 1.00; PNW 1.01; HFL 1.27; ML 1.71; PW 0.41; PPW 0.55. Indices: SI 86.96; CI 93.50; OI 25.22; HFI 110.43.

Description. With caste-specific morphology of the mesosoma related to wing-bearing and presence of ocelli on head. In full-face view, head longer than broad (CI = 93.50), posterior margin flat. Longitudinal rugae on cephalic dorsum prominent, wavy to irregular; interrugae strongly granulate, dull. Mandible with six teeth, dorsal surface coarsely rugose. Eye relatively small, situated anterior to middle of head. Antennal scape moderately to strongly granulate, dull. Psammophore poorly-developed, consisting of short hairs scattered across ventral side of head.

All mesosomal surfaces with subparallel, regular to weakly irregular longitudinal rugae except for sides and dorsum of propodeum where rugae converge posterad. Propodeum with long, well-developed superior and inferior spines, inferior spines about the same length as superior spines. In profile, petiolar node asymmetrical with anterior surface notably shorter than posterior surface, apex of node weakly angulate. In dorsal view, petiolar node slightly longer than wide, widest near middle, tapering to a rounded to spatulate anterior margin. Anterior surface of petiolar node smooth and shining; posterior surface with coarse regular to weakly irregular longitudinal rugae, interrugae weakly granulate, shining. In dorsal view, postpetiole widest near posterior margin, tapering to anterior margin, maximum width about equal to length; all surfaces strongly coriaceous, dull. First gastral tergum strongly coriaceous, dull. Moderately abundant yellowish-brown to brownish hairs on entire body, longest hairs on head and mesosoma shorter than MOD. Body mostly concolorous dark brown; legs, antennae, and mandibles lighter; postpetiole and first gastral tergum with an iridescent blue to purplish reflection (**Figure 7**).

Male. Diagnosis. Head, dorsum of mesosoma, and posterior surface of petiolar node strongly granulate-punctate, dull; dorsum of postpetiole weakly granulate-punctate, weakly shining; notauli well-developed (**Figure 8**). Note that these characters might not be diagnostic because males of *P. aterrimus* and *P. schmitti* are unknown.

Measurements. (damaged, unable to measure).

Additional material examined. DOMINICAN REPUBLIC. Pedernales: Pedernales, May 27, 2008 (A Clark; RAJC); Cabo Rojo, 5 m, Sept 9, 1992 (PS Ward; MCZ, UCDC); Parque Nacional Jaragua, 5 m, Mar 31, 2012 (D Lubertazzi; MCZ). **HAITI. Quest:** Mannville, 1954 (WM Mann; LACM, USNM).

Etymology. Wheeler did not give information regarding the derivation of this name. The specific epithet, *saucius* (Latin, *sauci* = wounded, injured, weakened) might refer to the behavior of disturbed workers feigning death, as occurs in some related species.

Discussion and biology. The smaller *P. schmitti* is the only congener known to occur in sympatry with *P. saucius* (**Figure 5**). *Pogonomyrmex saucius* is easily distinguished by the wavy to slightly irregular longitudinal rugae on the dorsum and sides of the mesosoma and posterior surface of the petiolar node. All other Hispaniolan congeners have rugoreticulate-vermiculate sculpturing on the mesosoma, and the posterior surface of the petiolar node is shining to strongly punctate or rugoreticulate, but never with prominent longitudinal rugae.

Currently, *P. saucius* is known only from arid, semi-desert habitats at low elevations in south-central Hispaniola (**Figure 5**). Wheeler and Mann (1914) found nests under stones near sea level in a very arid area that contained desert vegetation such as cacti and thorny bushes; another collection label also indicated that specimens were collected in desert habitats (PS Ward #11730). Nests of *P. saucius* contained small numbers of seeds (Wheeler & Mann 1914). No information is available on colony size, but it is probably small (200–300 workers) (D. Lubertazzi, pers. comm.).

Little information is available relative to timing of sexual production or mating flights for *P. saucius*. One alate queen was collected on March 31, and the date for males was given as winter 1912–1913 (Wheeler & Mann 1914). The queen was small, similar to the size of workers (see discussion under taxonomy, morphology, and ecology). We also examined one aberrant intermorph-like queen (USNM) that had small wing buds, but her size and shape (especially the mesosoma) was similar to that of workers; she also lacked ocelli and distinct mesosomal sutures (see also Heinze *et al.* 1992; Johnson *et al.* 2007; Kusnezov 1951).

We also note that Wheeler & Mann described *P. saucius* as brownish-black. This coloration agrees with specimens in recent collections and indicates that over time workers in the syntype series have discolored to a light orangish-brown.

