

2015

The Dynastinae of the island of Saba, Dutch Caribbean (Coleoptera: Scarabaeidae)

Conrad P. D. T. Gillett

University of East Anglia, c.gillett@uea.ac.uk

Michael P. T. Gillett

Saba University School of Medicine, m.gillett@saba.edu

Follow this and additional works at: <http://digitalcommons.unl.edu/insectamundi>

Gillett, Conrad P. D. T. and Gillett, Michael P. T., "The Dynastinae of the island of Saba, Dutch Caribbean (Coleoptera: Scarabaeidae)" (2015). *Insecta Mundi*. 938.

<http://digitalcommons.unl.edu/insectamundi/938>

This Article is brought to you for free and open access by the Center for Systematic Entomology, Gainesville, Florida at DigitalCommons@University of Nebraska - Lincoln. It has been accepted for inclusion in Insecta Mundi by an authorized administrator of DigitalCommons@University of Nebraska - Lincoln.

INSECTA MUNDI

A Journal of World Insect Systematics

0433

The Dynastinae of the island of Saba, Dutch Caribbean
(Coleoptera: Scarabaeidae)

Conrad P. D. T. Gillett
School of Biological Sciences
University of East Anglia
Norwich NR4 7TJ, United Kingdom

Michael P. T. Gillett
Department of Biochemistry
Saba University School of Medicine
The Bottom, Saba, Dutch Caribbean

Date of Issue: July 24, 2015

Conrad P. D. T. Gillett and Michael P. T. Gillett
The Dynastinae of the island of Saba, Dutch Caribbean (Coleoptera: Scarabaeidae)
Insecta Mundi 0433: 1–9

ZooBank Registered: urn:lsid:zoobank.org:pub:B5F53E47-00E9-461C-9E14-C8206B9F335A

Published in 2015 by

Center for Systematic Entomology, Inc.
P. O. Box 141874
Gainesville, FL 32614-1874 USA
<http://centerforsystematicentomology.org/>

Insecta Mundi is a journal primarily devoted to insect systematics, but articles can be published on any non-marine arthropod. Topics considered for publication include systematics, taxonomy, nomenclature, checklists, faunal works, and natural history. **Insecta Mundi** will not consider works in the applied sciences (i.e. medical entomology, pest control research, etc.), and no longer publishes book reviews or editorials. *Insecta Mundi* publishes original research or discoveries in an inexpensive and timely manner, distributing them free via open access on the internet on the date of publication.

Insecta Mundi is referenced or abstracted by several sources including the Zoological Record, CAB Abstracts, etc. **Insecta Mundi** is published irregularly throughout the year, with completed manuscripts assigned an individual number. Manuscripts must be peer reviewed prior to submission, after which they are reviewed by the editorial board to ensure quality. One author of each submitted manuscript must be a current member of the Center for Systematic Entomology.

Chief Editor: Paul E. Skelley, e-mail: insectamundi@gmail.com
Assistant Editor: David Plotkin, e-mail: insectamundi@gmail.com
Head Layout Editor: Eugenio H. Nearn
Editorial Board: J. H. Frank, M. J. Paulsen, Michael C. Thomas
Review Editors: Listed on the *Insecta Mundi* webpage

Manuscript Preparation Guidelines and Submission Requirements available on the *Insecta Mundi* webpage at: <http://centerforsystematicentomology.org/insectamundi/>

Printed copies (ISSN 0749-6737) annually deposited in libraries:

CSIRO, Canberra, ACT, Australia
Museu de Zoologia, São Paulo, Brazil
Agriculture and Agrifood Canada, Ottawa, ON, Canada
The Natural History Museum, London, UK
Muzeum i Instytut Zoologii PAN, Warsaw, Poland
National Taiwan University, Taipei, Taiwan
California Academy of Sciences, San Francisco, CA, USA
Florida Department of Agriculture and Consumer Services, Gainesville, FL, USA
Field Museum of Natural History, Chicago, IL, USA
National Museum of Natural History, Smithsonian Institution, Washington, DC, USA
Zoological Institute of Russian Academy of Sciences, Saint-Petersburg, Russia

