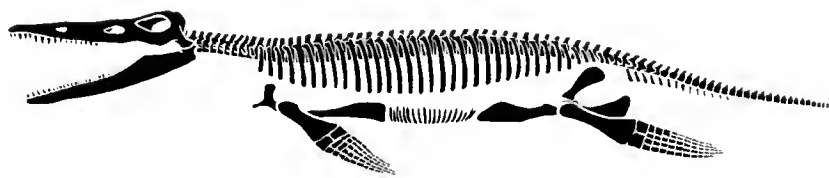


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ANTS OF BARBADOS (HYMENOPTERA, FORMICIDAE)

JAMES K. WETTERER,¹ DAVID LUBERTAZZI,² JIGNASHA D. RANA² AND EDWARD O. WILSON²

ABSTRACT. The Caribbean region is considered a threatened biodiversity hotspot because of its high levels of biotic endemism and widespread habitat destruction. On Caribbean islands, as elsewhere in the world, ants are a critical component of virtually every terrestrial ecosystem. Nonetheless, the ants of most Caribbean islands remain poorly known. Here, we reviewed historical accounts, compiled published and unpublished ant records, and collected new specimens to document the diversity of ants on the Caribbean island of Barbados, including summary accounts for each species. We expected Barbados to have a relatively depauperate native ant fauna with few endemic species because of high isolation, young age, flat terrain, and high degree of habitat destruction. Furthermore, we expected to find many exotic ants, introduced throughout a long history of international commerce dating back to the 1600s.

Our investigations increased the list of ant taxa known from Barbados to 69 (46 New World and 23 Old World). Of these, 62 are represented among specimens we collected, and seven are New World species only known from earlier records. We found that Barbados has fewer New World ant species and more Old World ant species than are known for Grenada and St. Vincent, two neighboring Caribbean islands of similar size. Most of the New World ant species in Barbados are continuously distributed from South American and Trinidad, through the Lesser Antilles and are probably native (i.e., predating human arrival). Some New World species in Barbados, however, may be exotics introduced through human commerce, as are all Old World ant species present. Six previously recorded New World species that we did not find may now be extinct in Barbados. These include *Atta cephalotes lutea* and *Crematogaster brevidentata*, the only two ant taxa thought to be endemic to Barbados, each collected just once >110 years ago.

KEY WORDS: ants; biogeography; exotic species; island biogeography; West Indies

INTRODUCTION

The Caribbean region is recognized as a threatened biodiversity hotspot because of its high levels of biotic endemism (e.g., 58% of terrestrial plant species and 51% of terrestrial vertebrate species) and widespread habitat destruction (only 10–15% intact

¹ Wilkes Honors College, Florida Atlantic University, 5353 Parkside Drive, Jupiter, Florida 33458, U.S.A.; e-mail: wetterer@fau.edu.

² Museum of Comparative Zoology, Harvard University, Cambridge, Massachusetts 02138, U.S.A.



Figure 1. Major islands (>50 km²) of the eastern Caribbean. Unshaded areas are now submerged but were dry land 15 kya when sea levels were ~ 150 m lower.

native vegetation remaining) (Solórzano *et al.*, 2005). On Caribbean islands, as elsewhere in the world, ants are critical components of virtually every terrestrial ecosystem (e.g., as scavengers, predators of other arthropods, seed dispersers, etc.) (Hölldobler and Wilson, 1990). Despite their importance, the native ants of most Caribbean islands have remained largely unknown. Now, several destructive exotic ant species are spreading through the region threatening native biodiversity. Here, we have compiled published and unpublished ant records and collected new specimens to document the diversity of ants from Barbados.

Barbados is the fourth largest island of the Lesser Antilles (Fig. 1). Compared with

other islands of the Lesser Antilles of similar size, we expected Barbados to have a relatively depauperate native ant fauna based on several factors. First, Barbados is the most isolated island of the Lesser Antilles, far to the east of all other islands (Fig. 1). Additionally, Barbados has never been connected to any other land mass, so all terrestrial species that have colonized Barbados had to cross the intervening ocean. Barbados is also one of the youngest islands of the Lesser Antilles, emerging only about 1 million years ago. Finally, compared with other major island in the Lesser Antilles, Barbados is flatter, more developed, and with less intact forest. Soon after European colonization in the 1600s, settlers quickly cleared most of the

forest for agriculture. In contrast, we expected Barbados to be home to many exotic ant species, introduced throughout a long history of international commerce. Barbados has traditionally depended heavily on imports from abroad, notably lumber and other building material (Peterson, 1973).

Published ant records from Barbados

Early reports on the natural history of Barbados mentioned several types of ants (Clark, 1670; Hughes, 1750; Coke, 1808–11; Schomburgk, 1848; see Appendix 1). These accounts all appear to concern well-known pest species: a leaf-cutting ant (*Atta* sp.), a large carpenter ant [*Camponotus atriceps* (Smith)], the African big-headed ant [*Pheidole megacephala* (Fabricius)], the tropical fire ant [*Solenopsis geminata* (Fabricius)], the ghost ant [*Tapinoma melanocephalum* (Fabricius)], and the little fire ant [*Wasmannia auropunctata* (Roger)]. Unfortunately, no specimens exist to confirm these early reports, so the species identities in these earliest reports remain uncertain (see Appendix 1). Therefore, despite anecdotal evidence on the importance of these six pest ants in the early history of Barbados, we did not include these early reports in our analyses.

In the oldest published ant records with extant voucher specimens, Smith (1877) described *Pseudomyrma pilosula* Smith and *Pseudomyrma variabilis* Smith [both = *Pseudomyrmex gracilis* (Fabricius)] from Barbados (date and collector unknown). Additionally, Ward (1989) reported that a specimen of *Pseudomyrmex maculatus* (Smith) was on the same pin as Smith's *P. variabilis* type specimen and presumably came from the same source.

Forel (1893) described *Atta lutea* Forel (= *Atta cephalotes lutea* Forel) based on specimens that W. G. Jeffreys collected in Barbados. Wheeler (1923) reported additional ant specimens that Jeffreys collected in

Barbados (presumably before 1893): *Triglyphothrix striatidens* Emery (= *Tetramorium lanuginosum* Mayr) and *Camponotus sexguttatus grenadensis* Forel (= *Camponotus sexguttatus* Fabricius).

On his way to Colombia in 1896, Forel himself made a short stop in Barbados and collected ants. In several subsequent publications, Forel (1897, 1901, 1902, 1912a,c,d, 1913) reported 13 currently valid ant taxa from Barbados: *Brachymyrmex cordemoyi* Forel, *C. sexguttatus*, *C. sexguttatus grenadensis* (= *C. sexguttatus*), *Cardiocondyla emeryi* Forel, *Crematogaster brevispinosus brevidentata* Forel (= *Crematogaster brevidentata* Forel), *Crematogaster steinheili* Forel, *Monomorium floricola* (Jerdon), *Odontomachus haematoda insularis* Guérin (= *Odontomachus insularis* Guérin), *Prenolepis vividula antillana* Forel [= *Nylanderia vividula antillana* (Forel)], *Pheidole fallax jelskii antillensis* Forel (= *Pheidole jelskii* Mayr), *Pheidole subarmata elongatula* Forel (= *Pheidole subarmata* Mayr), *Platythyrea punctata pruinosus* Mayr [= *Platythyrea punctata* (Smith)], *S. geminata*, and *W. auropunctata*.

Crawley (1921) described *Rhizomyrma marshalli* Crawley (= *Acropyga goeldii* Forel) from Barbados. Wheeler (1923) compiled a list of ant taxa known from Barbados based on published records of Forel, plus new material collected by Stoner (in 1918), Wheeler (in 1920), and Ballou (in 1922). Wheeler's (1923) list included five previously unreported species: *Brachymyrmex heeri obscurior* Forel (= *Brachymyrmex obscurior* Forel), *Crematogaster carinata* Mayr, *Crematogaster brevispinosa minutior* Forel (= *Crematogaster crinosa* Mayr), *Monomorium minutum* Mayr (= *Monomorium monomorium* Bolton), and *Prenolepis longicornis* Latreille [= *Paratrechina longicornis* (Latreille)]. In total, Wheeler (1923) listed 21 valid taxa from Barbados but omitted published records of Smith (1877; *P. gracilis*) and Crawley (1921; *A. goeldii*).

Tucker (1953) cataloged all insects known from Barbados, including a very incomplete list of ant taxa as follows: *Rhizomyrma* sp. (= *Acropyga* sp.), *R. marshalli* (= *A. goeldii*), *Brachymyrmex* spp., *C. sexguttatus*, *C. sexguttatus grenadensis* (= *C. sexguttatus*), *Crematogaster brevispinosa* Mayr, *C. brevispinosa brevidentata* (= *C. brevidentata*), *Monomorium destructor* Jerdon (= *Trichomyrmex destructor*), *Monomorium carbonarium ebeninum* (= *Monomorium ebeninum*), *P. longicornis*, *S. geminata*, and *Solenopsis corticalis* Forel. Of these, *C. brevispinosa*, *S. corticalis*, and *M. destructor* were new records, although the first two are most likely misidentifications; we therefore excluded these records.

Kempf (1972), in his catalog of Neotropical ants, included records representing 22 valid taxa of ants from Barbados, omitting records in Tucker (1953) and one other previously published record: *P. jelskii* (Forel, 1912b). After Kempf (1972), other published additions to the Barbados ant species list are *Tetramorium bicarinatum* (Bolton, 1979), *Gnamptogenys* cf. *striatula* (Peck, 1981; probably = *Gnamptogenys striatula* Mayr), *Hypoponera* sp. (Peck, 1981), and *P. maculatus* (Ward, 1989; see above). Thus, before our current collecting efforts, there were reliable published records from Barbados of 26 currently valid ant taxa, plus two taxa identified only to genus. Some of our current records of tramp ant species in Barbados have been reported earlier, in review papers on these species (Wetterer, 2008, 2009a–c, 2010a–c, 2011a–c, 2012a–e, 2013a,b, 2014a–c; MacGown and Wetterer, 2013).

METHODS

We searched for ant specimens from Barbados in the collections of the American Museum of Natural History, Museum of Comparative Zoology, and Smithsonian

Institute. We also pinned and identified Barbados ant specimens collected by Johanna P. E. C. Darlington in March 1987.

Stefan P. Cover (SPC) and one of us (EOW) collected ants in Barbados 17–20 March 1998. Another author (JKW) collected ants in Barbados 25–29 November 2003, 16–22 June 2006, and 2–14 May 2014 (see Appendix 2 for site details). We conducted much of our sampling in the remaining intact forest, notably in Hackleton's Cliff and Turner's Hall Woods, and in small forest patches that remain in deep gullies formed from collapsed caves (e.g., Jack-in-the-Box gully).

We collected ants following standard methods used in numerous earlier ant faunal surveys (e.g., Wetterer and Wetterer, 2004; referred to as “direct sampling” by Bestelmeyer *et al.*, 2000). The primary goal was to collect the maximum number of different ant species in the time allotted. To do this, we collected at numerous sites in the widest range of habitats accessible and permitted, spending more time at sites where the new or rare species accumulation rate was greater and adjusting collecting techniques to best sample different habitats (Longino, 2000). We have found that this method proves much more efficient than standardized techniques designed for evaluating relative abundances of species and making detailed comparisons among individual sites (such as the Ants of the Leaf Litter [ALL] protocol, which requires a minimum of three days sampling per site; Agosti and Alonso, 2000; Fisher *et al.*, 2000). We hand-collected ants, made vegetation beatings, and collected complete colonies from under rocks and logs and inside epiphytes, twigs, and dead wood. We sifted soil and litter samples using a Davis sifter. When possible, we collected not only workers and sexuals, but also larvae and pupae. One focus was surveying intact forests, where native and endemic species are most commonly found. We also surveyed highly disturbed areas,

particularly around ports, where invasive exotic ants dominate. We have found that botanical gardens, urban parks, and outdoor food markets are particularly rich sources of both native and exotic ant species.

John T. Longino confirmed the identification of our *Crematogaster* specimens. José Pacheco and William Mackay identified a subset of our thief ants (*Solenopsis* spp.) collected in 2003 and 2006. We did not include unidentified thief ants in our record counts.

We classified each species as either New World or Old World and evaluated its known range based on information from a wide range of sources (see Results). Kempf's (1972) catalog of Neotropical ants and Deyrup's (2003) checklist of Florida ants were particularly helpful sources of range information.

We classified Old World records into five biogeographic regions:

1. The Afrotropic or Ethiopian region (22.1 million km²) includes sub-Saharan Africa, the southern and eastern coasts of the Arabian Peninsula, southern Iran, southwestern Pakistan, Madagascar, the western Indian Ocean islands, Cape Verde Islands, and the southern mid-Atlantic islands.
2. The Palearctic region (54.1 million km²) includes Europe, northern Africa, the northern and central Arabian Peninsula, and Asia north of the Himalayas, including the main islands of Japan.
3. The Indomalay or Oriental region (7.5 million km²) includes southeastern Pakistan, the Indian subcontinent, Southeast Asia, southern China, the Philippines, Taiwan and Japan's Ryukyu Islands, and Indonesia west of Wallace's line.
4. The Australasia region (7.6 million km²) includes Australia, New Guinea, Indonesia east of Wallace's Line, Vanuatu, the Solomon Islands, New Caledonia, and New Zealand.
5. The Oceania region (1.0 million km²) includes the Pacific islands of Fiji, Micronesia, and Polynesia (except New Zealand).

RESULTS

We documented 69 ant taxa in Barbados (62 are represented among specimens we

collected and seven are based solely on earlier records; Tables 1, 2). We found that the one published record of *M. monomorium* in Barbados was based on misidentified specimens of *M. ebeninum*. We provisionally considered the published records of *B. corde-moyi*, *O. insularis*, *N. vividula antillana*, and *Pheidole fallax* in Barbados to be misidentifications of *B. cf. obscurior*, *Odontomachus ruginodis*, *Nylanderia cf. steinheili*, and *P. jelskii*, respectively (see Species Accounts below). We judged 46 of the ant taxa found in Barbados to be of New World ant species and the other 23 to be Old World exotics (Tables 1, 2; see Species Accounts below).

Our 1998, 2003, 2006, and 2014 collections yielded a diminishing number of previously unrecorded species, finding 26, 10, 5, and 1, respectively. We found several ant species at just one or two sites, indicating that it is likely we overlooked at least a few species.

SPECIES ACCOUNTS

C&W = S. P. Cover and E. O. Wilson (1998), JW = J. K. Wetterer (2003, 2006, and 2014). We list vial numbers for specimens we collected (see Appendix 2). * = previously published specimen records from Barbados identified as a different species. BMNH = Natural History Museum London, MCZ = Museum of Comparative Zoology, and SI = Smithsonian Institution.

1. *Acropyga goeldii* Forcl

Published Record. No site data; in soil by sugarcane root (1914; J. R. Bovell; Crawley 1921; as *Rhizomyrma marshalli*; type in BNHM).

Specimens Examined. C&W, one site (B68, B74). JW, two sites (2006: 358; 2014: 95).

Crawley (1921) described *R. marshalli* Crawley (= *A. goeldii*) from specimens that J. R. Bovell collected in Barbados. John Redman Bovell (1855–1928) was the Superintendent of Agriculture in Barbados, known

TABLE 1. NEW WORLD ANTS OF BARBADOS. FIRST = EARLIEST RECORD. NEW = NO. OF NEW SITE RECORDS (1998–2006).