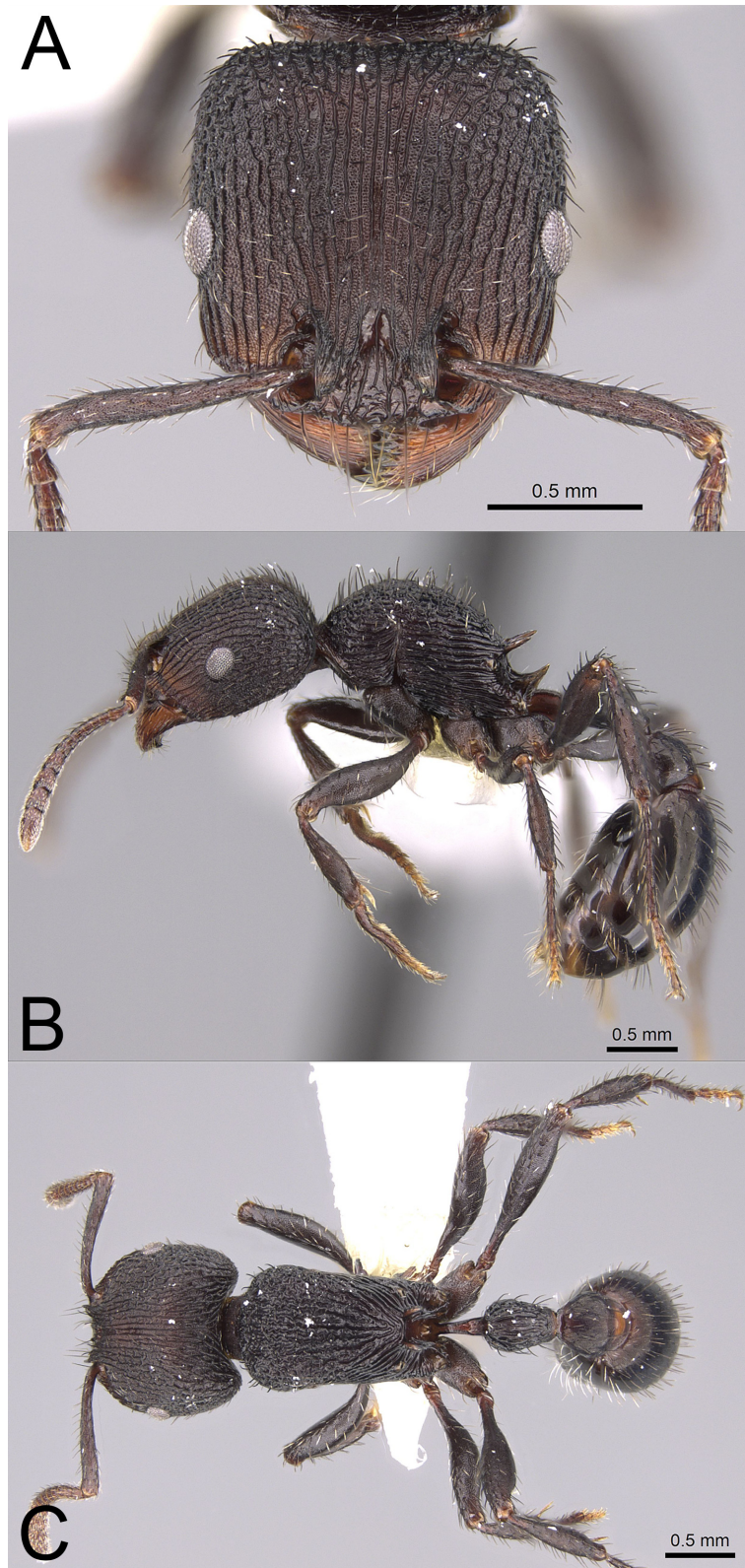


FIGURE 6. Photograph of *Pogonomyrmex saucius* Wheeler & Mann worker: (A) frontal view of head, (B) lateral view of body, and (C) dorsal view of body (MCZ-ENT00511548). Photographs by Michele Esposito from www.antweb.org.