	First	New		NW†		OW‡
<i>Crematogaster crinosa</i>	1920	91	CST	bgv	LG—	—————
<i>Camponotus sexguttatus</i>	1896	80	CST	bgv	LGBF	—————
<i>Brachymyrmex</i> cf. <i>obscurior</i>	1896	74	CST	bgv	LGBF	———AuOc
<i>Odontomachus ruginodis</i>	1896*	52	CST	bgv	LGBF	—————
<i>Wasmannia auropunctata</i>	1896	51	CST	bgv	LGBF	AfPa—AuOc
<i>Pheidole sculptior</i>	1998	47	CST	bgv	LG—	—————
<i>Cyphomyrmex minutus</i>	1998	46	CST	bgv	LGBF	—————
<i>Pheidole jelskii</i>	1896	39	—ST	bgv	LGB—	—————
<i>Solenopsis geminata</i>	1896	39	CST	bgv	LGBF	AfPaInAuOc
<i>Nylanderia</i> cf. <i>steinheili</i>	1896*	36	CST	bgv	LGB—	—Pa———
<i>Brachymyrmex</i> cf. <i>heeri</i>	1998	34	CST	bgv	LGBF	—Pa———
<i>Monomorium ebeninum</i>	1918*	33	CST	bgv	LGBF	—————
<i>Solenopsis globularia</i>	1998	31	CST	bgv	LGBF	—————
<i>Strumigenys margaritae</i>	1998	29	CST	bgv	LGBF	—————
<i>Pheidole exigua</i>	1998	24	CST	bg—	—G—	—————
<i>Anochetus mayri</i>	1998	23	CST	bgv	LGBF	—Pa———
<i>Rogeria curvipubens</i>	1987	23	CST	bgv	LGB—	—————
<i>Platythyrea punctata</i>	1896	21	CST	bgv	LGBF	—————
<i>Anochetus inermis</i>	1998	16	CST	bgv	L—B—	—————
<i>Gnamptogenys striatula</i>	1979*	16	CST	b—	LG—	—Pa———
<i>Pheidole transversostriata</i>	1998	15	—ST	b—	LG—	—————
<i>Camponotus atriceps</i>	1998	14	CST	bgv	———	—————
<i>Crematogaster curvispinosa</i>	1998	14	CST	bgv	L——	—————
<i>Odontomachus bauri</i>	1998	14	CST	bgv	LG—	—————
<i>Solenopsis pollux</i>	2003	13	CS—	bgv	LG—	—————
<i>Pheidole subarmata</i>	1896	10	CST	bgv	LGB—	—————
<i>Rogeria foreli</i>	2003	10	CST	bgv	LG—	—————
<i>Syllophopsis subcoeca</i>	1998	9	——	bg—	LG—	—————
<i>Solenopsis zeteki</i>	2006	8	CS—	bg—	L——	—————
<i>Solenopsis azteca</i>	2003	8	CS—	bgv	LG—	—————
<i>Nylanderia</i> cf. <i>fulva</i>	1998	7	CST	b—v	LG—F	—————
<i>Strumigenys louisianae</i>	2006	7	CST	b—v	LGBF	—————
<i>Strumigenys eggersi</i>	2003	5	CST	bg—	LGBF	—————
<i>Pheidole susannae</i>	2006	4	CST	b—	LG—	—————
<i>Solenopsis pygmaea</i>	2003	4	C—	bgv	—G—	—————
<i>Leptogenys pubiceps</i>	2003	3	—ST	bgv	LGB—	—————
<i>Acropyga goeldii</i>	1914	3	CST	b—	———	—————
<i>Strumigenys schulzi</i>	1998	2	CST	b—	———	—————
<i>Pseudoponera stigma</i>	2014	1	CST	bgv	LGBF	———InAuOc
<i>Hypoconera opaciceps</i>	≤1960	0	CST	b—	LGBF	—PaInAuOc
<i>Crematogaster carinata</i>	1920	0	CST	b—	———	—————
<i>Crematogaster brevidentata</i>	1896	0	——	b—	———	—————
<i>Crematogaster steinheili</i>	1896	0	——	b—	LGB—	—————
<i>Atta cephalotes lutea</i>	≤1893	0	——	b—	———	—————
<i>Pseudomyrmex gracilis</i>	≤1877	0	CST	b—v	LG—F	—Pa———Oc
<i>Pseudomyrmex maculatus</i>	≤1877	0	—ST	b—	———	—————

*First published record uncertain identification.

†New World Range: C = Central America, S = South America, T = Trinidad; b = Barbados, g = Grenada, v = St. Vincent.

‡Old World Range: L = other Lesser Antilles, G = Greater Antilles, B = Bahamas, F = Florida; Af = Afrotropic, Pa = Palearctic, In = Indomalaya, Au = Australasia, Oc = Oceania.

TABLE 2. OLD WORLD ANTS OF BARBADOS.

	First	New		NW*		OW*
<i>Paratrechina longicornis</i>	1920	61	CST	bgv	LGBF	AfPaInAuOc
<i>Tapinoma melanocephalum</i>	1998	53	CST	bgv	LGBF	AfPaInAuOc
<i>Tetramorium simillimum</i>	1998	29	CST	bgv	LGBF	AfPaInAuOc
<i>Cardiocondyla emeryi</i>	1896	27	CST	bgv	LGBF	AfPaInAuOc
<i>Pheidole megacephala</i>	2003	28	CST	b-v	LGBF	AfPaInAuOc
<i>Plagiolepis althaudi</i>	1998	27	—	bg-	L—	AfPaInAuOc
<i>Monomorium floricola</i>	1896	17	CST	bgv	LGBF	AfPaInAuOc
<i>Trichomyrmex destructor</i>	≤ 1953	11	CST	bgv	LGBF	AfPaInAuOc
<i>Tetramorium caldarium</i>	1998	9	CST	b—	LGBF	AfPaInAuOc
<i>Cardiocondyla minutior</i>	1998	6	CST	bg-	LGBF	Af—InAuOc
<i>Hypoponera punctatissima</i>	1998	6	CS-	bgv	LGBF	AfPaInAuOc
<i>Strumigenys rogeri</i>	1998	6	CST	bgv	LGBF	AfPaInAuOc
<i>Tetramorium lanuginosum</i>	≤ 1893	5	C-T	b-v	LG-F	AfPaInAuOc
<i>Cardiocondyla venustula</i>	1998	4	CST	b—	LGBF	Af—In—Oc
<i>Strumigenys emmae</i>	2003	4	CST	bgv	LGBF	Af—InAuOc
<i>Cardiocondyla mauritanica</i>	2006	2	C—	bg-	-G-F	AfPaInAu—
<i>Cardiocondyla obscurior</i>	1998	2	CS-	b—	-G-F	AfPaInAuOc
<i>Nylanderia bourbonica</i>	1998	2	C-T	b-v	LGBF	AfPaInAuOc
<i>Pheidole teneriffana</i>	2003	2	-S-	bg-	LG—	AfPa—
<i>Strumigenys membranifera</i>	1998	2	CST	b—	LGBF	AfPaInAuOc
<i>Sylophopsis sechellensis</i>	2003	2	—	b—	L—	Af—InAuOc
<i>Leptogenys maxillosa</i>	2006	1	CS-	b-v	LG—	AfPaIn—Oc
<i>Tetramorium bicarinatum</i>	1936	1	CST	bgv	LGBF	AfPaInAuOc

*Symbols as in Table 1.

for his research with sugarcane. His portrait is now on the two dollar bill of Barbados.

LaPolla (2004) determined *R. marshalli* to be a junior synonym of *A. goeldii*. *Acropyga goeldii* is also known from Brazil, Paraguay, Surinam, Guyana, Trinidad, Venezuela, Colombia, and Panama (LaPolla, 2004). *Acropyga* spp. are obligate mutualists of root-feeding Hemiptera. *Acropyga* are rarely collected except when researchers are specifically seeking them. *Acropyga goeldii*, often found tending mealy bugs on sugarcane roots, may be fairly common in Barbados, where sugarcane is a major crop.

2. *Anochetus inermis* André

Published Records. None.

Specimens Examined. C&W, two sites (B13, B21, B51). JW, 14 sites (2003: 87, 97, 99, 100, 119, 121; 2006: 359, 380, 410, 441, 442, 453; 2014: 27, 112).

This widespread New World trap-jaw ant is “a nearly uniform tawny to yellowish-red in color” (Brown, 1978) and is the larger and lighter colored of the two *Anochetus* species present in Barbados. We found this species in both natural and highly disturbed habitats. *Anochetus inermis* is native to South America and the West Indies, but populations in the Bahamas may be exotic (Deyrup *et al.*, 1998).

3. *Anochetus mayri* Emery

Published Records. None.

Specimens Examined. C&W, one site (B19, B30). JW, 22 sites (2003: 104, 107, 110, 130; 2006: 346, 348, 349, 359, 364, 365, 442; 2014: 9, 64, 71, 102, 107, 112, 169, 174, 180, 185, 189).

This widespread New World trap-jaw ant is the smaller and darker of the two *Anochetus* species present in Barbados. Brown (1978,

p. 617) wrote about the difficulties in defining the taxonomic boundaries of *A. mayri* as follows (in abbreviated form): “*A. mayri* is variable in body size, eye size, antennal scape length, color and sculpture, as well as size and details of form and dentition of the mandibles. It is not always easily separated from smaller specimens of the *inermis* complex on the one hand, or from *neglectus* on the other, and some of the variation raises the suspicion that *mayri* may include two or more sibling species.” “The *mayri* complex is widespread in the West Indies and shows there wide variation in size, color and sculpture.” “After prolonged study of this material, I cannot find any way to separate it into two species, or even into reasonably clearcut geographical forms.” We found this species in both natural and highly disturbed habitats. *Anochetus mayri* is native to South America, Central America, and the West Indies, but populations in the Bahamas and Florida may be exotic (Deyrup *et al.*, 1998, 2000).

4. *Brachymyrmex* cf. *heeri*

Published Records. None.

Specimens Examined. C&W, two sites (B69, B99, B102). JW, 32 sites (2003: 91, 93, 95, 99, 100, 121, 130; 2006: 337, 343, 348, 349, 354, 363, 365, 380, 442, 451, 453; 2014: 9, 60, 64, 74, 87, 92, 93, 94, 119, 135, 152, 156, 160, 174).

Forel (1874) described *Brachymyrmex heeri* Forel from greenhouses in Switzerland. Unfortunately, the taxonomy of the genus *Brachymyrmex* is in disarray, and the species boundaries are not clear. It is likely that there are two or more species identified under the name *B. heeri*. Some specimens we have identified as *B. cf. heeri* have been identified by other researchers as *Brachymyrmex minutus* Forel. Small yellow *Brachymyrmex* are widespread in the New World.

We found this species in both natural and highly disturbed habitats. It is fairly common

in Barbados, but it is probably often overlooked because of its very small size.

5. *Brachymyrmex* cf. *obscurior*

Published Records. No site data (1896; A. Forel; Forel, 1912d, as *Brachymyrmex cordemoyi* Forel). Bridgetown (1920; W. M. Wheeler; Wheeler, 1923, as *B. obscurior*). No site data (Sirjusingh *et al.*, 1992, as *B. obscurior*).

Specimens Examined. No site data (1934; N. A. Weber; MCZ). C&W, one site (B9). JW, 73 sites (2003: 87, 91, 92, 93, 95, 97, 99, 100, 108, 109, 112, 115, 116, 118, 121, 133; 2006: 354, 358, 363, 371, 373, 374, 375, 376, 379, 381, 383, 387, 410, 412, 418, 422, 440441, 442, 451, 456, 457; 2014: 6, 9, 26, 42, 44, 52, 54, 55, 56, 59, 60, 80, 81, 83, 85, 87, 92, 93, 94, 107, 109, 124, 135, 143, 144, 145, 151, 152, 154, 155, 156, 157, 160, 165, 168, 190).

Forel (1893) described *B. heeri obscurior* (= *B. obscurior*) from St. Vincent, writing that it differed from *B. heeri* in being brownish in color and slightly hairier and differed from *Brachymyrmex patagonicus* Mayr in being smaller, slightly hairier, and with slightly longer scapes.

Small brown *Brachymyrmex* are widespread and very common in the New World, particularly in highly disturbed environments. *Brachymyrmex* cf. *obscurior* is variable in size and color, making identification difficult. Some specimens that we list as *B. cf. obscurior* have been identified by others as *B. cordemoyi*. It is likely that there may be two or more species identified under this name. *Brachymyrmex* cf. *obscurior* has been reported from scattered sites outside this region: Hawaii (Wheeler, 1934), New Caledonia (Delsinne *et al.*, 2001), and Samoa (Wetterer and Vargo, 2003). MacGown *et al.* (2007) consider it an exotic in North America, where it is widespread in southern Florida, with isolated records from Mississippi and Georgia (Ipser *et al.*, 2005; MacGown *et al.*,

2007). *Brachymyrmex* cf. *obscurior* is very common in Bermuda, where it co-exists in close proximity with the two major pest species there: *P. megacephala* and *Linepithema humile* (Mayr) (see Wetterer and Wetterer, 2004).

6. *Camponotus atriceps* (Smith)

Published Records. None.

Specimens Examined. C&W, two sites (B78, B97). JW, 12 sites (2003: 89, 123129; 2006: 403409, 415, 417, 423439, 446, 459; 2014: 37, 68, 78, 126).

The enormous carpenter ant *C. atriceps* has been recorded from sites across Central and South America, as well as Trinidad and Tobago (Kempf, 1972). Although Hashmi (1973) synonymized many *C. atriceps* subspecies, it is likely that *C. atriceps* is not a single species, but rather a species complex. *Camponotus atriceps nocens* Wheeler is known only from Grenada and St. Vincent.

In Barbados, *C. atriceps* nests inside dead branches in wooded areas. *Camponotus atriceps* has been found in greenhouses in Italy (Jucker *et al.*, 2008) and The Netherlands (Boer and Vierbergen, 2008).

7. *Camponotus sexguttatus* (Fabricius)

Published Records. No site data (1896; A. Forel; Forel, 1897). Bridgetown (1920; W. M. Wheeler; Wheeler, 1923).

Specimens Examined. Bridgetown (1920; W. M. Wheeler; MCZ). Turner's Hall Woods (1987; JPEC Darlington; MCZ), C&W, four sites (B22, B26, B35, B42, B47, B75, B83, B92, B94, B107). JW, 76 sites (2003: 87, 88, 89, 91, 99, 100-102, 104, 107, 108, 109, 110, 118, 120, 121, 122, 130, 131; 2006: 341-342, 343-345, 346, 348, 350-352, 355-356, 357, 361-362, 364, 366, 368, 370, 380, 381, 388, 390-392, 393-394, 395-398, 399-402, 410-411, 412-414, 420-421, 422, 440-441, 445, 447, 450, 453-454, 457, 460; 2014: 13, 29, 31, 45, 46, 58, 63, 67, 73, 77, 89, 90, 96, 99, 101, 104, 115, 118, 122, 125, 138, 143, 148, 161, 164, 167, 173, 179, 180, 188).

This widespread New World carpenter ant (Kempf, 1972) commonly nests inside dead branches. It is extremely common in many habitats. In *C. sexguttatus sexguttatus*, minor workers are uniformly dark, except for light spots on the gaster, whereas major workers also have a lighter colored head. *Camponotus sexguttatus* is considered an exotic in Florida and the Bahamas (Deyrup *et al.*, 1998, 2000).

7a. *Camponotus sexguttatus grenadensis*

Forel (= *C. sexguttatus*) (stat. rev.)

Published Records. No site data (\leq 1893; W. G. Jeffreys; Wheeler, 1923). No site data (1896; A. Forel; Forel, 1897). No site data (1918; D. Stoner; Wheeler, 1923).

Forel (1897) described *C. sexguttatus grenadensis* from Barbados and Grenada. This form has a much lighter colored head and thorax than the typical form. Emery (1898) considered *grenadensis* to be a junior synonym of *Camponotus biguttatus* Emery, known only from Bolivia. Wheeler (1923), however, placed *biguttatus* as a subspecies of *sexguttatus* and separated it from *grenadensis* and all other subspecies of *sexguttatus* in the first couplet of his dichotomous key. Wheeler (1923, p. 8) wrote that *biguttatus* was the sole subspecies with "epinotum in profile convex and arcuate above"; all other subspecies have "epinotum in profile straight or more or less depressed above." Wheeler (1923, p. 8) also described two additional subspecies of *sexguttatus* from the Lesser Antilles, both of which have lighter head, thorax, and gaster than the typical form: *antiguensis* Wheeler from Antigua ("gaster with cream-colored spots on second segment") and *montserratensis* from Montserrat ("gaster immaculate"). Emery (1925), in his catalog of known ants, listed *biguttatus* as a variety of *sexguttatus* and with *grenadensis* as a junior synonym of *biguttatus*. Emery (1925), however, did not consider *antiguensis* and *montserratensis*, so presumably he had not read Wheeler (1923) and did

not know the characters Wheeler (1923) used to separate *biguttatus* and *grenadensis*. Nonetheless, Bolton (1995) listed *antignensis* and *montserratensis* as valid subspecies, but *grenadensis* as a junior synonym of the Bolivian *biguttatus*. Following Wheeler (1923), we do not consider *grenadensis* to be a junior synonym of *biguttatus*. Although *grenadensis* specimens are often strikingly lighter in color than the typical form, W. Mackay (personal communication) does not consider this a distinct subspecies. We therefore have not separated out lighter forms on our list of *C. sexguttatus* records above, and we provisionally consider *C. sexguttatus grenadensis* to be a junior synonym of *C. sexguttatus*.

8. *Cardiocondyla emeryi* Forel

Published Records. No site data (1896; A. Forel; Forel, 1912c). North of Bridgetown (1995; Seifert, 2003). Review (Wetterer, 2012d).

Specimens Examined. JW, 27 sites (2003: 86, 89, 95, 114, 116; 2006: 371, 375, 387, 451; 2014: 6, 44, 54, 56, 59, 60, 81, 83, 85, 87, 145, 152, 155, 156, 157, 160, 165, 190).

Cardiocondyla emeryi, an African native, is a well-known tramp species distributed worldwide by human commerce (Wetterer, 2012d). This species is most common in disturbed environments and often co-occurs with dominant exotic ant species (Wetterer, 2012d). Because of their very small size, all *Cardiocondyla* species are probably often overlooked.

9. *Cardiocondyla mauritanica* Forel

Published Records. Review (Wetterer, 2012f).

Specimens Examined. JW, one site (2006: 356).

Cardiocondyla mauritanica is an African native that has become a cosmopolitan tramp species (Wetterer, 2012f). In the New World, many older studies recorded this species as its junior synonym, *Cardiocondyla*

ectopia Snelling. This species is most common in disturbed environments.

10. *Cardiocondyla minutior* Forel

Published Records. Review (Wetterer, 2014b).

Specimens Examined. C&W, one site (B46). JW, five sites (2003: 112; 2014: 108, 145, 154, 168).

Cardiocondyla minutior is an Indo-Malayan native that has become a cosmopolitan tramp species (Wetterer, 2014b). In the New World, many older studies incorrectly recorded this species as *Cardiocondyla nuda* (Mayr).

11. *Cardiocondyla obscurior* Wheeler

Published Records. None.

Specimens Examined. C&W, one site (B3). JW, two sites (2006: 364; 2014: 95).

Cardiocondyla obscurior is an Old World tramp species (Seifert, 2003). This species is often misidentified as another tramp, *Cardiocondyla wroughtonii* (Forel), but may be distinguished from this species based on coloration and discriminate function analysis (Seifert, 2003). These two species also show ecological differences, with *C. obscurior* being more arboreal and *C. wroughtonii* more subterranean (SPC, personal observation).

12. *Cardiocondyla venustula* Wheeler

Published Records. None.

Specimens Examined. C&W, one site (B62). JW, three sites (2006: 373; 2014: 94, 168).

Cardiocondyla venustula is an Old World tramp species (Seifert, 2003). This species is most common in disturbed environments.

13. *Crematogaster crinosa* Mayr

Published Records. Bridgetown (1920; W. M. Wheeler; Wheeler, 1923).

Specimens Examined. C&W, two sites (B15, B54). JW, 89 sites (2003: 87, 89, 91, 92, 93, 95, 97, 99, 100, 103, 104, 107, 109, 115, 118, 130; 2006: 337, 338, 339, 343, 346, 349, 354, 357, 365, 369, 370, 371, 375, 376, 380, 383, 387, 390, 394, 395, 399, 410, 418, 419, 440, 442, 447, 450, 451, 457; 2014: 9, 21,

26, 43, 44, 49, 50, 53, 54, 57, 59, 62, 66, 71, 74, 80, 82, 84, 85, 91, 92, 93, 94, 95, 98, 100, 102, 107, 109, 118, 135, 141, 143, 144, 145, 152, 154, 156, 157, 162, 174, 181, 190.

Longino (2003) recorded this New World species from the West Indies (Grenada, Nevis, and Saint Vincent) and from many sites in South and Central America, north to Texas: Argentina, Belize, Bolivia, Brazil, Colombia, Costa Rica, Guyana, Mexico, Panama, Paraguay, Peru, Uruguay, Texas, and Venezuela. This was our most commonly collected ant species in Barbados, both in forests and disturbed habitats, often occurring in very high densities. We most often found this species nesting in trees, but it also nests in the ground.

14. *Crematogaster curvispinosa* Mayr

Published Records. None.

Specimens Examined. C&W, one site (B60). JW, 13 sites (2003: 87, 100, 122; 2006: 346, 395, 397, 419, 453, 459; 2014: 27, 118, 169, 181).

Longino (2003) reported this species from the West Indies (Saint Lucia) and from many sites in South and Central America, north to Mexico (Bolivia, Brazil, Colombia, Costa Rica, Guatemala, Guyana, Mexico, Nicaragua, Panama, Peru, and Venezuela). In the West Indies, this species has also been reported from Martinique (Forel, 1893, 1912b) and Saint Vincent (Forel, 1893). Although Longino (2003) found this species was most common in disturbed habitats, we collected it primarily in forest areas.

15. *Cyphomyrmex minutus* Mayr

Published Records. None.

Specimens Examined. C&W, three sites (B11, B16, B37, B50, B81, B88, B106). JW, 43 sites (2003: 86, 89, 93, 97, 99, 100, 104, 107, 112, 131; 2006: 338, 343, 346, 349, 364, 367, 370, 371, 376, 387, 390, 394, 399, 410, 441, 446, 451, 459; 2014: 42, 56, 87, 100, 108, 113, 121, 124, 154, 156, 157, 165, 169, 180, 185).

Cyphomyrmex minutus is common across the West Indies, although it has often been misidentified as *Cyphomyrmex rimosus*.

According to Longino (2004): “Snelling and Longino (1992) distinguished three similar species, *hamulatus*, *minutus*, and *rimosus*, based on differences in size, pilosity, and extent of the median basal groove of the first gastral tergite. Subsequently I have not been able to differentiate these taxa. There is abundant geographic variation. In some localities it appears that there are discrete sympatric forms, but in other areas the distinction is blurred. For example, in Florida there are two discrete forms, a native species that is relatively small and an introduced species that is larger and darker. The key in Snelling and Longino would separate these into *minutus* and *rimosus*, respectively. In Costa Rica, specimens that are collected from open areas, usually by finding nests in the soil or foragers on the surface, are relatively larger and with longer scapes than specimens found in wet forest leaf litter, but the size distributions overlap. Until further evidence for discrete species is produced, I prefer to call them all *C. rimosus*.” In our case, we considered all *Cyphomyrmex* in Barbados to be *C. minutus*.

This small and inconspicuous fungus-growing ant freezes when disturbed and often may be overlooked. Nonetheless, it is surprising that this common species has not been previously reported from Barbados. Weber (1972) presented a map indicating the range of *Cyphomyrmex* that includes Barbados but provided no records. Other maps in Weber (1972) seem to include Barbados in the ranges of *Trachymyrmex*, *Mycetophylax*, and *Mycocepurus*, but none of these genera has actually been documented in Barbados. It may be that Weber’s maps were carelessly drawn.

16. *Gnamptogenys striatula* Mayr

Published Records. None, but one probable record. Coles Cave (1979; S. B. Peck; Peck, 1981, as *Gnamptogenys* sp. *striatula* complex).

Specimens Examined. C&W, one site (B80, B82, B86, B89). JW, 15 sites (2003: 87, 89, 105-106, 130, 131-132; 2006: 343, 346, 354, 395, 455, 458, 459; 2014: 8, 76, 100).

This species has been reported from sites across the Neotropics, from Mexico to northern Argentina and the West Indies (Lattke *et al.*, 2007).

We were unable to find Peck's specimens, the only *Gnamptogenys* previously reported from Barbados, but we assume that they are conspecific with our specimens.

17. *Hypoponera opaciceps* (Mayr)

Published Records. None.

Specimens Examined. Barbados, soil in cane field; queen (R. W. E. Tucker; SI).

R. W. E. Tucker published papers in the 1930s to 1950s. We confirmed that this specimen is correctly identified. *Hypoponera opaciceps* is a small, subterranean ant that feeds on minute soil arthropods. Originally from the New World, *H. opaciceps* has spread around the world through human commerce. Although people rarely come in contact with *H. opaciceps* workers, swarms of queens that can sting make this species an occasional pest. Because of its largely subterranean habits, *H. opaciceps* is probably often overlooked.

18. *Hypoponera punctatissima* (Roger)

Published Records. None, but one possible record. Coles Cave (1979; S. B. Peck; Peck, 1981, as *Hypoponera* sp.). We were unable to find Peck's specimens, the only previously published *Hypoponera* record from Barbados.

Specimens Examined. C&W, three sites (B59, B87, B90, B112). JW, three sites (2006: 370; 2014: 100, 169).

This African native is a well-known tramp species widely distributed throughout the tropics and subtropics (Delabie and Blard, 2002). Because of its largely subterranean habits, *H. punctatissima* is probably often overlooked.

19. *Leptogenys maxillosa* (Smith)

Published Records. None.

Specimens Examined. JW, one site (2006: 452).

Leptogenys maxillosa is a widespread tramp species originally from Africa (Wilson and Taylor, 1967; Lattke, 2011). In the New World, this species is also known from Brazil, Cuba, Honduras, St. Thomas, and St. Vincent (Ashmead, 1900; Kempf, 1972; Lattke, 2011; P. S. Ward, unpublished record).

20. *Leptogenys pubiceps* Emery

Published Records. None.

Specimens Examined. JW, three sites (2003: 94, 100, 111).

Leptogenys pubiceps is a species complex with "a distribution range restricted to the Caribbean Basin. It is found on the mainland from Heredia and Limon Provinces of Costa Rica to northern Colombia, the northern slopes of the Venezuelan Andes, the Venezuelan Coastal Range and Trinidad. It is found on both the Greater and Lesser Antilles" (Lattke, 2011, p. 218).

21. *Monomorium ebeninum* Forel

Published Records. No site data (1922; H. A. Ballou; Wheeler, 1923, as *M. minutum*).

Specimens Examined. No site data (1922; H. A. Ballou; MCZ). No site data (1934; N. A. Weber; MCZ). C&W, one site (B44). JW, 32 sites (2003: 87, 89, 93, 97, 118; 2006: 338, 343, 354, 358, 367, 380, 390, 395, 399, 410, 412, 418, 419, 422, 440, 441, 446; 2014: 6, 8, 60, 92, 93, 94, 95, 107, 143, 165).

Wheeler (1923) misidentified specimens from Barbados as *M. minutum* (= *M. monomorium*).

This small black New World arboreal species is widespread and common in the West Indies and Central America (Kempf, 1972). This species has also been collected from several sites in the Florida Keys, where Deyrup *et al.* (2000) considered it to be exotic.

22. *Monomorium floricola* (Jerdon)

Published Records. No site data (1896; A. Forcl; Wheeler, 1905; Forcl, 1912c). Review (Wetterer, 2010a).

Specimens Examined. JW, 17 sites (2003: 93, 97, 99, 108, 112; 2006: 354, 364, 365, 380, 381; 2014: 64, 71, 87, 90, 92, 107, 190).

This tiny Asian species is an extremely widespread tramp species but is rarely a major pest (Wetterer, 2010a). Fowler *et al.* (1993) found that *M. floricola* was the most commonly collected ant at a municipal hospital in São Paulo, Brazil, making up 34.5% of the ants collected.

23. *Nylanderia bourbonica* (Forel)

Published Records. None.

Specimens Examined. C&W, two sites (B53, B63).

Nylanderia bourbonica (formerly *Paratrechina bourbonica*) is an Old World tramp species spread through human commerce. In the West Indies, this species has been reported from the Bahamas (Smith, 1954; Deyrup *et al.*, 1998), Cuba (Trager, 1984), the U.S. Virgin Islands (Wetterer and Lombard, 2010), and the Florida Keys (Deyrup *et al.*, 1988; Wetterer and O'Hara, 2002). Wetterer (unpublished data) has also collected this species on other West Indian islands, including Anguilla, Antigua, Barbuda, and the Cayman Islands. Outdoor populations of *N. bourbonica* are widespread in Florida, and indoor populations are known from several other U.S. states (e.g., see Trager, 1984; MacGown and Forster, 2005).

24. *Nylanderia cf. fulva*

Published Records. None.

Specimens Examined. C&W, one site (B66, B73). JW, six sites (2003: 108, 121; 2006: 461; 2014: 94, 95, 165).

Nylanderia fulva (Emery) is a New World species that has been reported from numerous other sites scattered across the New World tropics and subtropics. Unfortunately, almost all records of *N. fulva* are of questionable reliability because of problems distinguishing *N. fulva* from other closely related species, notably *Nylanderia pubens* (Trager, 1984; Gotzek *et al.*, 2012). *Nylan-*

deria fulva and *N. pubens*, however, may be distinguished using genetic analyses and male morphology (Gotzek *et al.*, 2012). *Nylanderia fulva* has undergone population explosions in parts of Colombia, the southern United States, and on St. Croix, U.S. Virgin Islands, where locals blamed *N. fulva* for serious crop damage (e.g., a coconut plantation produced no coconuts because of high densities of plant-feeding Hemiptera tended by the ants; Wetterer and Keularts, 2008). An extreme population boom followed by a bust may be a common *N. fulva* pattern and might distinguish this species from the closely related *N. pubens* (Wetterer *et al.*, 2014).

25. *Nylanderia cf. steinheili*

Published Records. No site data [1896; A. Forel; Forel, 1912d, as *Nylanderia vividula antillana* (Forel) = *Nylanderia guatemalensis* (Forel)].

Specimens Examined. C&W, one site (B27, B29, B40, B48). JW, 35 sites (2003: 89, 100, 101, 121, 130; 2006: 346, 349, 354, 357, 363, 364, 365, 387, 410, 422, 440-441, 446-447, 451; 2014: 9, 27, 75, 87, 90, 94, 95, 102, 110, 112, 118, 124, 169, 174, 180, 185, 189).

Nylanderia steinheili (Forel) and *N. guatemalensis* (Forel) are New World species that are similar in size and appearance. Both species have been reported from many sites in the West Indies, but the identities of most records are uncertain. For example, extensive records of *N. guatemalensis* from Florida may all represent misidentifications of *N. steinheili* (Kallal and LaPolla, 2012).

26. *Odontomaclus bauri* Emery

Published Records. None.

Specimens Examined. Turner's Hall Woods (1987; J. P. E. C. Darlington; MCZ), C&W, two sites (B21, B24, B101, B107, B108). JW, 12 sites (2006: 365, 394; 2014: 61, 105, 116, 123, 124, 172, 178, 184, 187, 189).

Odontomachus bauri is a widespread New World species, known from South America, Central America, and the West Indies (Brown, 1976). This large black trap-jaw ant is common in intact forest habitats on many West Indian islands.

27. *Odontomachus ruginodis* Wheeler

Published Records. None.

Specimens Examined. No site data (<1932; R. Thaxter; MCZ). No site data (1934; N. A. Weber; MCZ). C&W, one site (B7, B14, B17). JW, 51 sites (2003: 87, 89, 93, 99, 103, 112, 114, 116, 117, 118, 119, 121, 130, 131; 2006: 337, 343, 346, 348, 353, 359, 367, 374, 376, 380, 384, 387, 390, 395, 399, 410, 412, 419, 441, 443, 446-447, 450, 453; 2014: 10, 26, 44, 61, 64, 74, 88, 107, 137, 140, 144, 152, 154, 190).

Odontomachus ruginodis is a widespread New World species probably native to the West Indies (Deyrup *et al.*, 1998) but may be exotic in Florida (Deyrup, 1991). Brown (1976) regarded *O. ruginodis* as synonymous with *Odontomachus brunneus*. Brown (*in* Deyrup *et al.*, 1985), however, changed his mind and again separated them into two distinct species. This species is often misidentified as *O. insularis* (e.g., see below). This species is common in a wide variety of habitats, including highly disturbed urban areas.

27a. *Odontomachus insularis* Guérin

Published Records. No site data (1896; A. Forel; Forel, 1912a). No site data (1918; D. Stoner; Wheeler, 1923). Bridgetown (1920; W. M. Wheeler; Wheeler, 1923).

We believe that the several Barbados records of this valid species are actually misidentified *O. ruginodis*, originally described as a variety of *O. insularis*. True *O. insularis* are known from the Greater Antilles.

28. *Paratrechina longicornis* (Latrielle)

Published Records. Garrison (date unknown; W. Norwell; Wheeler, 1923). Bridgetown (1920; W. M. Wheeler; Wheeler, 1923). No site

data (Sirjusingh *et al.*, 1992). Review (Wetterer, 2008).

Unpublished Record. North Point (1969; E. Wartburg; AntWeb, 2016).

Specimens Examined. No site data (1934; N. A. Weber; MCZ). Harrison's Cave garden (2005; J. Endeman). C&W, two sites (B1, B5). JW, 59 sites (2003: 86, 89, 91, 93, 95, 97, 99, 100, 108, 109, 114, 116, 117, 118, 119, 121, 133; 2006: 354, 357, 363, 367, 371, 373, 374, 376, 378, 380, 382, 383, 387, 395, 412, 418, 422, 444, 448, 456, 457; 2014: 8, 26, 42, 52, 56, 59, 60, 87, 92, 93, 95, 100, 136, 143, 144, 145, 152, 154, 160, 163, 168, 190).

The longhorn crazy ant, *P. longicornis*, is an Old World tramp species spread throughout the tropics and subtropics by human commerce (Wetterer, 2008). *Paratrechina longicornis* is a ubiquitous agricultural and household pest throughout much of the tropics and subtropics and is a pervasive indoor pest in temperate areas. It thrives even in the most artificial environments, including ships at sea, facilitating its dispersal around the world (Wetterer, 2008).

29. *Pheidole exigua* Mayr

Published Records. None.

Specimens Examined. C&W, one site (B96, B109). JW, 23 sites (2003: 99, 107, 114, 119, 130, 131; 2006: 343, 346, 348-349, 358, 363, 376, 441, 450; 2014: 65, 107, 114, 118, 170, 176, 180, 185, 189).

Pheidole exigua is a widespread New World species known from South America, Central America, and the West Indies (Wilson, 2003). We collected it in a range of habitats in Barbados.