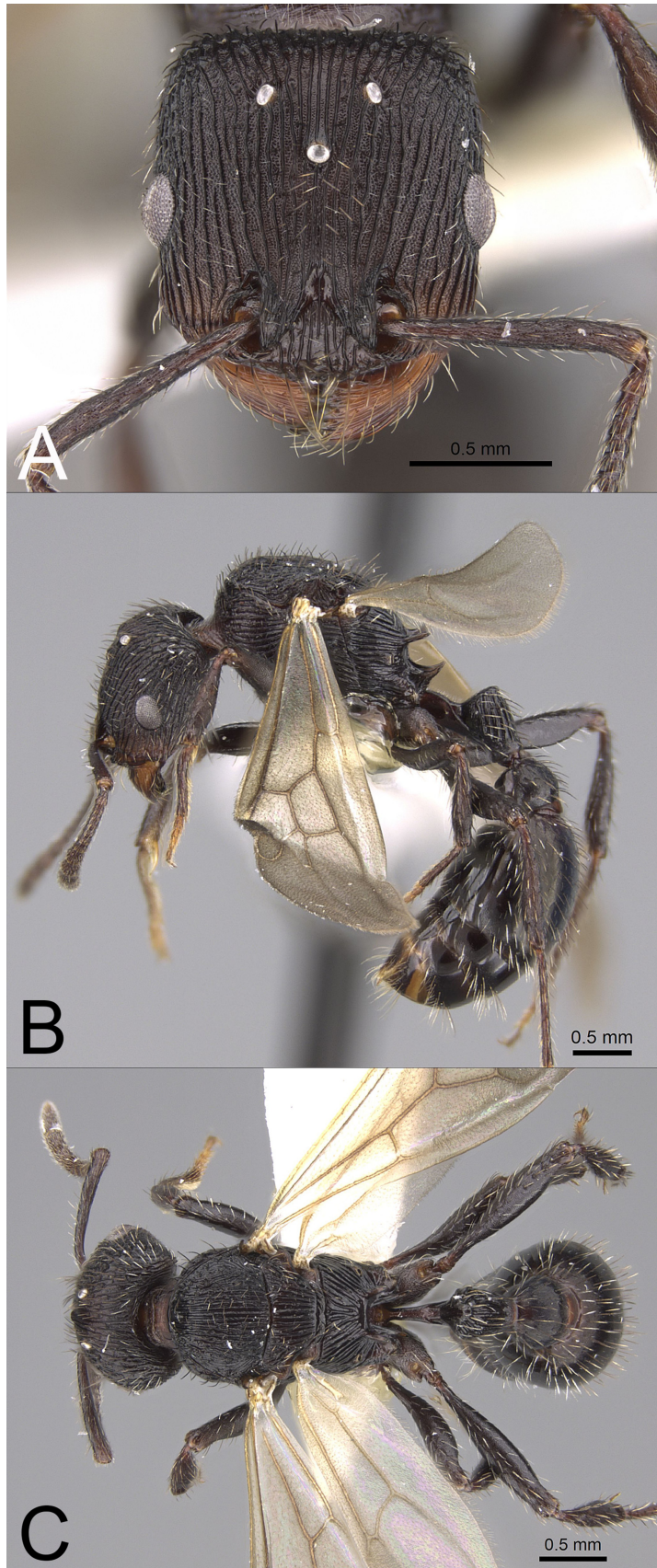


FIGURE 7. Photograph of *Pogonomyrmex saucius* Wheeler & Mann alate queen: (A) frontal view of head, (B) lateral view of body, and (C) dorsal view of body (MCZ-ENT00511553). Photographs by Michele Esposito from www.antweb.org.