30. *Pheidole jelskii* Mayr

Published Records. No site data (1896; A. Forel; Forel, 1912b). No site data (1918; D. Stoner; Wheeler, 1923). No site data (1998; C&W; Wilson, 2003).

Specimens Examined. Bridgetown (1920; W. M. Wheeler; MCZ). No site data (N. A. Weber; MCZ). C&W, two sites (B8, B23,

B49). JW, 37 sites (2003: 89, 91, 92, 93, 95, 97, 99, 100, 103, 104, 110, 112, 121, 133; 2006: 338, 354, 371, 376, 381, 383, 387, 412, 418, 422, 441, 442, 446, 450, 451, 456; 2014: 9, 42, 56, 80, 95, 145, 165).

Pheidole jelskii is a widespread New World species known from South America and the West Indies (Wilson, 2003). This large species is common in Barbados, with conspicuous ground nests in open sunny areas.

30a. *Pheidole fallax* Mayr

Published Records. No site data (Sirjusingh *et al.*, 1992).

In a review paper concerning biological control of weevils and whitegrubs, Sirjusingh *et al.* (1992) recorded *P. fallax* from Barbados. This was most likely a misidentification of *P. jelskii*, a common species that was first described as *P. fallax jelskii*. Wilson (2003, p. 290) wrote of *P. fallax*, "no certain records exist from the Lesser Antilles, where the closely related *jelskii* abounds."

31. *Pheidole megacephala* (Fabricius)

Published Records. Review (Wetterer, 2012e).

Specimens Examined. JW, 28 sites (2003: 92, 95-96, 103, 109, 113-114, 115; 2006: 346-347, 375, 376, 379, 389, 410, 451; 2014: 7, 42, 48, 54, 59, 83, 86, 90, 142, 143, 150, 152, 155, 157, 166).

Although Wilson (2005) speculated that these are the pest ants reported in Barbados by Clarke (1670), the earliest published records of *P. megacephala* in the New World come from St. Vincent (Forel, 1893) and the Bahamas (Emery, 1895). There are no published records of *P. megacephala* from Barbados.

The African big-headed ant, *P. megacephala*, an African native, is an important pest ant spread throughout the tropics and subtropics by human commerce (Wetterer, 2012e). *Pheidole megacephala* is well known as a household and agricultural pest. Because *P. megacephala* does not attack humans, this

species is often not recognized as a substantial threat. The negative ecological effect of *P. megacephala*, however, may be greater than any other invasive ant species. In areas where it occurs at high density, few native invertebrates persist. Loss of invertebrate species that serve key functions in the natural community (e.g., important prey species) may have cascading effects, leading to the subsequent loss of additional species. *Pheidole megacephala* tends to thrive in open, disturbed habitats with weedy vegetation that can support high densities of plant-feeding Hemiptera, which these ants tend for honeydew.

32. *Pheidole sculptior* Forel

Published Records. None.

Specimens Examined. C&W, four sites (B4, B28, B34, B39, B41, B43, B65, B100, B105). JW, 43 sites (2003: 87, 89, 93, 100, 104, 107; 2006: 358, 363, 365, 371, 376, 380, 387, 394, 395, 399, 440, 442, 446-447, 451, 453, 459; 2014: 27, 45, 61, 72, 74, 87, 95, 98, 107, 112, 118, 140, 152, 154, 156, 157, 169, 174, 180, 185, 190).

Pheidole sculptior is widespread in the West Indies and northern South America (Wilson, 2003). It is common in a wide range of habitats in Barbados.

33. *Pheidole subarmata* Mayr

Published Records. No site data (1896; A. Forel; Forel, 1912b).

Specimens Examined. C&W, one site (B6). JW, nine sites (2003: 89, 99; 2006: 346, 442; 2014: 27, 87, 135, 146, 154).

Pheidole subarmata is a widespread New World species known from South America, Central America, and the West Indies, common in disturbed habitats (Wilson, 2003).

34. *Pheidole susannae* Forel

Published Records. None.

Specimens Examined. JW, four sites (2006: 453; 2014: 27, 74, 183).

Pheidole susannae is a widespread New World species, known from South America, Central America, and the West Indies, found in a wide variety of habitats (Wilson, 2003).

35. *Pheidole teneriffana* Forel

Published Records. None.

Specimens Examined. JW, two sites (2003: 115; 2006: 373).

This Old World species was described from the Canary Islands, but Espadaler and Bernal (2003) considered this species an exotic there. It is also known from Sicily, Egypt, the Arabian Peninsula, Israel, Turkey, Malta, Greece, the Iberian Peninsula, California, Cuba, St. Helena, and Ascension Island (Wetterer, 2011c). Wilson (2003) proposed that this species may be native to the Mediterranean. It does not appear to be very common in Barbados, found only at two highly disturbed sites.

36. *Pheidole transversostriata* Mayr

Published Records. None.

Specimens Examined. JW, 15 sites (2006: 343, 346, 349, 365, 367, 370, 390, 394, 397, 419, 442, 450, 453, 457, 459).

Pheidole transversostriata is a widespread New World species, known from South America and the West Indies (Wilson, 2003). It is fairly common in Barbados, particularly at forested sites.

37. *Plagiolepis alluaudi* Emery

Published Records. Review (Wetterer, 2014a).

Specimens Examined. C&W, one site (B72). JW, 27 sites (2003: 91, 114, 117, 118; 2006: 357, 364, 379, 387, 390, 399; 2014: 6, 9, 44, 48, 56, 60, 61, 72, 74, 83, 85, 87, 107, 140, 153, 154, 157).

This small orange ant is an African tramp species that has been spread around the world, particularly in the Pacific, through human commerce (Wetterer, 2014a). Kempf (1972) listed this species in the New World from Bermuda, St. Kitts, and St. Lucia. It also occurs on the Atlantic islands of

Bermuda, Ascension, and St. Helena (Wetterer *et al.*, 2007).

38. *Platythyrea punctata* (Smith)

Published Records. No site data (1896; Forel, 1901). No site data (1918; D. Stoner; Wheeler, 1923). Turner's Hall Woods (1995; Schilder *et al.*, 1999).

Specimens Examined. JW, 21 sites (2003: 87, 89, 94, 101, 122, 130; 2006: 358, 360, 364, 410, 442, 453; 2014: 28, 60, 71, 74, 118, 169, 177, 180, 186).

Platythyrea punctata is a "circum-Caribbean" species found in a wide range of habitats (Brown, 1975). Seal *et al.* (2011) made genetic analyses of *P. punctata* specimens from a wide range of sites in the West Indies, Central America, Mexico, Texas, and Florida. Analyses by Seal *et al.* (2011) indicated that populations of *P. punctata* in Central America are most basal and that populations in Mexico and Texas branched off long before this ant colonized the West Indies and Florida. Seal *et al.* (2011, p. 11) found that "phylogeographic analysis of *P. punctata* indicates a recent, one-way colonization from Central America to the West Indies," and concluded that it is "unlikely that *P. punctata* is a tramp species aided by human movements and commerce, because island haplotypes were never found on the mainland and only in one case was a mainland haplotype found in the West Indies." Seal *et al.* (2011) estimated that *P. punctata* spread from Central America and through the West Indies about 150,000 years ago.

39. *Pseudoponera stigma* (Fabricius)

Published Records. None.

Specimens Examined. JW, one site (2014: 186).

This species has an extensive range in both the New World and Old World tropics. *Pseudoponera stigma* shows characteristics of a native species throughout its range in both the New World and Old World, with near continuous distributions in intact forest

habitats. Wetterer (2012b) concluded that *P. stigma* most likely originated in tropical South and Central America.

40. *Rogeria curvipubens* Emery

Published Records. None.

Specimens Examined. Orange Hill, in rotten wood (1987; J. P. E. C. Darlington; MCZ). C&W, one site (B19, B31). JW, 22 sites (2003: 97, 100, 109, 131; 2006: 343, 346, 349, 399, 410, 419, 447, 453, 457; 2014: 9, 61, 74, 98, 108, 118, 169, 174, 180).

Rogeria curvipubens is a widespread New World species known from northern South America, Central America, and the West Indies (Kugler, 1994; LaPolla and Sosa-Calvo, 2006). We found this species in a wide variety of habitats.

41. *Rogeria foreli* Emery

Published Records. None.

Specimens Examined. JW, 10 sites (2003: 97, 104, 109, 121; 2006: 363, 390, 447; 2014: 9, 140, 152).

Rogeria foreli is a widespread New World species known from northern South America, Central America, the West Indies, and the southwestern United States (Kugler, 1994; LaPolla and Sosa-Calvo, 2006). We found this species in a variety of habitats.

42. *Solenopsis azteca* Forel

Published Records. Review (Pacheco and Mackay, 2013).

Specimens Examined. JW, eight sites (2003: 87; 2006: 349, 363, 365, 395, 397, 419, 450).

Thief ants are generally overlooked because of their small size and primarily subterranean habits. Thief ants commonly persist at high densities in areas invaded by dominant exotic ants such as *P. megacephala* and *L. humile* (Wetterer *et al.*, 2001). Despite the recent pioneering work on the taxonomy of thief ants (Pacheco and Mackay, 2013), much taxonomic work remains to be done on this challenging group.

Solenopsis azteca has monomorphic workers that range in color from light yellow to

light brown (Pacheco and Mackay, 2013). *Solenopsis azteca* is a New World species with a known range of "Honduras south to Colombia (Cauca) and northern Venezuela, Caribbean Region (Jamaica, Puerto Rico, Antilles)" (Pacheco and Mackay, 2013, p. 112).

43. *Solenopsis geminata* (Fabricius)

Published Records. No site data (1896; A. Forel; Forel, 1912c). No site data (1922; H. A. Ballou; Wheeler, 1923). Bridgetown (1920; W. M. Wheeler; Wheeler, 1923). No site data (Sirjusingh *et al.*, 1992). Review (Wetterer, 2011a).

Specimens Examined. C&W, one site (B93). JW, 38 sites (2003: 86, 89, 90, 91, 93, 97, 98-99, 104, 118, 133; 2006: 337, 338, 340, 343, 346, 357, 358, 363, 371-372, 373, 376-377, 386, 387, 399, 412, 446-447, 450, 451, 456, 457; 2014: 12, 27, 74, 80, 81, 124, 147, 154).

The tropical fire ant, *S. geminata*, is native to the New World, where in disturbed areas, it can reach very high densities and dominate the invertebrate community (Risch and Carroll, 1982). It is also an invasive pest in many other parts of the world, including many tropical and subtropical areas where sea turtles nest, such as Australia, islands of the Pacific and Indian Oceans, the Arabian Peninsula, India, South Africa, Greece, and Cyprus (Wetterer, 2011a).

44. *Solenopsis globularia* (Smith)

Published Records. Review (Pacheco and Mackay, 2013).

Specimens Examined. C&W, three sites (B2, B56, B64, B70, B111). JW, 28 sites (2003: 95, 97, 109, 112, 121, 133; 2006: 371, 375, 376, 381, 387, 410, 422, 442, 446-447, 449, 450, 456, 457; 2014: 6, 52, 56, 61, 85, 92, 154, 156, 157).

Solenopsis globularia is a widespread New World species that ranges throughout the Caribbean to the Gulf Coast of the United States, through Mexico, to the central and northern part of South America

(Brazil, Ecuador, Guiana) and the Galapagos Islands (Pacheco and Mackay, 2013). It also occurs on the South Atlantic islands of Ascension and St. Helena (Wetterer *et al.*, 2007).

45. *Solenopsis pollux* Forel

Published Records. Review (Pacheco and Mackay, 2013).

Specimens Examined. JW, 13 sites (2003: 95, 110, 116, 121, 130; 2006: 337, 338, 346, 358, 371, 390, 451, 459; Pacheco and Mackay, 2013).

Solenopsis pollux is a widespread New World species known from South America, Central America, and the West Indies (Pacheco and Mackay, 2013).

46. *Solenopsis pygmaea* Forel

Published Records. Review (Pacheco and Mackay, 2013).

Specimens Examined. JW, four sites (2003: 107; 2006: 364, 501, 528; Pacheco and Mackay, 2013).

Solenopsis pygmaea is a widespread New World species known from Central America and the West Indies (Pacheco and Mackay, 2013).

47. *Solenopsis zeteki* Wheeler

Published Records. Review (Pacheco and Mackay, 2013).

Specimens Examined. JW, eight sites (2006: 380, 381, 395, 397, 399, 410, 440-441, 453).

Solenopsis zeteki is a widespread New World species known from northern South America, Central America, and the West Indies (Pacheco and Mackay, 2013).

48. *Strumigenys eggersi* Emery

Published Records. None.

Specimens Examined. JW, five sites (2003: 130; 2006: 348-349, 453; 2014: 100, 102).

Strumigenys are tiny predatory ants that feed on soil arthropods. All *Strumigenys* species are probably often overlooked because of their small size and primarily subterranean habits. *Strumigenys eggersi* is

a widespread New World species (Bolton, 2000). Brown (1959, p. 46) proposed that this species' "home range is probably south Brazil and Bolivia, though a lack of collections from central and northern Brazil prevents us from knowing how far north this species extends. *Strumigenys eggersi* is also known from widely scattered localities in the West Indies, Florida, and southern Mexico ... and it seems likely that it has been introduced by man at these many points." Brown (1962, p. 249), however, seemed more unsure of the species' exotic range, writing that *S. eggersi* was "widespread (possibly by recent introduction) in the West Indies; southern Florida; southern Mexico."

This species appears to be relatively uncommon in Barbados.

49. *Strumigenys emmae* (Emery)

Published Records. Review (Wetterer, 2012c).

Specimens Examined. JW, four sites (2003: 104, 117; 2006: 379; 2014: 174).

Strumigenys emmae is a common Old World tramp found in tropical regions worldwide (Wetterer, 2012c). *Strumigenys emmae* is one of three Old World dacetine ants, along with *Strumigenys membranifera* and *Strumigenys rogeri*, with widespread records in both the Old World and the New World.

50. *Strumigenys louisianae* Roger

Published Records. Review (Wetterer, 2014c)

Specimens Examined. JW, seven sites (2006: 337, 450; 2014: 54, 108, 152, 154, 174).

Strumigenys louisianae has the broadest geographic distribution of any New World *Strumigenys*, with an essentially continuous range from Argentina to North Carolina (Wetterer, 2014c). The widespread occurrence of *S. louisianae* in natural habitats across the West Indies suggests that *S. louisianae* is native throughout most or all of this region (Wetterer, 2014c). However, we found *S. louisianae* only at two highly

disturbed sites, suggesting that it may be exotic to Barbados.

51. *Strumigenys margaritae* (Forel)

Published Records. Review (MacGown and Wetterer, 2013).

Specimens Examined. C&W, two sites (B18, B21, B25). JW, 27 sites (2003: 87, 89, 107, 121, 130; 2006: 337, 343, 364, 367, 370, 380, 387, 395, 419, 446, 450, 453; 2014: 9, 103, 108, 118, 135, 140, 156, 169, 174, 185).

Strumigenys margaritae is a widespread New World species (MacGown and Wetterer, 2013). Although rare in many parts of its range, *P. margaritae* appears to have an essentially continuous circum-Caribbean distribution from northern South America to the southeastern US and through the Lesser Antilles from Trinidad to Puerto Rico. If this distribution is truly continuous, it would support the hypothesis that *P. margaritae*, though generally considered exotic to the southeastern US, is actually native throughout its known range.

Strumigenys margaritae is commonly found associated with *W. anropunctata*, an aggressive and often dominant Neotropical species. *Strumigenys margaritae* may derive protection from predators by associating with *W. anropunctata*. It is also possible that *P. margaritae* might afford some benefit to *W. anropunctata*.

Strumigenys margaritae is common in a wide range of habitats in Barbados.

52. *Strumigenys membranifera* (Emery)

Published Records. Review (Wetterer, 2011b).

Specimens Examined. C&W, two sites (B67, B87).

Strumigenys membranifera is a widespread tramp species of African origin (Wetterer, 2011b). Whereas *S. rogeri* and *S. emmae* are almost exclusively tropical, *S. membranifera* has spread to higher latitudes. *Strumigenys membranifera* is the only one of the three species with outdoor populations in Europe (e.g., *S. membranifera* is common in urban

parks of southern Spain). In the continental United States, *S. membranifera* has been found in 12 southern states, whereas *S. rogeri* and *S. emmae* have outdoor populations only in peninsular Florida. *Strumigenys membranifera* occurs in a broad range of habitats, including dense forest, cultivated fields, urban lawns, and gardens.

53. *Strumigenys rogeri* Emery

Published Records. Review (Wetterer, 2012a).

Specimens Examined. C&W, two sites (B95, B96). JW, four sites (2003: 89; 2006: 354; 2014: 108, 180).

Strumigenys rogeri apparently originated in tropical Africa, where its closest relatives all live, but it has become widespread on tropical islands of the Indo-Pacific and the West Indies and in peninsular Florida (Wetterer, 2012a). Outside of Africa and Florida, there are only a small number of continental records of *S. rogeri*, including a few from South and Central America and just one from continental Asia, in peninsular Malaysia. It is unclear whether *S. rogeri* has not yet spread to these continental areas, whether continental ants have competitively excluded *S. rogeri*, or whether these ants have been simply overlooked in surveys of diverse continental faunas.

54. *Strumigenys schulzi* (Emery)

Published Records. None.

Specimens Examined. C&W, one site (B36). JW, one site (2006: 363).

Strumigenys schulzi was originally described from Brazil and is known from South America, Central America, and Trinidad (Bolton, 2000). Our records of *S. schulzi* on Barbados are the only records of this species on a noncontinental island.

55. *Sylophopsis sechellensis* (Emery)

Published Records. None.

Specimens Examined. JW, two sites (2003: 130; 2014: 343).

Syllophopsis sechellensis (formerly *Monomorium sechellense*) is native to tropical Asia but has spread by human commerce to many Old World sites. Wheeler (1923) recorded this species from Antigua. The present records are the only others known from the New World. This small yellow species is similar in appearance to *Syllophopsis subcoeca*.

56. *Syllophopsis subcoeca* (Emery)

Published Records. None.

Specimens Examined. C&W, one site (B19). JW, eight sites (2003: 100, 104, 119; 2006: 354, 387, 443; 2014: 108, 135).

We provisionally classify *S. subcoeca* (formerly *Monomorium subcoecum*) as a New World species. All published records for *S. subcoeca* come from the Neotropics, where it has been considered native (Fernández, 2007). All other members of *Syllophopsis*, however, are restricted to the Old World (except *S. sechellensis*; see above), and it is possible that *S. subcoeca* is actually an Old World species not yet collected in its native range. *Syllophopsis subcoeca* is similar in appearance to *S. sechellensis*; however, the mesopleuron is shiny and unsculptured in *subcoeca*, whereas it is matte and microreticulate in *sechellensis*.

57. *Tapinoma melanocephalum* (Fabricius)

Published Records. Review (Wetterer, 2009a).

Specimens Examined. C&W, one site (B58). JW, 51 sites (2003: 91, 92, 93, 95, 97, 99, 108, 112, 114, 118, 119, 121; 2006: 337, 338, 354, 358, 364, 373, 376, 380, 383, 387, 390, 394, 410, 412, 418, 440, 441, 442, 447, 450; 2014: 27, 42, 51, 56, 83, 85, 90, 92, 93, 95, 136, 140, 144, 145, 156, 159, 162, 165, 190).

The ghost ant, *T. melanocephalum*, is a ubiquitous indoor and outdoor pest throughout much of the tropics and subtropics and a common indoor pest in temperate regions (Wetterer, 2009a). The close resemblance between *T. melanocephalum* and

a number of Indo-Pacific taxa indicates that *T. melanocephalum* probably originated in this region.

58. *Tetramorium bicarinatum* (Nylander)

Published Records. No site data (date unknown; collector unknown; Bolton, 1979). Review (Wetterer, 2009c).

Specimens Examined. No site data (1936; E. A. Chapin and R. E. Blackwelder; SI). (1987; J. P. E. C. Darlington; MCZ). JW, one site (2014: 90).

Bolton (1979) wrote that he examined *T. bicarinatum* specimens from Barbados, citing Bolton (1977), but no records from Barbados were listed in the earlier paper. The penny ant, *T. bicarinatum*, is an Old World tramp species spread throughout the tropics and subtropics by human commerce (Wetterer, 2009c).

59. *Tetramorium caldarium* (Roger)

Published Records. None.

Specimens Examined. C&W, one site (B110). JW, eight sites (2003: 92, 109, 112, 114; 2006: 376, 381; 2014: 83, 165).

Tetramorium caldarium is a tramp ant species originally from Africa that has dispersed around the world through human commerce. From 1862 to 1979, *T. caldarium* was considered a junior synonym of *Tetramorium simillimum* (Smith), but Bolton (1979) revived *T. caldarium* as a species. *Tetramorium caldarium* records are particularly common on Atlantic islands and from greenhouses and heated buildings in temperate Europe.

We found this species only in highly disturbed habitats in Barbados.

60. *Tetramorium lanuginosum* Mayr

Published Records. No site data (≤ 1893 ; W. G. Jeffreys; Wheeler, 1923). Review (Wetterer, 2010b).

Specimens Examined. JW, five sites (2006: 376, 387; 2014: 151, 152, 157).

Tetramorium lanuginosum is considered a pantropical tramp (Wetterer, 2010b). Although we found this species at only two

sites, it was very common in grassy areas of the University of the West Indies campus.

61. *Tetrauorium simillimum* (Smith)

Published Records. None.

Specimens Examined. C&W, two sites (B10, B77). JW, 27 sites (2003: 86, 92, 93, 112, 114, 115, 117, 119, 121, 133; 2006: 337, 376, 381, 383, 385, 387, 418, 422, 441, 442, 456; 2014: 54, 144, 154, 157, 160, 190).

This species is a common and widespread Old World tramp species that has spread worldwide through human commerce (Bolton, 1977). Concerning *T. caldarium* and *T. simillimum*, Bolton (1979, p. 169) wrote: "Of the two there is no doubt that *simillimum* is the most successful. It has been widely recorded throughout the tropics and subtropics and also occurs fairly frequently in the temperate zones in zoological and botanical gardens and in conservatories and other constantly heated buildings." We found this species at many highly disturbed sites in Barbados.

62. *Trichomyrmex destructor* (Jerdon)

Published Records. No site data (Tucker, 1953). Review (Wetterer, 2009b).

Specimens Examined. JW, 11 sites (2003: 86, 115, 117, 119, 133; 2006: 371, 374, 381, 416, 450; 2014: 42).

The destroyer ant, *T. destructor* (formerly *Monomorium destructor*) is an Old World tramp species that is a pest in many tropical and subtropical areas (Wetterer, 2009b). It is notorious for living in electrical equipment, chewing through the insulation of electrical wires, and attacking people.

63. *Wasmannia auropunctata* (Roger)

Published Records. No site data (1896; A. Forel; Forel, 1912c). Coles Cave (1979; S. B. Peck; Peck, 1981). Review (Wetterer, 2013a).

Specimens Examined. C&W, two sites (B38, B85, B91). JW, 49 sites (2003: 89, 93, 99, 104, 107, 110, 114, 122, 130; 2006: 338, 343, 346, 349, 354, 364, 370, 387, 390, 394, 395, 399, 419, 422, 442, 446-447, 450, 457, 459; 2014: 6, 8, 44, 60, 64,

74, 87, 95, 98, 100, 102, 107, 111, 113, 121, 135, 145, 158, 169, 185, 189).

The little fire ant, *W. auropunctata*, occurs throughout most of the warmer parts of the New World, from subtropical Argentina to subtropical Mexico and through much of the West Indies, although it is not clear whether this species is native to this entire region. During the past century, exotic populations of *W. auropunctata* have become established in numerous other places, including the Galapagos Islands, West Africa (Gabon, Cameroon, and possibly the Republic of Congo and the Democratic Republic of Congo), Melanesia (New Caledonia, Solomon Islands, Vanuatu, and possibly Tuvalu), Polynesia (Wallis and Futuna and Hawaii), the mainland United States (Florida and possibly California), and subtropical Atlantic islands (the Bahamas and Bermuda). In many areas, *W. auropunctata* can be a significant agricultural pest, not only stinging agricultural workers, but also enhancing populations of Hemiptera. Hemiptera cause damage both through sapping plants of nutrients and by increasing the occurrence of diseases, including viral and fungal infections. Additionally, *W. auropunctata* has a negative effect on many animals, both invertebrates and vertebrates, although most reports on such effects have been anecdotal. The effects of *W. auropunctata* populations seem to be most severe on tropical islands where it is not native, such as the Galapagos, New Caledonia, and the Solomon Islands. Reports of widespread blindness in both domestic and native mammals caused by *W. auropunctata* stings deserve serious attention (Wetterer, 2013a).

SPECIES WITH NO RECENT RECORDS
(POSSIBLY EXTINCT)

64. *Atta cephalotes lutea* Forel (stat. rev.)

Published Records. No site data (\leq 1893; W. G. Jeffreys; Forel, 1893; type locale).

Specimens Examined. None.

This species was collected only once. Forel (1893) described *A. lutea* Forel from Barbados but later designated it a subspecies of *colombica* (Forel, 1908), a classification followed by Emery (1913). Santschi (1929) revived its status as a species and listed it in Trinidad. Gonçalves (1942) listed it as a species and was told by R. W. E. Tucker that it did not occur in Barbados. Borgmeier (1950) repeated its status as a species.

Weber (1958, p. 10) designated it a subspecies of *cephalotes*, writing "Contrary to the allocations of this as a separate species by more recent workers, it appears to be no more than a subspecies of *cephalotes*. It would seem to be a mutant developed from a subspecies of *cephalotes* on the pale coral sand of this small island. Perhaps it was introduced as typical *cephalotes* by way of the abundant shipping between Barbados and Trinidad and Demerara several centuries ago. I collected typical *cephalotes* in all parts of Trinidad and do not believe that *lutea* occurs there."

Borgmeier (1959, p. 344) wrote (in German), "*Atta lutea* For. 1893 (Barbados, Jeffreys leg.) was described as a species. The description fits exactly with uncolored specimens of *cephalotes* (seen in the shiny gaster of the smallest workers); Forel mentions 'a bunch of hairs a little more abundant of each side of the vertex', which fits only *cephalotes*. One hardly understands therefore that Forel (1913) and Emery (1913, 1923) place *lutea* as a variety of *colombica*. Santschi (1929) brought new confusion in that he considered light yellow specimens with shinier forehead of Trinidad as *lutea*, and Gonçalves (1942) and Borgmeier (1950) repeated this; but Forel says specifically that his animals were dull; only for the 3 mm worker does he give the head as subopaque and the gaster as 'very shiny'. Of geographic variation, therefore there can be nothing said. The light yellow coloring alone can establish no subspecies. Such light yellow

workers were gathered by Weber himself on Trinidad (1934, 20 XII., no. 33); it appears in the same colony together with normally colored animals and therefore has no nomenclatural value at all." Weber (1958), however, explicitly stated that he did not believe *lutea* occurred in Trinidad; thus, "light yellow coloring alone" clearly was not Weber's (1958) basis for differentiating *lutea*.

Weber (1972) resurrected *lutea* as a subspecies of *cephalotes*. Bolton (1995) listed *lutea* as a junior synonym based on Borgmeier (1959). Borgmeier (1959), however, made this synonymy based on the written description, not through examining type specimens. We therefore chose to follow Weber (1972), the more recent taxonomic designation. The taxonomy of this form deserves further study.

This record is the only record for any *Atta* species from Lesser Antilles (except Trinidad and Tobago), and this may be an exotic to Barbados, as Weber (1958) suggested.

65. *Crematogaster brevidentata* Forel

Published Records. Bathsheba, 200 m (1896; A. Forel; Forel, 1912b; type locale).

Specimens Examined. None.

Forel (1912b) described *C. brevispinosus brevidentata* from Barbados. Longino (2003) examined a syntype worker in the Musée d'Histoire Naturelle Genève and raised *brevidentata* to full species, known only from Barbados. Longino (2003, p. 131) wrote: "workers are small, propodeal spines are tiny, there are no erect setae on head or fourth abdominal tergite, erect setae are sparse on mesosoma, and there is a strong anteroventral petiolar tooth."

Several described subspecies of *C. brevispinosa* were later determined to be synonyms of *C. crinosa*. Of the five New World ant species that we collected, most often in Barbados, *C. crinosa* is the only one that Forel did not report among the ants he collected in 1896. It seems likely that either

C. brevidentata is conspecific with *C. crinosa* or that *C. brevidentata* has been driven extinct by *C. crinosa*.

66. *Crematogaster carinata* Mayr

Published Records. Bridgetown (1920; W. M. Wheeler; Wheeler, 1923).

Specimens Examined. None.

Longino (2003) examined specimens of this New World species from many parts of South and Central America. Wheeler's (1923) specimens, not examined by Longino (2003), are the only record of this species from the West Indies. This arboreal species was collected only in Bridgetown, the capital and main port city of Barbados, suggesting that this species may be exotic to Barbados. Wheeler (1923) may have sampled a temporary population of this species, brought to Barbados on lumber from South America.

67. *Crematogaster steinheili* Forel

Published Records. No site data (1896; A. Forel; Forel, 1912b).

Specimens Examined. None.

This yellow arboreal ant is a strictly Antillean species. It is very common in the Greater Antilles and the Bahamas and has been introduced to Florida. In the Lesser Antilles, it is otherwise known only from a few sites in Antigua (JKW, unpublished data), the nearest site records to the single Barbados site record. *Crematogaster steinheili* is the only New World ant species in Barbados that is known from Florida or the Bahamas, but not from Trinidad or South America. Thus, it seems likely that *C. steinheili* is not native to Barbados. Forel (1912b) may have sampled a temporary population of this species, brought to Barbados on lumber from the Greater Antilles.

68. *Pseudomyrmex gracilis* (Fabricius)

Published Records. No site data (2w; ≤ 1877 ; no date; no collector; BMNH; lectotype and paralectotype of *P. pilosula* Smith; Smith 1877; designation by Ward, 1993: 155). No site data (1w; no date; no

collector; BMNH; lectotype of *P. variabilis* Smith; designation by Ward, 1989: 439). Review (Wetterer, 2010c).

Specimens Examined. None.

In the earliest ant records from Barbados with extant specimens, Smith (1877) described *P. pilosula* Smith and *P. variabilis* Smith [both species = *P. gracilis* (Fabricius)]. It has never been found since. This species is widespread through much of the New World and could be exotic (Wetterer, 2010c), brought to Barbados on lumber from South America. It has been introduced to the southeastern United States and Hawaii (Wetterer, 2010c; MacGown *et al.*, 2013).

69. *Pseudomyrmex maculatus* (Smith)

Published Records. "Barbadoes" (1w; ≤ 1877 ; no collector; BMNH; Ward, 1989).

Specimens Examined. None.

Ward (1989) found that a specimen of *P. maculatus* (Smith) was on the same pin as Smith's *P. variabilis* specimen that was labeled "Barbadoes." Ward (1992) also listed this species from Barbados. Smith (1855) described *P. maculatus* from Brazil. The specimens of *P. gracilis* and *P. maculatus* are of unknown age but must predate Smith (1877). This species could be exotic, brought to Barbados on lumber from South America.

DISCUSSION

In preliminary biogeographic analyses of West Indian ants, Wilson (1988) reported 18 ant species from Barbados. Here, we documented 69 ant taxa collected in Barbados (46 New World and 23 Old World). Preliminary analyses (Table 3) indicate that there are fewer New World and more Old World ant species recorded from Barbados than from the two Lesser Antilles islands most similar in size to Barbados: St. Vincent and Grenada (Table 3).

TABLE 3. ANT SPECIES RICHNESS OF BARBADOS AND NEIGHBORING ISLANDS.*

	Area (km ²)	Elev (m)	Total	NW	OW
Barbados	462	336	69	46	23
St Vincent [†]	381	1,234	70	58	12
Grenada [†]	344	840	74	61	13

*Elev = maximum elevation, NW= New World species, OW= Old World species.

[†]St Vincent and Grenada data from Wetterer *et al.* (unpublished data).

Only four ant taxa recorded in Barbados are known solely from the West Indies (Table 1). Most of the New World ant species we recorded have very broad ranges (Table 1). Of the New World species found in Barbados, 41 also occur in mainland South America, but only 17 are known from Florida. Several of these New World species have been found at a few sites in the Old World (e.g., *A. mayri*, *B. cf. heeri*, *C. atriceps*, *N. cf. steinheili*, *G. striatula* in European greenhouses). However, only two species, *S. geminata* and *W. auropunctata*, are tramp species that have spread worldwide via human commerce (Table 1). Therefore, it seems likely that most of the New World ants in Barbados are probably native and originated in South America. Some New World species, however, could be exotic to Barbados (e.g., *C. steinheili* and *N. cf. fulva*; see Species Accounts), and others could have a mix of both native and exotic populations. For example, one possibility is that light-colored *C. sexguttatus grenadensis* (= *C. sexguttatus*), known only from Barbados, Grenada, and St. Vincent, is native to Barbados, whereas the widespread typical form of *C. sexguttatus* is exotic.

All 23 Old World ant species found in Barbados have broad worldwide distributions and are certainly exotic to Barbados. These included some major pest species, such as *P. megacephala*, *T. melanocephalum*, and *T. destructor*. Of these 23 species, 18 are also

known from South America, 16 from Trinidad, and 19 from Florida.

Possible ant extinctions in Barbados

A number of ant species on Barbados may have been driven extinct through human activities, some lost without a trace. By the time of the earliest ant collection in Barbados in the 19th century, little remained of the original vegetation (Forel, 1912b). Six ant species, all of New World origin, are known from Barbados based solely on single collection records >80 years old (Tables 1, 2; see Species Accounts). Four of these ants are widespread arboreal species: *C. carinata*, *C. steinheili*, *P. gracilis*, and *P. maculatus*. These species may have been incidentally extirpated due to widespread deforestation in Barbados. Alternatively, these arboreal ants may have been only temporary populations introduced on imported lumber (see Species Accounts). The other two species with no recent records from Barbados are the only apparently endemic taxa: *A. cephalotes lutea* and *C. brevidentata*.