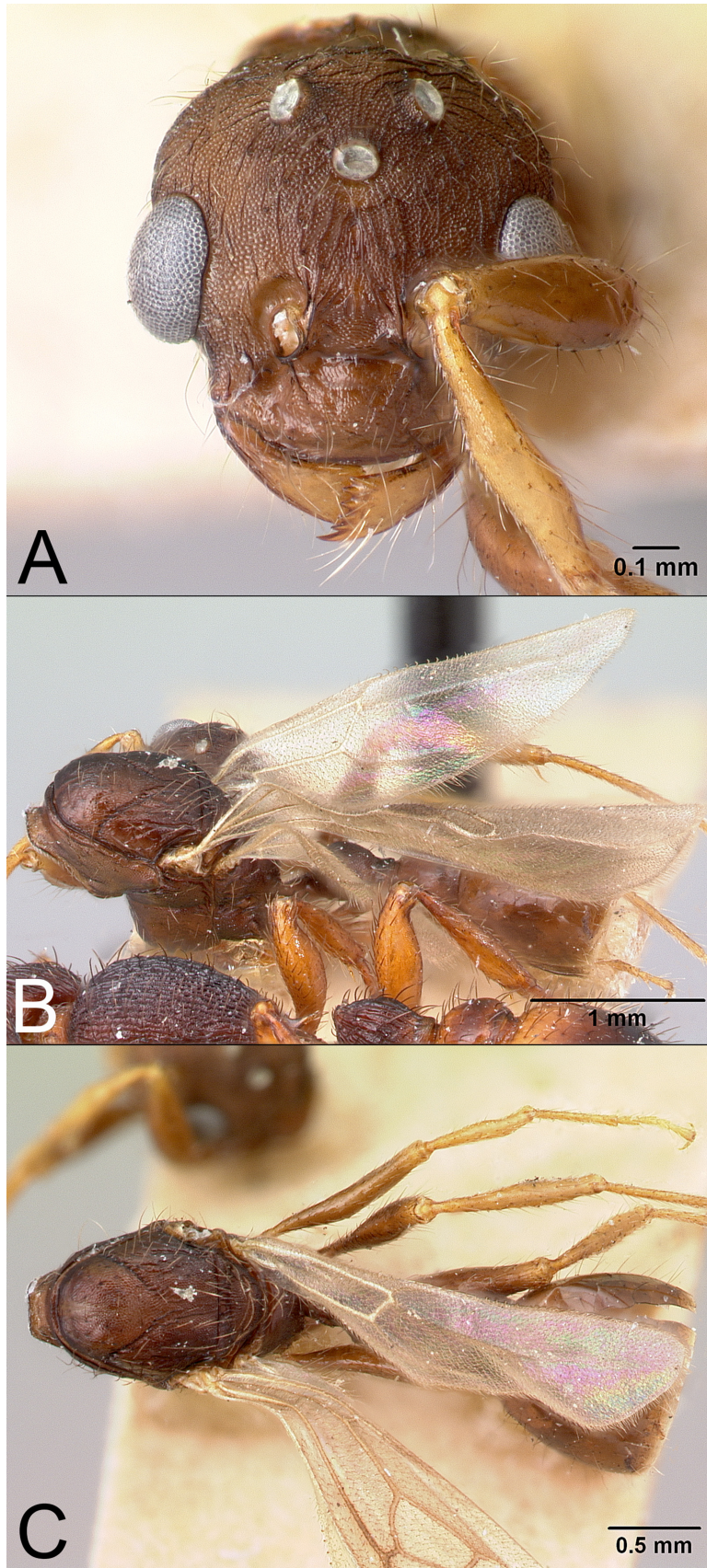


FIGURE 8. Photograph of *Pogonomyrmex saucius* Wheeler & Mann paralectotype male: (A) frontal view of head, (B) lateral view of body, and (C) dorsal view of body (CASENT0217245). Photographs by Erin Prado from www.antweb.org.

***Pogonomyrmex schmitti* Forel 1901**

(Figures 9–10)

Pogonomyrmex schmitti Forel, 1901: 339, fig. 9 (worker); Olsen, 1934: plate 8, fig. 1. Syntypes examined: 1 worker [MCZ], 1 worker [MHNG], 1 worker [NMW]; HAITI—no additional locale data given (P.J. Schmitt leg.) (NMW worker here designated **LECTOTYPE** [CASENT0173356]).

Pogonomyrmex (Epehebomyrmex) schmitti Forel; Wheeler, 1902: 390. First combination in *P. (Epehebomyrmex)*; Wheeler & Mann, 1914: 29, fig. 9 (queen).

Epehebomyrmex schmitti (Forel); Kempf, 1972: 106. First combination in *Epehebomyrmex*.

Pogonomyrmex schmitti Forel; Bolton, 1995: 341. Revived combination in *Pogonomyrmex*.

Pogonomyrmex (Epehebomyrmex) schmitti var. *sublaevigatus* Wheeler & Mann, 1914: 29 (worker, queen). Syntypes examined: 4 workers [MCZ], HAITI, Ennery; 9 workers [AMNH], 2 workers, 1 dealate queen [USNM], Manneville (MCZ worker here designated **LECTOTYPE** [ANTWEB1008774]). **NEW SYNONYMY**

Pogonomyrmex (Epehebomyrmex) schmitti sublaevigatus Wheeler & Mann; Wheeler, 1936; 197. Raised to subspecies.

Epehebomyrmex schmitti sublaevigatus (Wheeler & Mann); Kempf, 1972: 106. First combination in *Epehebomyrmex*.

Pogonomyrmex schmitti sublaevigatus Wheeler & Mann; Bolton, 1995: 341. Revived combination in *Pogonomyrmex*.

Worker. Diagnosis. Small (HW = 0.90–1.17 mm); dorsum of mesosoma rugoreticulate to vermiculate; posterior surface of petiolar node viewed from behind and above broadly fan-shaped and about as wide as long; in dorsal view, petiolar node about as wide as postpetiole (PW/PPW = 0.87–1.03); anterior surface of petiolar node mostly smooth and shining, forming a noticeably obtuse angle with peduncle of petiole; dorsum of postpetiole and first gastral tergum smooth and shining to partly or completely punctate, weakly shining (**Figure 9**).

Measurements. lectotype ($n = 34$). HL 1.12 (0.97–1.25); HW 0.97 (0.90–1.17); MOD 0.19 (0.19–0.25); OMD 0.24 (0.21–0.30); SL 0.70 (0.71–0.92); PNW 0.74 (0.65–0.90); HFL 0.93 (0.83–1.16); ML 1.30 (1.09–1.59); PW 0.42 (0.37–0.48); PPW 0.43 (0.38–0.52). Indices: SI 72.16 (68.97–88.30); CI 86.61 (88.79–99.15); OI 19.59 (17.95–24.47); HFI 95.88 (81.37–103.33).

Queen. Diagnosis. With caste-specific morphology of the mesosoma related to wing-bearing and presence of ocelli on head. Small (HW = 0.87–1.19 mm), rarely larger than conspecific workers (**Figure 4A**); in dorsal view, petiolar node fan-shaped, relatively broad (width/length > 0.90), relatively broad compared to postpetiole (PW/PPW > 0.80); anterior surface of petiolar node largely smooth and shining; posterior surface of petiolar node, dorsum of postpetiole, and first gastral tergum smooth and shining to completely punctate, weakly shining (**Figure 10**).