Jeffreys collected the only known specimens of *A. cephalotes lutea* in Barbados sometime before 1893 (Forel, 1893). Elsewhere in the New World, colonies of other *A. cephalotes* subspecies can grow to include several million workers. These ants are highly conspicuous and destructive pests. It seems unlikely that *A. cephalotes lutea* colonies have survived to the present day undetected in Barbados. This ant may have been purposely exterminated in Barbados as an agricultural pest.

Forel (1912b) made the only known collection of the acrobat ant *C. brevidentata* at a site 200 m above the coastal town of Bathsheba. The area above Bathsheba is the site of the largest remaining forest in Barbados, on the slopes of

Hackleton's Cliff. Although we collected extensively in this area, we did not find *C. brevidentata*.

Future research

Building upon the present study on the ants of Barbados, we plan to complete our inventory of the ants of neighboring Grenada and St. Vincent, the southernmost major islands of the Lesser Antilles (Fig. 1). Grenada and St. Vincent differ from Barbados in many ways that can influence biodiversity. Grenada and St. Vincent are much older than Barbados, having first emerged ~ 50 mya, and some researchers have proposed that they were once attached to South America. During low sea levels 15 kya, Grenada was joined with all the Grenadine islands to the north and with an extension to the south, forming an island about ten times Grenada's current size that was separated from St. Vincent by just a few kilometers and from South America by ~ 70 km (Fig. 1). Grenada and St. Vincent are also much more mountainous than Barbados.

Our present inventory can serve as a baseline for ant research in Barbados. We collected several ant species at only single locales, and we expect that additional collecting in Barbados will find additional species present. We also expect that additional exotic ant species will continue to invade Barbados. For example, the highly destructive red imported fire ant, *Solenopsis invicta*, originally from South America, is now spreading across the West Indies (Wetterer, 2013b) but has not yet been recorded from Barbados.

About 30 Old World ant species are known from the West Indies. Of these, major Old World tramp species that have not yet been recorded from Barbados include *Monomorium pharaonis* and *Technomyrmex difficilis*. Destructive exotic ants tend to thrive in

open, disturbed habitats with weedy vegetation that can support high densities of plant-feeding Hemiptera, which these ants tend to honeydew. This is one reason to encourage the strict protection of what little forest remains in Barbados.

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APPENDIX 1.

EARLY REPORTS FROM BARBADOS CONCERNING ANTS OF UNCERTAIN SPECIES IDENTITIES

Clarke (1670: pp. 70–71) presented the earliest account of ants in Barbados, writing, "They have ants and pismires of a small size, but of a great industry; they are every where, in hollow ground amongst the root of Trees, upon the Bodie, Branches, Leaves, and Fruit of all Trees; without houses, within their houses, upon their sides, walls, windows, Roofs, Tables, Cupboards, Stools, Beds, Floors, all within and without are covered with them. When they find a dead Cockroeh, though he be bigger then a hundred of them, yet they will take hold of him and lift him up, and away they carry him, some going by to assist those that are weary; some (like Officers) lead the way to shew the hole into which he must pass, and if his body do lie a cross that it cannot go into the hole, they give notice to the carriers, that presently turn his body endwise before it come to the hole, and that without any stop, and they never pull contrary wayes. The Planters which are so eurious to prevent their coming upon their Tables, Cupboards, and Beds, have little troughs filled with water for the feet of these to stand in; yet all will not prevail, for they will get in the seieling, and so fall down upon them. To keep them from the shelves on which their meat stands, they are forced to hang them to the roof with ropes, and to tar those ropes and the roofs over them. When a Carpet upon a Table is covered over with them, if you kill many, and let them alone but a while, they will carry away all the dead ones. If you set Sugar upon a Table which you have first freed from them, some in the

room will presently smell it, and make towards it as fast as they can, and having found it, return again without meddling with it, and gives notice of this booty, and then they come in thousands and ten thousands, and in an instant fetch it all away so that there is no place safe from these over-busie Creatures.”

Wilson (2005, p. 32) speculated on the identity of the ants reported by Clarke (1670), writing, “On Barbados in the mid-1600s there was an ant that was a serious house pest. Unlike fire ants, its workers lifted and carried large food items, such as cockroaches, in an unusually coordinated fashion. This feature points to the ant genus *Pheidole*. Among the many species known from the West Indies, only two are candidates: *P. jelskii*, a native species, and *P. megacephala*, which is of African origin. The evidence favours *P. megacephala*, a global, invasive ant that has caused similar problems in other tropical countries.” *Pheidole*, however, have distinctly dimorphic workers, a trait not mentioned by Clarke (1670). An alternative possibility is *P. longicornis*, whose workers often carry large prey in a coordinated group.

Hughes (1750, pp. 93-94) wrote about four species of ants in Barbados:

1. “The Small Red Ant. This is a very small ant: Yet the Part of the Skin it bites continues painful for near Four Hours afterwards. If these are likewise killed, and rubbed upon the Skin, they raise a Blister. The Bodies of these Ants are thickly covered with sharp fine-pointed Bristles, imperceptible to the naked Eye.”
2. “The Stinging Ant. This appears to be the same with what is to be seen in England in the Summer Season in most Pasture-Lands.”
3. “The Horse-Ant. This is the largest-sized Ant, and is often to be met with both within and without Doors; and hath nothing peculiar in its Make or Qualities.”
4. “The Sugar-Ant. This is a small whitish Ant, very fond of Sugar, or any sweet and oily Liquids; and consequently very troublesome to the Housewives, it being difficult to keep them from every kind of Victuals.”

Judging from Hughes’ (1750) depictions, it seems likely that the “small red ant” is the little fire ant *W. auropunctata*, the “stinging ant” is the tropical fire ant *S. geminata* (Wheeler, 1926; Wilson, 2005), the “horse-ant” is the enormous carpenter ant *C. atriceps*, and the “sugar-ant” is the ghost ant *T. melanocephalum* (Wheeler, 1926). Hughes (1750) also mentioned a “Wood-Ant” and a “Great-headed Ant.” Hughes (1750) described the Wood-Ant as “very destructive to Timber” and “very expeditious in building their Nests, which are long hollow

Tubes, the Outside being an Incrustation of a gritty clayey Matter.” Hughes (1750) continued that the Great-Headed Ant “no-way differs from the last described [the Wood-Ant], but by the Bigness of its Head.” The description of long tubes of clay indicates that these last two “ants” are actually worker and soldier termites.

Castles (1790) wrote extensively about a population explosion of “sugar ants” that devastated Grenada beginning around 1770 but largely receded after a hurricane in 1780. Castles (1790) mentioned that Barbados once experienced the bad effects of these same ants but had been freed of this problem.

In a chapter on the history of Martinique, Coke (1808–11) wrote about a highly destructive “sugar-ant” that devastated Martinique between 1763 and 1766 and again around 1770. Coke (1808–11) also mentioned that “some time before they appeared in Martinico, they ravaged Barbadoes to such a degree, that it was deliberated, whether that island, formerly so flourishing, should not be deserted” (Coke, 1808–11; vol 2: 313). Wheeler (1926) and Wilson (2005) concluded that this 18th century plague ant was probably *S. geminata*, which may have had a population explosion that was associated with the introduction of an exotic plant-feeding Hemiptera mutualist.

In his “History of Barbados,” Schomburgk (1848) devoted four pages to pest ants. Schomburgk (1848) discussed four ant species, which he identified as *Formica omnivora*, *Formica cephalotes*, *Formica caustica*, and *Formica saccharivora*. These four species may or may not correspond to *S. geminata*, *Atta cephalotes*, *W. auropunctata*, and *T. melanocephalum*, although it is not certain. Most of the Schomburgk (1848) information on ants came from New World locales other than Barbados, and much of it appears to involve confusion of different ant and termite species.

Schomburgk (1848, p. 640) described the ravages of “the Sugar Ant. *Formica omnivora*, Linn., *Myrmica omnivora*, Latr.,” drawing heavily on the writings of Castles (1790) concerning Grenada and Coke (1808–11) concerning Martinique. Schomburgk (1848, p. 640) stated these ants “showed themselves about 1760 in Barbados, and caused such devastation that ‘it was deliberated, whether that island, formerly so flourishing, should not be deserted.’” Schomburgk (1848) further wrote, “It has been asserted that this insect had been brought to Barbados from Tobago in some mould imported by Mr. Gidney Clarke, owner of the Bell Plantation. In 1814 they again made their appearance with considerable injury in many districts to the vegetable productions and feathered stock, but they did not continue long,” citing “Dr. Collyns’s MSS” as his source of information. Schomburgk (1848, p. 643)

continued: "They are still to be found in Barbados, but only in small numbers." As mentioned above, Wheeler (1926) and Wilson (2005) concluded that *F. omnivora* was probably *S. geminata*.

Schomburgk (1848, p. 643) then wrote about the "Cushi or Great-headed ant," which he identified as *F. cephalotes* (= *A. cephalotes*), a species of the leaf-cutting ant that is a major pest in South and Central America. But Schomburgk's (1848) own observations on this ant all appear to come from Guyana in South America, and his mention of the presence of this ant in Barbados may be based on Hughes' (1750) mention of a "Great-headed Ant," which actually referred to a termite.

Schomburgk (1848) also noted a small red ant, citing (and paraphrasing) Hughes' (1750) account, which appears to refer to *W. auropunctata*. But then Schomburgk (1848, p. 644) added, "the ant is described by Kollar as *Formica caustica*." Later authors have identified *F. caustica* as either *Cephalotes minutus* (Fabricius) (Forel, 1895) or *Cephalotes pusillus* (Klug) (Kempf, 1951). Neither of these species is small or red or stings, and no *Cephalotes* is known from Barbados.

Finally, Schomburgk (1848, p. 644) wrote, "the Sugar Ant, which will creep through the smallest crevices in order to get to the sugar, is *Formica saccharivora*." This second "Sugar Ant" is clearly different from the *F. omnivora* "sugar ant" he discussed earlier. Although modern taxonomists have been unable to determine the identity of *F. saccharivora*, Linnaeus (1758) described it as an American species the size of *Formica caespitum* (= *Tetramorium caespitum*), the large "pavement ant" of Europe. Such a large ant would not be able to "creep through the smallest crevices." Instead, the Schomburgk (1848) account of this second sugar ant appears similar to that of Hughes' (1750) sugar ant; both seem to fit *T. melanocephalum* (also see Wheeler, 1926).

APPENDIX 2. COLLECTION SITE INFORMATION

Information given as vial nos.: site; degrees N, degrees W (date).

Cover and Wilson, 1998 (six sites)

B1-18, 55-56, 105-106, 110-113: Casuarina Beach Club; 13.07, 59.57 (17, 18, and 21 Mar 1998)

B19-54: Turner's Hall Woods; 13.23, 59.58 (18 Mar 1998)

B57-65, 76-77: Graeme Hall Swamp; 13.07, 59.58 (19 Mar 1998)

B66-75: Barbados Wildlife Reserve; 13.27, 59.60 (19 Mar 1998)

B78-94: Jack-in-the-Box; 13.17, 59.58 (20 Mar 1998)
B95-104, 107-109: Hackleton's Cliff Forest; 13.20, 59.53 (20 Mar 1998)

Wettcrer, 2003 (27 sites)

86 and 117: Black Rock, by apartment; 13.126, 59.634 (25 and 28 Nov 2003)

87-88: Hopewell House, gully forest; 13.166, 59.587 (25 Nov 2003)

89-90: Harrison's Cave, forest; 13.178, 59.579 (25 Nov 2003)

91: Edghill, weeds by field; 13.151, 59.604 (25 Nov 2003)

92: Holetown, beach; 13.183, 59.644 (26 Nov 2003)

93-94: Speightstown, vacant lot; 13.229, 59.648 (26 Nov 2003)

95-96: Crab Hill, sugar; 13.309, 59.646 (26 Nov 2003)

97: Cluffs, scrub; 13.323, 59.629 (26 Nov 2003)

98-99: Farley Hill, sugar and weeds; 13.262, 59.601 (26 Nov 2003)

100-102: Turner's Hall Woods, secondary forest; 13.225, 59.583 (26 Nov 2003)

103: Proutes, sugar; 13.160, 59.581 (27 Nov 2003)

104-106: Pool, forest patch; 13.174, 59.516 (27 Nov 2003)

107: Hackleton's Cliff, forest; 13.199, 59.528 (27 Nov 2003)

108: Bathsheba, seagrape; 13.214, 59.528 (27 Nov 2003)

109: Barclay's Park, seagrape; 13.230, 59.545 (27 Nov 2003)

110-111: Welshman Hall Gully, groomed forest; 13.191, 59.581 (27 Nov 2003)

112: East Point, grass and weeds; 13.161, 59.435 (28 Nov 2003)

113-114: King George V Park, trees and grass; 13.130, 59.466 (28 Nov 2003)

115: Oistins, beach; 13.064, 59.552 (28 Nov 2003)

116: Bridgetown, post office garden; 13.095, 59.626 (28 Nov 2003)

118: The Valley, sugar; 13.118, 59.570 (28 Nov 2003)

119-120: Brighton, base of trees by field; 13.121, 59.533 (28 Nov 2003)

121: Hopewell, flower garden; 13.175, 59.594 (29 Nov 2003)

122-129: Welshman Hall Gully, forest by ball fields; 13.185, 59.585 (29 Nov 2003)

130: Flower Forest, garden; 13.202, 59.572 (29 Nov 2003)

131-132: Flower Forest, forest; 13.199, 59.570 (29 Nov 2003)

133: Seawell, airport parking; 13.078, 59.493 (29 Nov 2003)

Wetterer, 2006 (41 sites)

337: Black Rock, compost by hotel; 13.126, 59.634 (16 June 2006)

338-342: Edge Hill, by cricket field; 13.152, 59.602 (16 June 2006)

343-345: Hopewell House, gully forest; 13.166, 59.587 (16 June 2006)

346-347: Canefield, forest patch; 13.193, 59.590 (16 June 2006)

348-353: Boarded Hall, forest; 13.209, 59.576 (16 June 2006)

354-356: Breedy's, scrub forest; 13.251, 59.590 (16 June 2006)

357: Hackleton's Cliff, base forest; 13.203, 59.536 (16 June 2006)

358: Hackleton's Cliff, sugarcane above cliff; 13.198, 59.527 (17 June 2006)

359-363: Hackleton's Cliff, trees at top edge; 13.197, 59.525 (17 June 2006)

364: Hackleton's Cliff, grass above cliff; 13.197, 59.524 (17 June 2006)

365-366: Hackleton's Cliff, forest at bottom; 13.202, 59.533 (17 June 2006)

367: Jericho, grass; 13.183, 59.587 (17 June 2006)

370: Welshman Hall, gully forest; 13.163, 59.564 (17 June 2006)

371-372: Fitts, beach picnic area; 13.145, 59.645 (17 June 2006)

373: Bridgetown, Cavans Lane; 13.093, 59.62 (18 June 2006)

374: Bridgetown, Carlisle Wharf; 13.093, 59.623 (18 June 2006)

375: Bridgetown, St. Mary's Church; 13.096, 59.623 (18 June 2006)

376-378: Bridgetown, Queen's Park; 13.096, 59.615 (18 June 2006)

379: Marine Gardens, by apartments; 13.072, 59.598 (18 June 2006)

380: Gemswick, trees by grass; 13.086, 59.478 (18 June 2006)

381-382: Foul Bay, beach; 13.095, 59.455 (18 June 2006)

383-386: Cheapside, by cruise terminal; 13.097, 59.634 (18 June 2006)

387-389: Cave Hill, UWI campus; 13.133, 59.636 (19 June 2006)

390-392: Bennett's, trees by Route 2A; 13.170, 59.617 (19 June 2006)

393-394: Ridgeway, gully forest; 13.186, 59.617 (20 June 2006)

395-398: Plumtree, roadside forest; 13.195, 59.619 (20 June 2006)

399-409, 423-439: Rockless, gully forest; 13.250, 59.630 (20 June 2006)

410-411: Trents, vine-covered trees; 13.298, 59.633 (20 June 2006)

412-417: River Bay, waterfront park; 13.317, 59.600 (20 June 2006)

418: Diamond Corner, by ball field; 13.272, 59.603 (20 June 2006)

419-421: Moore Hill, St. Nicholas Abbey; 13.273, 59.597 (20 June 2006)

422: Lakes Beach, beach; 13.245, 59.556 (20 June 2006)

440-441: Bath, near route H3; 13.182, 59.482 (21 June 2006)

442-445: Bath, near beach; 13.185, 59.480 (21 June 2006)

446-449: Codrington College, campus; 13.172, 59.479 (21 June 2006)