Measurements ($n = 4$). HL 0.94–1.26; HW 0.87–1.19; MOD 0.21–0.26; OMD 0.22–0.25; SL 0.69–0.87; PNW 0.66–0.99; HFL 0.88–1.07; ML 1.29–1.80; PW 0.34–0.48; PPW 0.42–0.57. Indices: SI 71.57–79.31; CI 89.47–94.44; OI 21.62–24.14; HFI 73.95–106.90.

Male. Unknown.

Additional material examined. DOMINICAN REPUBLIC: *La Altagracia*: 1 km NW Boca de Yuma, Feb 13, 1975 (WL & DE Brown; MCZ); 3 km NW Boca de Yuma, Feb 13, 1975 (WL & DE Brown; LACM, MCZ); 3 km S El Macao, Feb 14, 1975 (WL & DE Brown; MCZ, LACM); Punta Cana, Indigenous Eyes Nature Preserve, 30', Mar 24, 2002 (SP Cover; MCZ, RAJC); Parque Nacional del Este, Caseta de Guaraguoa, 30', Mar 30, 2004 (SP Cover; MCZ, RAJC); Parque Nacional del Este, Boca de Yuma, 60', Apr 3, 2004 (SP Cover; MCZ); Parque Nacional del Este, Punta Cana, 140', Mar 25, 2002 (SP Cover; MCZ). ***Le Vega*:** Constanza, 3,000–4,000', Aug 1938 (PJ Darlington; MCZ). ***Monte Cristi*:** Villa Elisa, Dec 8, 2003 (M Deyrup; MCZ); 1.6 mi N Villa Elisa, 150 m, Dec 8, 2003 (G Alpert; MCZ, RAJC); Parque Nacional Monte Cristi, 20 m, Dec 8, 2003 (SP Cover, L Davis, M Deyrup; CAS, LACM, MCZ); Monte Cristi, May 2 & Jun 1–2, 2008 (A Clark; MCZ). ***Pedernales*:** Pedernales, May 27, 2008 (A Clark; MCZ). ***Santiago*:** Foothills Cordillera Central, south of Santiago, Jun 1938 (PJ Darlington; MCZ); Parque Nacional Jaragua, 5–166 m, Mar 29–31, 2012 (D Lubertazzi; MCZ); Parque Nacional Jaragua, 400 m, Mar 27, 2014 (D Lubertazzi; MCZ). ***Santo Domingo*:** Santo Domingo Botanical Garden, 54 m, Dec 9, 2003 (L Davis, M Deyrup; MCZ). ***Valverde*:** Parque Nacional Monte Cristi, 20 m, Dec 8, 2003 (SP Cover; MCZ: G Alpert; MCZ, RAJC). **HAITI. *Centre*:** Poste Terre Rouge, Oct 5, 1934 (PJ Darlington; MCZ)(reported as Port Terre Rouge by Wheeler, 1936). ***Nord*:** Cap-Haitien, no date (WM Mann; LACM, MCZ, NHMG). ***Quest*:** Diquini, no date (WM Mann; AMNH, LACM, NHMG); Manneville, Nov 16–17, 1934 (PJ Darlington; MCZ: WM Mann; LACM, USNM); Monace, no date (WM Mann; USNM), Petionville, no date (WM Mann; USNM), Port-au-Prince, no date (G Keitel; MHNG, USNM: WM Mann; AMNH, USNM: KWC; USNM).

Etymology. This species was named after Rev. P.J. Schmitt, who collected the syntype series of workers.

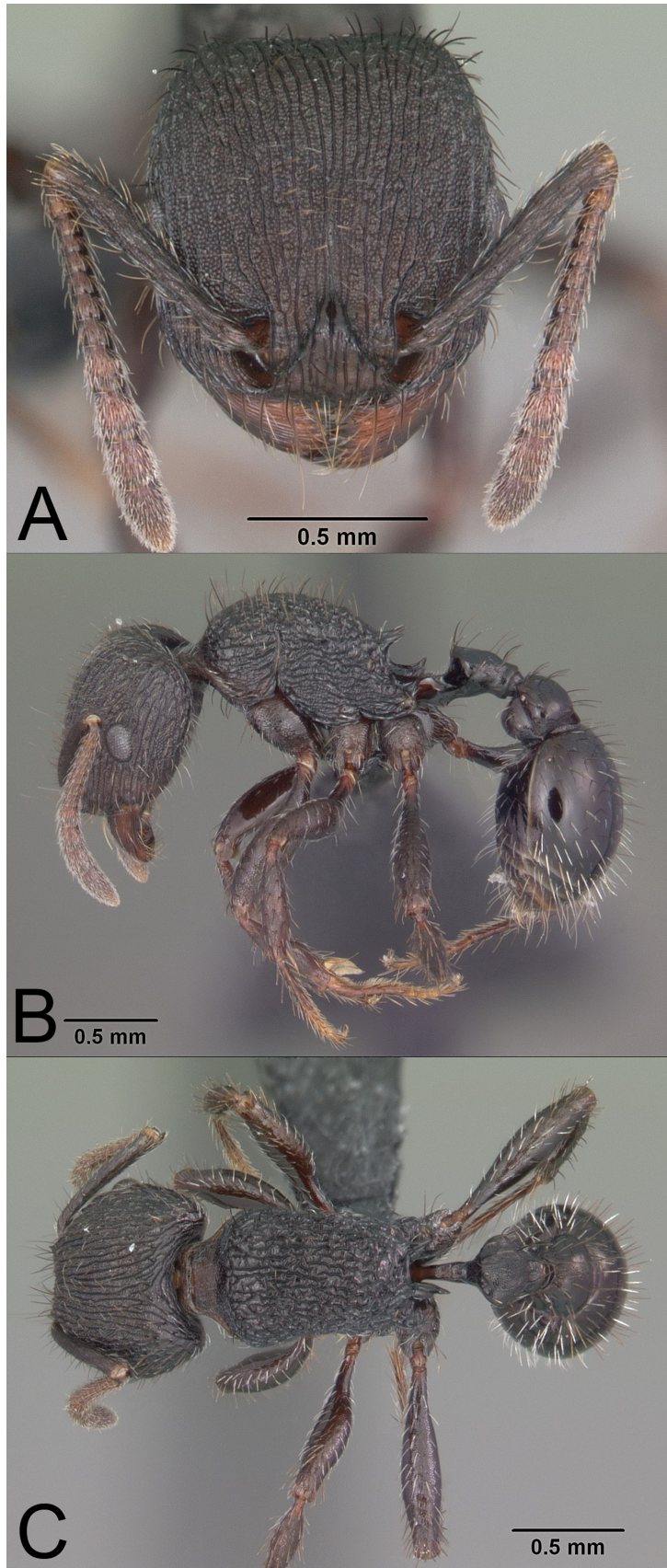


FIGURE 9. Photograph of *Pogonomyrmex schmitti* Forel worker: (A) frontal view of head, (B) lateral view of body, and (C) dorsal view of body (CASENT0103066). Photographs by April Nobile from www.antweb.org.