450: Sweet Vale, Orchid World; 13.159, 59.555 (21 June 2006)

451-452: Belleplaine, Sport Club; 13.243, 59.564 (22 June 2006)

453-455: Walkers, gully forest; 13.242, 59.576 (22 June 2006)

456: Gregg Farm, store at crossroad; 13.215, 59.592 (22 June 2006)

457-458: Hoytes, secondary forest; 13.230, 59.588 (22 June 2006)

459-461: Jack-in-the-Box, gully forest; 13.168, 59.582 (22 June 2006)

Wetterer, 2014 (55 sites)

6-7: Holetown, by apartment; 13.180, 59.635 (2 May 2014)

8-25: Hillcrest, Andromeda Garden; 13.210, 59.518 (3 May 2014)

26: Bathsheba, waterfront park; 13.212, 59.518 (3 May 2014)

27-41: Hackleton's Cliff, 0.6 km E highway; 13.205, 59.529 (3 May 2014)

42-43: Fitts, waterfront park; 13.146, 59.638 (4 May 2014)

- 44-47: Lazaretto, park scrub; 13.134, 59.634 (4 May 2014)
- 48-51: Brandons Beach, park; 13.117, 59.627 (4 May 2014)
- 52-53: Cheapside, by restaurant; 13.101, 59.624 (4 May 2014)
- 54: Bridgetown, by restaurant; 13.096, 59.618 (4 May 2014)
- 55: Bridgetown, Jubilee Gardens; 13.098, 59.618 (4 May 2014)
- 56-58: Carrington, by ball field; 13.105, 59.605 (4 May 2014)
- 59: Bridgetown, Independence Square; 13.105, 59.605 (4 May 2014)
- 60: Trens, scrub; 13.194, 59.629 (5 May 2014)
- 61-63: Rock Hall, forest; 13.191, 59.610 (5 May 2014)
- 64-70: Mt. Hillaby, N side forest; 13.212, 59.582 (5 May 2014)
- 71-73: Mt. Hillaby, S side forest; 13.211, 59.582 (5 May 2014)
- 74-78: Melvin Hill, forest edge; 13.201, 59.564 (5 May 2014)
- 80: Ape Hill, golf course; 13.22, 59.60 (6 May 2014)
- 81-82: Ape Hill, by houses; 13.22, 59.60 (6 May 2014)
- 83-84: Folkestone, Bellairs Station; 13.192, 59.640 (6 May 2014)
- 85-86: Holetown, mall; 13.185, 59.638 (6 May 2014)
- 87-89: Worthing, preserve entrance; 13.071, 59.578 (7 May 2014)
- 90-91: Worthing, swamp trail; 13.071, 59.577 (7 May 2014)
- 92: South Point, scrub; 13.047, 59.530 (7 May 2014)
- 93: Enterprise, scrub; 13.058, 59.538 (7 May 2014)
- 94: Jackmans, scrub; 13.139, 59.594 (7 May 2014)
- 95-96: Hackleton, scrub; 13.199, 59.518 (8 May 2014)
- 98-99: Hackleton's Cliff, by water tank; 13.205, 59.530 (8 May 2014)
- 100-101: Hackleton's Cliff, 750 m E of highway; 13.204, 59.529 (8 May 2014)
- 102-105: Hackleton's Cliff, 900 m E of highway; 13.203, 59.527 (8 May 2014)
- 107-111: Hunte's Garden, garden; 13.192, 59.551, 8 and 9 May 2014)
- 112-117 and 126-134: Turner's Hall Woods, SW forest by ghut; 13.221, 59.584 (9 May 2014)
- 118-123: Turner's Hall Woods, forest 150 m NE ghut; 13.222, 59.582 (9 May 2014)
- 124-125: Turner's Hall Woods, SW edge forest; 13.222, 59.586 (9 May 2014)
- 135-139: Waterford, scrub; 13.117, 59.600 (10 May 2014)
- 140-142: Oughterson, by house; 13.143, 59.475 (10 May 2014)
- 143: Three Houses, park; 13.158, 59.460 (10 May 2014)
- 144: Church Village, by church; 13.137, 59.489 (10 May 2014)
- 145-149: Batts Rock Beach, waterfront; 13.134, 59.636 (11 May 2014)
- 150-151: Bridgetown, parking lot; 13.097, 59.617 (11 May 2014)
- 152-153: Brittons Hill, office garden; 13.094, 59.598 (11 May 2014)
- 154: Henrys, former campus; 13.093, 59.609 (11 May 2014)
- 155: Bayville, office plantings; 13.087, 59.609 (11 May 2014)
- 156: Rendezvous, tree in yard; 13.079, 59.581 (11 May 2014)
- 157-159: Bayville, museum garden; 13.083, 59.602 (12 May 2014)
- 160-161: Green Garden, American University of Barbados campus; 13.048, 59.523 (12 May 2014)
- 162-164: Long Beach, sea grape; 13.061, 59.499 (12 May 2014)
- 165-167: Wotton, by ball field; 13.074, 59.545 (12 May 2014)
- 168: Welches Heights, store plants; 13.155, 59.611 (12 May 2014)
- 169-173: Turner's Hall Woods, forest by old bridge; 13.221, 59.584 (13 May 2014)
- 174-179: Turner's Hall Woods, forest 300 m NE of ghut; 13.224, 59.582 (13 May 2014)
- 180-184: Turner's Hall Woods, forest 450 m NE of ghut; 13.225, 59.581 (13 May 2014)
- 185-188: Turner's Hall Woods, forest 650 m NE of ghut; 13.226, 59.580 (13 May 2014)
- 189: Turner's Hall Woods, forest 75 m NE of ghut; 13.222, 59.583 (13 May 2014)
- 190: Two-Mile Hill, by veterinary office; 13.099, 59.592 (14 May 2014)

LITERATURE CITED

- AGOSTI, D., AND L. E. ALONSO. 2000. The ALL protocol: a standard protocol for the collection of ground-

- dwelling ants, pp. 204–206. In D. Agosti, J. D. Majer, L. E. Alonso, and T. R. Schultz eds. *Ants: Standard Methods for Measuring and Monitoring Biodiversity*. Washington, D.C., Smithsonian Institution Press.
- ASHMEAD, W. H. 1900. Report upon the Aculeate Hymenoptera of the islands of St. Vincent and Grenada, with additions to the Parasitic Hymenoptera and a list of the described Hymenoptera of the West Indies. *Transactions of the Entomological Society of London* **1900**: 207–367.
- BESTELMEYER, B. T., L. E. ALONSO, AND R. R. SNELLING. 2000. The ants (Hymenoptera: Formicidae) of Laguna del Tigre National Park, Petén, Guatemala. *RAP Bulletin of Biological Assessment* **16**: 75–83.
- BOER, P. D., AND B. VIERBERGEN. 2008. Exotic ants in the Netherlands (Hymenoptera: Formicidae). *Entomologische Berichten* **68**: 121–129.
- BOLTON, B. 1977. The ant tribe Tetramoriini (Hymenoptera: Formicidae). The genus *Tetramorium* Mayr in the Oriental and Indo-Australian regions, and in Australia. *Bulletin of the British Museum (Natural History) Entomology* **36**: 67–151.
- BOLTON, B. 1979. The ant tribe Tetramoriini (Hymenoptera: Formicidae). The genus *Tetramorium* Mayr in the Malagasy region and in the New World. *Bulletin of the British Museum (Natural History) Entomology* **38**: 129–181.
- BOLTON, B. 1995. *A New General Catalogue of the Ants of the World*. Cambridge, Massachusetts, Harvard University Press.
- BOLTON, B. 2000. The ant tribe Dacetini. *Memoirs of the American Entomological Institute* **65**: 1–1028.
- BORGMEIER, T. 1950. Estudos sobre *Atta* (Hym. Formicidae). *Memórias do Instituto Oswaldo Cruz* **48**: 239–263.
- BORGMEIER, T. 1959. Revision der Gattung *Atta* Fabricius (Hymenoptera, Formicidae). *Studia Entomologica* **2**: 321–390.
- BROWN, W. L., JR. 1959. The neotropical species of the ant genus *Strumigenys* Fr. Smith: group of *gimdlachi* (Roger). *Psyche* **66**: 37–52.
- BROWN, W. L., JR. 1962. The Neotropical species of the ant genus *Strumigenys* Fr. Smith: synopsis and keys to species. *Psyche* **69**: 238–267.
- BROWN, W. L., JR. 1975. Contributions toward a reclassification of the Formicidae. V. Ponerinae, tribes Platythyreini, Cerapachyini, Cylindromyrmecini, Acanthostichini, and Aenictogitini. *Search Agriculture* **5**.
- BROWN, W. L., JR. 1976. Contributions toward a reclassification of the Formicidae. Part VI. Ponerinae, tribe Ponerini, subtribe Odontomachiti. Section A. Introduction, subtribal characters. Genus *Odontomachus*. *Studia Entomologica* **19**: 67–171.
- BROWN, W. L., JR. 1978. A supplement to the world revision of *Odontomachus* (Hymenoptera: Formicidae). *Psyche* **84**: 281–285.
- CASTLES, J. 1790. Observations on the sugar ants. In a letter from John Castles, Esq. to Lieut. Gen. Melvill, F. R. S. *Philosophical Transactions of the Royal Society of London* **80**: 688–694.
- CLARKE, S. 1670. *A True and Faithful Account of the Four Chiefest Plantations of the English in America, To Wit, of Virginia, New-England, Bermudas, Barbados: With the Temperature of the Air, the Nature of the Soil, the Rivers, Mountains, Beasts, Fowls, Birds, Fishes, Trees, Plants, Frmits, &c.: As Also, of the Natives of Virginia, and New-England, Their Religion, Customs, Fishing, Hunting, &c.* London, Clavel, Passenger, Cadman, Whitwood, Sawbridge, and Birch.
- COKE, T. 1808–11. *A History of the West Indies Containing the Natural, Civil, and Ecclesiastical History of Each Island: With an Account of the Missions Instituted in those Islands, from the Commencement of Their Civilisation but More Especially of the Missions which Have Been Established in That Archipelago by the Society Late in Connection with the Rev. John Wesley*. Liverpool, Nuttall, Fisher, and Dixon.
- CRAWLEY, W. C. 1921. New and little-known species of ants from various localities. *Annals and Magazine of Natural History* (series 9) **7**: 87–97.
- DELABIE, J. H. C., AND F. BLARD. 2002. The tramp ant *Hypoponera punctatissima* (Roger) (Hymenoptera: Formicidae: Ponerinae): new records from the Southern Hemisphere. *Neotropical Entomology* **31**: 149–151.
- DELSINNE, T., H. JOURDAN, AND J. CHAZEAU. 2001. Premières données sur la monopolisation de ressources par l'envahisseur *Wasmannia amrommctata* (Roger) au sein d'une myrmécophage de forêt sèche neo-calédonienne. *Actes des Colloques Insectes Sociaux* **14**: 1–8.
- DEYRUP, M. 1991. *Technomyrmex albipes*, a new exotic ant in Florida (Hymenoptera: Formicidae). *Florida Entomologist* **74**: 147–148.
- DEYRUP, M. 2003. An updated list of Florida ants (Hymenoptera: Formicidae). *Florida Entomologist* **86**: 43–48.
- DEYRUP, M., N. CARLIN, J. TRAGER, AND G. UMPHREY. 1988. A review of the ants of the Florida Keys. *Florida Entomologist* **71**: 163–176.
- DEYRUP, M., L. DAVIS, AND S. BUCKNER. 1998. Composition of the ant fauna of three Bahamian Islands, pp. 23–31. In T. K. Wilson ed. *Proceedings*

- of the Seventh Symposium on the Natural History of the Bahamas. San Salvador, Bahamian Field Station.
- DEYRUP, M., L. DAVIS, AND S. COVER. 2000. Exotic ants in Florida. *Transactions of the American Entomological Society* **126**: 293–326.
- DEYRUP, M., J. TRAGER, AND N. CARLIN. 1985. The genus *Odontomachus* in the southeastern United States (Hymenoptera: Formicidae). *Entomological News* **96**: 188–195.
- EMERY, C. 1895. Beiträge zur Kenntniss der nordamerikanischen Ameisenfauna. (Schluss), Zoologische Jahrbücher. *Abteilung für Systematik, Geographie und Biologie der Tiere* **8**: 257–360.
- EMERY, C. 1898. Aggiunte e correzioni al saggio di un catalogo sistematico dei generi *Camponotus*, *Polyrhachis* e affini. *Rendiconti delle Sessioni della Reale Accademia delle Scienze dell'Istituto di Bologna* **2**: 225–231.
- EMERY, C. 1913. Études sur les Myrmicinae. [V–VII.] *Annales de la Société Entomologique de Belgique* **57**: 250–262.
- EMERY, C. 1923. Hymenoptera. Fam. Formicidae. Subfam. Myrmicinae. [concl.] *Genera Insectorum* **174c**: 207–397.
- EMERY, C. 1925. Hymenoptera, Fam. Formicidae, subfam. Formicinae. *Genera Insectorum* **183**.
- ESPADALER, X., AND V. BERNAL. 2003. Exotic ants in the Canary Islands, Spain (Hymenoptera, Formicidae). *Vieraea* **31**: 1–7.
- FERNÁNDEZ, F. 2007. Two new South American species of *Monomorium* Mayr with taxonomic notes on the genus. *Memoirs of the American Entomological Institute* **80**: 128–145.
- FISHER, B. L., A. K. F. MALSCH, R. GADAGKAR, J. H. C. DELABIE, H. L. VASCONCELOS, AND J. D. MAJER. 2000. Applying the ALL protocol: selected case studies, pp. 207–214. In D. Agosti, J. D. Majer, L. E. Alonso, and T. R. Schultz eds. *Ants: Standard Methods for Measuring and Monitoring Biodiversity*. Washington, D.C., Smithsonian Institution Press.
- FOREL, A. 1874. Les fourmis de la Suisse. Systématique, notices anatomiques et physiologiques, architecture, distribution géographique, nouvelles expériences et observations de moeurs. *Neue Denkschriften der Allgemeinen Schweizerischen Gesellschaft für die Gesamten Naturwissenschaften* **26**.
- FOREL, A. 1893. Note sur les Attini. *Annales de la Société Entomologique de Belgique* **37**: 586–607.
- FOREL, A. 1895. Nouvelles fourmis de diverses provenances, surtout d'Australie. *Annales de la Société Entomologique de Belgique* **39**: 41–49.
- FOREL, A. 1897. Quelques Formicides de l'Antille de Grenada récoltés par M. H. H. Smith. *Transactions of the Entomological Society of London* **1897**: 297–300.
- FOREL, A. 1901. Nouvelles espèces de Ponerinae. (Avec un nouveau sous-genre et une espèce nouvelle d'*Eciton*) *Revue Suisse de Zoologie* **9**: 325–353.
- FOREL, A. 1902. Quatre notices myrmécologiques. *Annales de la Société Entomologique de Belgique* **46**: 170–182.
- FOREL, A. 1908. Ameisen aus Sao Paulo (Brasilien), Paraguay, etc. Gesammelt von Prof. Herm. v. Ihering, Dr. Lutz, Dr. Fiebrig, etc. *Verhandlungen der Kaiserlich-Königlichen Zoologisch-Botanischen Gesellschaft in Wien* **58**: 340–418.
- FOREL, A. 1912a. Formicides Néotropiques. Part I. *Annales de la Société Entomologique de Belgique* **56**: 28–49.
- FOREL, A. 1912b. Formicides Néotropiques. Part III. 3me sous-famille Myrmicinae (suite). Genres *Cremastogaster* et *Pheidole*. *Memoires de la Société Entomologique de Belgique* **19**: 211–237.
- FOREL, A. 1912c. Formicides Néotropiques. Part IV. 3me sous-famille Myrmicinae Lep. (suite). *Memoires de la Société Entomologique de Belgique* **20**: 1–32.
- FOREL, A. 1912d. Formicides Neotropiques. Part 6. 5me sous-famille Camponotinae Forel. *Memoires de la Société Entomologique de Belgique* **20**: 59–92.
- FOREL, A. 1913. Fourmis d'Argentine, du Brésil, du Guatemala and de Cuba. Reçues de MM. Bruch, Prof. v. Ihering, Mlle Baez, M. Peper et M. Rovereto. *Bulletin de la Société Vaudoise des Sciences Naturelles* **49**: 203–250.
- FOWLER, H. G., O. C. BUENO, T. SADATSUNE, AND A. C. MONTELLI. 1993. Ants as potential vectors of pathogens in hospitals in the state of Sao Paulo, Brazil. *Insect Science and Its Application* **14**: 367–370.
- GONÇALVES, C. R. 1942. Contribuição para o conhecimento do gênero *Atta* Fabr., das formigas saúvas. *Boletim da Sociedade Brasileira de Agronomia, Rio de Janeiro* **5**: 333–358.
- GOTZEK, D., S. G. BRADY, R. J. KALLAL, AND J. S. LAPOLLA. 2012. The importance of using multiple approaches for identifying emerging invasive species: the case of the Raspberry crazy ant in the United States. *PLoS ONE* **7**(9): e45314. doi:10.1371/journal.pone.0045314.
- HASHMI, A. A. 1973. A revision of the Neotropical ant subgenus *Myrmothrix* of genus *Camponotus* (Hymenoptera: Formicidae). *Studia Entomologica* **16**.
- HÖLDOBLER, B., AND E. O. WILSON. 1990. *The Ants* Cambridge, Massachusetts, Harvard University Press.
- HUGHES, G. 1750. *Natural History of Barbados*. 1972 reprint edition New York, Arno Press.