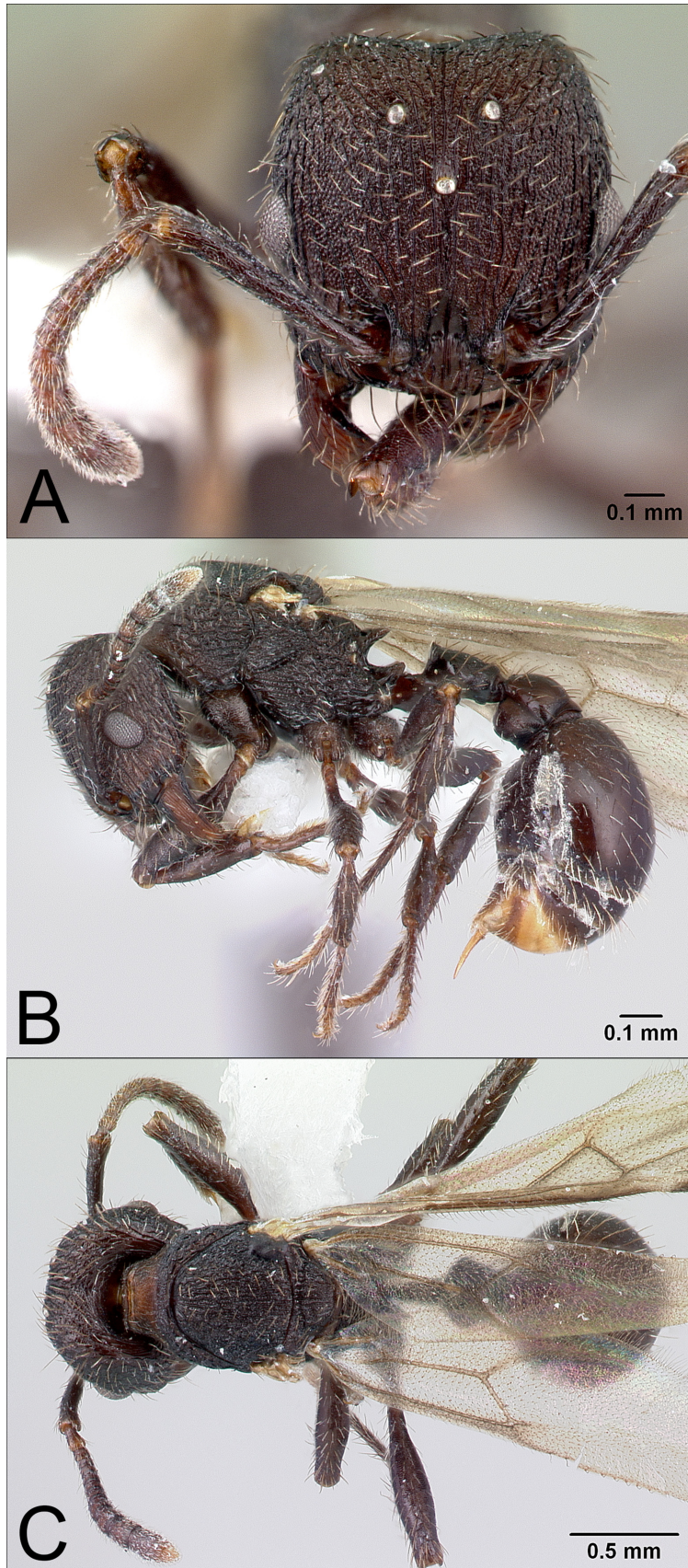


FIGURE 10. Photograph of *Pogonomyrmex schmitti* Forel alate queen: (A) frontal view of head, (B) lateral view of body, and (C) dorsal view of body (CASENT0217246). Photographs by Erin Prado from www.antweb.org.

Discussion and biology. *Pogonomyrmex schmitti* co-occurs with *P. saucius* in south-central Hispaniola. The two species are easily separated as *P. schmitti* has a rugoreticulate-vermiculate mesosoma and the posterior surface of the petiolar node is shining to strongly punctate. In *P. saucius*, the dorsum and sides of the mesosoma and posterior surface of the petiolar node have wavy to weakly irregular longitudinal rugae. *Pogonomyrmex aterrimus* might also co-occur with *P. schmitti* given that the two species have been taken in proximate locales. *Pogonomyrmex schmitti* is separated from *P. aterrimus* using the following characters: (1) *P. schmitti* is smaller (HW = 0.90–1.17 mm), (2) in dorsal view, the petiolar node is fan-shaped and nearly as broad to slightly broader than the postpetiole (PW/PPW = 0.87–1.03), (3) the anterior surface of the petiolar node is smooth and shining, and (4) the dorsum of postpetiole and first gastral tergum are usually weakly shining to shining, not densely punctate. Workers of *P. aterrimus* are larger (HW = 1.11–1.35 mm), in dorsal view, the petiolar node is elongate and notably narrower than the postpetiole (PW/PPW = 0.78–0.90) (**Figure 4C**), the anterior surface of the petiolar node is at least partly granulate, weakly shining, and the dorsum of the postpetiole and anterior portion of first gastral tergum densely punctate, dull (**Figure 1**). Moreover, several individual characters can separate these two species, but the above suite of characters provides a much more definitive diagnosis.

Pogonomyrmex schmitti subsp. *sublaevigatus* was described as differing from *P. schmitti* subsp. *schmitti* because the dorsum of the postpetiole and base of the first gastral tergum were smooth and shining or with only traces of fine punctures at the base, whereas both areas are punctate and dull in typical *P. schmitti*. We examined large series of workers, and found that these characters vary intranidally, from workers with the dorsum of the postpetiole and the first gastral tergum smooth and shining to those in which both areas were punctate and dull. Thus, we synonymize *P. schmitti* subsp. *laevigatus* under *P. schmitti*.

Little is known about the biology of *P. schmitti*. Most collections come from coastal areas at elevations that range from 10–150 m, though Darlington collected one colony at approximately 605 m near Poste Terre Rouge (see Wheeler 1936). *Pogonomyrmex schmitti* has been collected in disturbed evergreen tropical dry forest, secondary semi-evergreen shrub, coastal evergreen dry forest, and urban areas, e.g., the Santo Domingo Botanical Garden.

Pogonomyrmex schmitti is the most widely distributed and most frequently collected *Pogonomyrmex* on Hispaniola; it occurs throughout most coastal and lower elevation areas, and it represents approximately 75% of the series examined in this study. Nest microhabitats range from full shade to open, exposed sites, and Wheeler and Mann (1914) found crater nests in the ground or sometimes under rocks. *Pogonomyrmex schmitti* harvests seeds and insects (Wheeler & Mann 1914), and colonies appear to contain less than 200 workers, often fewer than 50 (S.P. Cover, pers. obs.).

Little information is available relative to timing of sexual production or mating flights for *P. schmitti*. One alate queen was collected on 13 February (WL Brown; MCZ) and one dealate queen was collected on 27 May while sifting litter (A Clark; MCZ); this latter queen was probably a foundress from a recent mating flight. Queens of *P. schmitti* are unusual because of their very small size, which is similar to that of workers. All of three standard body size measurements (head width, head length, width of the pronotum) were similar to those of 35 workers (one queen was smaller than all workers for all three measures, one queen was slightly larger than all workers; **Figure 4A**).

Discussion

Taxonomy, morphology, and ecology. Recent collections provided material to re-evaluate species boundaries and to update information on taxonomic status, distribution, biogeography, and biology for the *Pogonomyrmex* of Hispaniola so as to make this interesting group more accessible for future studies. Unresolved problems include determining microhabitat preferences, dietary preferences, and foraging strategies of all three species. Males are presently unknown in *P. schmitti* and *P. aterrimus*, and additional collections are needed to verify the taxonomic status of “*P. darlingtoni*”.

Colony founding behavior promises to be a rewarding subject to investigate given the very small size of queens for *P. schmitti* and *P. saucius*. Based on our morphological data, *P. schmitti* probably has the lowest queen to worker mass dimorphism (for species with alate queens) within the genus. Previously, the lowest queen to worker mass ratio occurred in *P. pima* (queen dry mass/worker dry mass = 2.05), in which alate queens are significantly larger than workers (Johnson *et al.* 2007; R.A. Johnson, unpub. data). Queens of *P. saucius* were also small as their

HW and HL fell within the range of measured workers, but their pronotal width was greater than that of all measured workers. The small size of these queens suggests that colony founding occurs via queen foraging, pleometrosis, or budding.

At this time, all three Hispaniola species of *Pogonomyrmex* are known to have only alate queens, which is interesting given that closely related *Ephebomyrmex* clade species in North America (*P. pima*, *P. imberbiculus*) (Heinze *et al.* 1992; Johnson *et al.* 2007) and South America (*P. naegelii*, *P. cunicularius*, *P. pencosensis*, *P. serpens*, and two undescribed species in the *P. breviparbis*-group) (Johnson 2015; R.A. Johnson, unpub. data) have ergatoid (wingless) or dimorphic queens (ergatoid and winged). However, we note that few *Pogonomyrmex* queens have been collected on Hispaniola (1 for *aterrimus*, 1 for *saucius*, 4 for *schmitti*), leaving open the possibility that additional queen phenotypes remain to be collected.

Lastly, we note that all three species of *Pogonomyrmex* are endemic to and contribute to the high level of endemism for the ants of Hispaniola. Approximately 52% (64 of 124 species) of the native ant species are endemic to Hispaniola (Perez-Gelabert 2008), which is higher than the 36.9% rate for all insects (Perez-Gelabert 2008). Interestingly, species of *Pogonomyrmex* are absent from other parts of the Greater Antilles (i.e., Cuba, Puerto Rico, Jamaica, and the Cayman Islands) (Fontenla 1997; Reyes 2002) and all islands in the Lesser Antilles.

Key to workers for species of *Pogonomyrmex* on the island of Hispaniola

- 1 Dorsum and sides of mesosoma and posterior surface of petiolar node with coarse, regular to weakly irregular, subparallel, longitudinal rugae (Figure 6) *saucius*
- Dorsum and sides of mesosoma rugoreticulate to vermiculate; posterior surface of petiolar node mostly smooth, granulate-punctate to rugoreticulate, but lacking subparallel longitudinal rugae (Figures 1, 2, 9) 2
- 2 Small (HW = 0.90–1.17 mm); posterior surface of petiolar node viewed from behind and above broadly fan-shaped and about as wide as long; in dorsal view, petiolar node about as wide as postpetiolar node (PW/PPW = 0.87–1.03); anterior surface of petiolar node mostly smooth and shining, forming a noticeably obtuse angle with peduncle of petiole; dorsum of postpetiole and first gastral tergum smooth and shining to partly or completely punctate, weakly shining. *schmitti*
- Larger (HW = 1.11–1.35); posterior surface of petiolar node viewed from behind and above elongate, clearly longer than wide; in dorsal view, petiolar node notably narrower than postpetiolar node (PW/PPW = 0.78–0.90); anterior surface of petiolar node partly to completely sculptured, dull to weakly shining, forming a right to weakly obtuse angle with peduncle of petiole; dorsum of postpetiolar and first gastral tergum strongly punctate, dull *aterrimus*

Key to queens

- 1 Dorsum of mesoscutum, mesoscutellum, and posterior surface of petiolar node with coarse, regular to weakly irregular, subparallel, longitudinal rugae (Figure 7) *saucius*
- Dorsum of mesoscutum and mesoscutellum with irregular longitudinal rugae to rugoreticulate/vermiculate; posterior surface of petiolar node mostly smooth, granulate-punctate to rugoreticulate, but lacking subparallel longitudinal rugae (Figures 3, 10) 2
- 2 Larger (HW = 1.32 mm), notably larger than conspecific workers; in dorsal view, petiolar node elongate (width/length < 0.85), relatively narrow compared to postpetiole (PW/PPW < 0.75); anterior surface of petiolar node moderately sculptured; dorsum of postpetiole and most of first gastral tergum strongly granulate-punctate, dull. *aterrimus*
- Smaller (HW = 0.87–1.19 mm), about the same size as conspecific workers; in dorsal view, petiolar node fan-shaped, relatively broad (width/length > 0.90), relatively broad compared to postpetiole (PW/PPW > 0.80); anterior surface of petiolar node largely smooth and shining; dorsum of postpetiole and first gastral tergum smooth and shining to completely punctate, weakly shining. *schmitti*

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