- IPSER, R. M., M. A. BRINKMAN, AND W. A. GARDNER. 2005. First report of *Brachymyrmex obscurior* Forel (Hymenoptera: Formicidae) from Georgia. *Journal of Entomological Science* **40**: 250–251.
- JUCKER, C., F. RIGATO, AND R. REGALIN. 2008. Exotic ant records from Italy (Hymenoptera, Formicidae). *Bollettino di Zoologia agraria e di Bachicoltura* **40**: 99–107.
- KALLAL, R. J., AND J. S. LAPOLLA. 2012. Monograph of *Nylanderia* (Hymenoptera: Formicidae) of the world, part II: *Nylanderia* in the Nearctic Zootaxa **3508**.
- KEMPF, W. W. 1951. A taxonomic study on the ant tribe Cephalotini (Hymenoptera: Formicidae). *Revista de Entomologia (Rio de Janeiro)* **22**.
- KEMPF, W. W. 1972. Catálogo abreviado das formigas da região neotropical (Hymenoptera: Formicidae). *Studia Entomologica* **15**.
- KUGLER, C. 1994. A revision of the ant genus *Rogeria* with description of the sting apparatus (Hymenoptera: Formicidae). *Journal of Hymenoptera Research* **3**: 17–89.
- LAPOLLA, J. S. 2004. *Acropyga* (Hymenoptera: Formicidae) of the World Contributions of the American Entomological Institute **33**(3)
- LAPOLLA, J. S., AND J. SOSA-CALVO. 2006. Review of the ant genus *Rogeria* (Hymenoptera: Formicidae) in Guyana. *Zootaxa* **1330**: 59–68.
- LATTKE, J. E. 2011. Revision of the New World species of the genus *Leptogenys* Roger (Insecta: Hymenoptera: Formicidae: Ponerinae). *Arthropod Systematics & Phylogeny* **69**: 127–264.
- LATTKE, J. E., F. FERNÁNDEZ, AND E. E. PALACIO. 2007. Identification of the species of *Gnamptogenys* Roger in the Americas. *Memoirs of the American Entomological Institute* **80**: 254–270.
- LINNAEUS, C. 1758. *Systema naturae per regna tria naturae, secundum classes, ordines, genera, species, cum characteribus, differentiis, synonymis, locis*. Tomus I. Editio decima, reformata Holmiae [= Stockholm], L. Salvii.
- LONGINO, J. T. 2000. What to do with the data., pp. 186–203. In D. Agosti, J. D. Majer, L. E. Alonso, and T. R. Schultz eds. *Ants: Standard Methods for Measuring and Monitoring Biodiversity* Washington, D.C., Smithsonian Institution Press.
- LONGINO, J. T. 2003. The *Crematogaster* (Hymenoptera, Formicidae, Myrmicinae) of Costa Rica. *Zootaxa* **151**.
- LONGINO, J. T. 2004 [Internet]. Olympia, Washington: The Evergreen State College [2004 Feb 22; cited 2016 Mar 19]. Ants of Costa Rica website: *Cyphomyrmex rimosus* (Spinola 1851). Available from: <http://academic.evergreen.edu/projects/ants/genera/Cyphomyrmex/species/rimosus/rimosus.html>.
- MACGOWN, J. A., AND J. A. FORSTER. 2005. A preliminary list of the ants (Hymenoptera: Formicidae) of Alabama. *Entomological News* **116**: 61–74.
- MACGOWN, J. A., J. G. HILL, AND M. A. DEYRUP. 2007. *Brachymyrmex patagonicus* (Hymenoptera: Formicidae), an emerging pest species introduced into the southeastern United States. *Florida Entomologist* **90**: 457–464.
- MACGOWN, J. A., H. RICHTER, AND R. L. BROWN. 2013. Notes and new distributional records of invasive ants in the southeastern United States. *Midsouth Entomologist* **6**: 104–120.
- MACGOWN, J. A., AND J. K. WETTERER. 2013. Distribution and biological notes of *Strumigenys margaritae* (Hymenoptera: Formicidae: Dacetini). *Terrestrial Arthropod Reviews* **6**: 247–255.
- PACHECO, J. A., AND W. MACKAY. 2013. The Systematics and Biology of the New World Thief Ants of the Genus *Solenopsis* (Hymenoptera: Formicidae). Lampeter, Wales, Edwin Mellen Press.
- PECK, S. B. 1981. Community composition and zoogeography of the invertebrate cave fauna of Barbados. *Florida Entomologist* **64**: 519–527.
- PETERSON, C. E. 1973. Sawdust trail, annals of sawmilling and the lumber trade from Virginia to Hawaii via Maine, Barbados, Sault Ste. Marie, Manchac and Seattle to the Year 1860. *Bulletin of the Association for Preservation Technology* **5**: 84–153.
- RISCH, S. J., AND C. R. CARROLL. 1982. Effect of a keystone predaceous ant, *Solenopsis geminata*, on arthropods in a tropical agroecosystem. *Ecology* **63**: 1979–1983.
- SANTSCHI, F. 1929. Mélange myrmécologique. *Wiener Entomologische Zeitung* **46**: 84–93.
- SCHILDER, K., J. HEINZE, G. ROY, AND B. HÖLLDOBLER. 1999. Microsatellites reveal clonal structure of populations of the thelytokous parthenogenetic ant *Platythyrea punctata* (F. Smith) (Hymenoptera: Formicidae). *Molecular Ecology* **8**: 1497–1507.
- SCHOMBURGK, R. H. 1848. *The History of Barbados; Comprising a Geographical and Statistical Description of the Island; a Sketch of the Historical Events since the Settlement; and an Account of its Geology and Natural Productions*. 1998 reprint edition. London, Frank Cass.
- SEAL, J. N., K. KELLNER, A. TRINDL, AND J. HEINZE. 2011. Phylogeography of the parthenogenetic ant *Platythyrea punctata*: highly successful colonization of the West Indies by a poor disperser. *Journal of Biogeography* **38**: 868–882.

- SEIFERT, B. 2003. The ant genus *Cardiocondyla* (Insecta: Hymenoptera: Formicidae). A taxonomic revision of the *C. elegans*, *C. bulgarica*, *C. batesii*, *C. unda*, *C. slmckardi*, *C. stambuloffii*, *C. wroughtonii*, *C. emeryi*, and *C. minutior* species groups. *Annalen des Naturhistorischen Museums in Wien Serie B Botanik und Zoologie* **104B**: 203–338.
- SIRJUSINGH, C., A. KERMARREC, H. MAULEON, C. LAVIS, AND J. ETIENNE. 1992. Biological control of weevils and whitegrubs on bananas and sugarcane in the Caribbean. *Florida Entomologist* **75**: 548–562.
- SMITH, F. 1855. Descriptions of some species of Brazilian ants belonging to the genera *Pseudomyrma*, *Eciton* and *Myrmica* (with observations on their economy by Mr. H. W. Bates). *Transactions of the Royal Entomological Society of London* (2) **3**: 156–169.
- SMITH, F. 1877. Descriptions of new species of the genera *Pseudomyrma* and *Tetraponera*, belonging to the family Myrmicidae. *Transactions of the Entomological Society of London* **10**: 57–72.
- SMITH, M. R. 1954. Ants of the Bimini Island Group, Bahamas, British West Indies (Hymenoptera, Formicidae). *American Museum Novitates* **1671**.
- SNELLING, R. R., AND J. T. LONGINO. 1992. Revisionary notes on the fungus-growing ants of the genus *Cyphomyrmex*, *rimosus* group (Hymenoptera: Formicidae: Attini), pp. 479–494. In D. Quintero and A. Aiello eds. *Insects of Panama and Mesoamerica: Selected Studies*. Oxford, Oxford University Press.
- SOLÓRZANO, L. A., S. MCKENNA, AND K. WALKER. 2005. The Caribbean Biodiversity Initiative at Conservation International, pp 299–302. In P. Miloslavich and E. Klein eds. *Caribbean Marine Biodiversity: The Known and the Unknown*. Lancaster, Pennsylvania, Destech Publications, Inc.
- TRAGER, J. C. 1984. A revision of the genus *Paratrechina* (Hymenoptera: Formicidae) of the continental United States. *Sociobiology* **9**: 49–162.
- TUCKER, R. W. E. 1953. Insects of Barbados. *Journal of the Barbados Museum and Historical Society* **20**: 155–181.
- WARD, P. S. 1989. Systematic studies on pseudomyrmecine ants: revision of the *Pseudomyrmex oculatus* and *P. subtilissimus* species groups, with taxonomic comments on other species. *Quaestiones Entomologicae* **25**: 393–468.
- WARD, P. S. 1992. Ants of the genus *Pseudomyrmex* (Hymenoptera: Formicidae) from Dominican amber, with a synopsis of the extant Antillean species. *Psyche* **99**: 55–85.
- WARD, P. S. 1993. Systematic studies on *Pseudomyrmex* acacia-ants (Hymenoptera: Formicidae: Pseudomyrmecinae). *Journal of Hymenoptera Research* **2**: 117–168.
- WEBER, N. A. 1958. Nomenclatural notes on *Proatta* and *Atta* (Hym.: Formicidae). *Entomological News* **69**: 7–13.
- WEBER, N. A. 1972. *Gardening Ants: The Attines*. Philadelphia, American Philosophical Society.
- WETTERER, J. K. 2008. Worldwide spread of the longhorn crazy ant, *Paratrechina longicornis* (Hymenoptera: Formicidae). *Myrmecological News* **11**: 137–149.
- WETTERER, J. K. 2009a. Worldwide spread of the ghost ant, *Tapinoma melanocephalum* (Hymenoptera: Formicidae). *Myrmecological News* **12**: 23–33.
- WETTERER, J. K. 2009b. Worldwide spread of the destroyer ant, *Monomorium destructor* (Hymenoptera: Formicidae). *Myrmecological News* **12**: 97–108.
- WETTERER, J. K. 2009c. Worldwide spread of the penny ant, *Tetramorium bicarinatum* (Hymenoptera: Formicidae). *Sociobiology* **54**: 811–830.
- WETTERER, J. K. 2010a. Worldwide spread of the flower ant, *Monomorium floricola* (Hymenoptera: Formicidae). *Myrmecological News* **13**: 19–27.
- WETTERER, J. K. 2010b. Worldwide spread of the wooly ant, *Tetramorium lanuginosum* (Hymenoptera: Formicidae). *Myrmecological News* **13**: 81–88.
- WETTERER, J. K. 2010c. Worldwide spread of the graceful twig ant, *Pseudomyrmex gracilis* (Hymenoptera: Formicidae). *Florida Entomologist* **93**: 535–540.
- WETTERER, J. K. 2011a. Worldwide spread of the tropical fire ant, *Solenopsis geminata* (Hymenoptera: Formicidae). *Myrmecological News* **14**: 21–35.
- WETTERER, J. K. 2011b. Worldwide spread of the membraniferous dacetine ant, *Strumigenys membranifera* (Hymenoptera: Formicidae). *Myrmecological News* **14**: 129–135.
- WETTERER, J. K. 2011c. Worldwide spread of *Pheidole teneriffana* (Hymenoptera: Formicidae). *Florida Entomologist* **94**: 843–847.
- WETTERER, J. K. 2012a. Worldwide spread of Roger's dacetine ant, *Strumigenys rogeri* (Hymenoptera: Formicidae). *Myrmecological News* **16**: 1–6.
- WETTERER, J. K. 2012b. Worldwide spread of the stigma ant, *Pachycondyla stigma* (Hymenoptera: Formicidae). *Myrmecological News* **16**: 39–44.
- WETTERER, J. K. 2012c. Worldwide spread of Emma's dacetine ant, *Strumigenys emmae* (Hymenoptera: Formicidae). *Myrmecological News* **16**: 69–74.
- WETTERER, J. K. 2012d. Worldwide spread of Emery's sneaking ant, *Cardiocondyla emeryi* (Hymenoptera: Formicidae). *Myrmecological News* **17**: 13–20.
- WETTERER, J. K. 2012e. Worldwide spread of the African big-headed ant, *Pheidole megacephala* (Hymenoptera: Formicidae). *Myrmecological News* **17**: 51–62.

- WETTERER, J. K. 2012f. Worldwide spread of the Moorish sneaking ant, *Cardiocondyla mauritanica* (Hymenoptera: Formicidae). *Sociobiology* **59**: 985–997.
- WETTERER, J. K. 2013a. Worldwide spread of the little fire ant, *Wasmannia auropunctata* (Hymenoptera: Formicidae). *Terrestrial Arthropod Reviews* **6**: 173–184.
- WETTERER, J. K. 2013b. Exotic spread of *Solenopsis invicta* (Hymenoptera: Formicidae) beyond North America. *Sociobiology* **60**: 53–63.
- WETTERER, J. K. 2014a. Worldwide spread of Alluaud's little yellow ant, *Plagiolepis alluaudi* (Hymenoptera: Formicidae). *Myrmecological News* **19**: 53–59.
- WETTERER, J. K. 2014b. Worldwide spread of the lesser sneaking ant, *Cardiocondyla minutior* (Hymenoptera: Formicidae). *Florida Entomologist* **97**: 567–574.
- WETTERER, J. K. 2014c. Geographic distribution of *Strumigenys louisianae* (Hymenoptera, Formicidae). *Terrestrial Arthropod Reviews* **7**: 159–170.
- WETTERER, J. K., O. DAVIS, AND J. R. WILLIAMSON. 2014. Boom and bust of the tawny crazy ant, *Nylanderia fulva*, on St. Croix, US Virgin Islands. *Florida Entomologist* **97**: 1099–1103.
- WETTERER, J. K., X. ESPADALER, A. L. WETTERER, D. AGUIN-POMBO, AND A. M. FRANQUINHO-AGUIAR. 2007. Ants (Hymenoptera: Formicidae) of the Madeiran Archipelago. *Sociobiology* **49**: 265–297.
- WETTERER, J. K., AND J. L. W. KEULARTS. 2008. Population explosion of the hairy crazy ant, *Paratrechina pubens* (Hymenoptera: Formicidae), on St. Croix, US Virgin Islands. *Florida Entomologist* **91**: 423–427.
- WETTERER, J. K., AND C. D. LOMBARD. 2010. Fire ants on an important sea turtle nesting beach in St. Croix, US Virgin Islands. *Florida Entomologist* **93**: 449–450.
- WETTERER, J. K., AND B. C. O'HARA. 2002. Ants of the Dry Tortugas, the outermost Florida Keys. *Florida Entomologist* **85**: 303–307.
- WETTERER, J. K., AND D. L. VARGO. 2003. Ants (Hymenoptera: Formicidae) of Samoa. *Pacific Science* **57**: 409–419.
- WETTERER, J. K., AND A. L. WETTERER. 2004. Ants (Hymenoptera: Formicidae) of Bermuda. *Florida Entomologist* **87**: 212–221.
- WETTERER, J. K., A. L. WETTERER, AND E. HEBARD. 2001. Impact of the Argentine ant, *Linepithema humile*, on the native ants of Santa Cruz Island, California. *Sociobiology* **38**: 709–721.
- WHEELER, W. M. 1905. The ants of the Bahamas, with a list of the known West Indian species. *Bulletin of the American Museum of Natural History* **21**: 79–135.
- WHEELER, W. M. 1923. Report on the ants collected by the Barbados-Antigua expedition from the Univ. of Iowa in 1918. *Studies in Natural History, Iowa University* **10**: 3–9.
- WHEELER, W. M. 1926. The Natural History of Ants. From an Unpublished Manuscript in the Archives of the Academy of Sciences of Paris by René Antoine Ferchault de Réaumur. New York, Alfred A. Knopf.
- WHEELER, W. M. 1934. Revised list of Hawaiian ants. *Occasional Papers Bernice P. Bishop Museum* **10**.
- WILSON, E. O. 1988. The biogeography of the West Indian ants (Hymenoptera: Formicidae), pp. 214–230. In J. K. Liebherr ed. *Zoogeography of Caribbean Insects*, Ithaca, New York, Cornell University Press.
- WILSON, E. O. 2003. *Pheidole in the New World: A Dominant, Hyperdiverse Ant Genus*. Cambridge, Massachusetts, Harvard University Press.
- WILSON, E. O. 2005. Early ant plagues in the New World. *Nature* **433**: 32.
- WILSON, E. O., AND R. W. TAYLOR. 1967. Ants of Polynesia. *Pacific Insects Monograph* **14**.