Electronic copies (Online ISSN 1942-1354, CDROM ISSN 1942-1362) in PDF format:

Printed CD or DVD mailed to all members at end of year. Archived digitally by Portico.
Florida Virtual Campus: <http://purl.fcla.edu/fcla/insectamundi>
University of Nebraska-Lincoln, Digital Commons: <http://digitalcommons.unl.edu/insectamundi/>
Goethe-Universität, Frankfurt am Main: <http://nbn-resolving.de/urn/resolver.pl?urn:nbn:de:hebis:30:3-135240>

Copyright held by the author(s). This is an open access article distributed under the terms of the Creative Commons, Attribution Non-Commercial License, which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original author(s) and source are credited. <http://creativecommons.org/licenses/by-nc/3.0/>

Layout Editor for this article: Eugenio H. Nearn

The Dynastinae of the island of Saba, Dutch Caribbean (Coleoptera: Scarabaeidae)

Conrad P. D. T. Gillett
School of Biological Sciences
University of East Anglia
Norwich NR4 7TJ, United Kingdom
c.gillett@uea.ac.uk

Michael P. T. Gillett
Department of Biochemistry
Saba University School of Medicine
The Bottom, Saba, Dutch Caribbean
m.gillett@saba.edu

Abstract. The fauna of Dynastinae (Scarabaeidae) on the island of Saba, Dutch Caribbean, was investigated through fieldwork during 2006 to 2015. Three species, belonging to the three tribes Cyclocephalini, Pentodontini and Phileurini, are newly recorded from Saba and are discussed, with summaries of all relevant information from the West Indies. Detailed locality data, temporal distributions, and habitus photographs are presented for each species.

Key Words. Rhinoceros beetle, dynastine, scarab beetle, West Indies, Lesser Antilles, new records.

Introduction

The West Indies are currently thought to constitute one of the planet's "hotspots" for species biodiversity (Myers et al. 2000; Myers 2003; Mittermeier et al. 2004). Indeed, based upon endemism and habitat loss metrics, the Caribbean region has been ranked in the top eight 'hottest hotspots' globally (Myers et al. 2000). However, this view is based upon knowledge of just a few well-known taxonomic groups such as the vascular plants and terrestrial vertebrates. Much less attention has been given to the more numerous invertebrate species, especially the insects, including the Coleoptera, although Peck and Perez-Gelabert (2012) highlighted the apparently high endemic generic richness in beetles of the region. Therefore, studies of insect biodiversity on any of the smaller Caribbean islands can be expected to be useful adjuncts to our knowledge and to further our understanding of the bio-differentiation events that have taken place in the region.

The present study focuses on the island of Saba, one of five Dutch islands in the Caribbean that made up the former Netherlands Antilles but which reverted to being overseas territories of the Netherlands and, together with a sixth island, are unofficially known as the Dutch Caribbean. Unlike Aruba, Bonaire, and Curaçao, which lie off the coast of Venezuela, Saba and its two Dutch neighbours, St. Eustatius and Sint Maarten, are true oceanic islands, in that they are not attached to a continent and were not joined to one during any Pleistocene eustatic event. Saba itself is a tiny volcanic island with an area of only 13 km², much of which is inaccessible and uninhabited, and it is one of the smallest inhabited islands in the West Indies, being home to approximately 1500 inhabitants. It is the most northerly island of the inner (volcanic) arc of the Leeward Islands group of the Lesser Antilles (Fig. 1; approximate co-ordinates: 17°38'N 63°15'W). Saba is well-known by tourists for its rugged and unspoilt terrain and has been nicknamed the "Unspoiled Queen" of the Caribbean, giving the impression of being a pristine island. Lacking beaches and with little flat terrain, Saba has not been subjected to the modern, excessive, and often poorly planned tourist developments or, in colonial times, to large-scale plantation agriculture. In different ways, both of these have devastated the ecosystems of many other Caribbean islands.

Despite its small size, Saba has three distinct biotopes (Fig. 2–4). However, very little of this is primary rainforest, corresponding to the Leeward Islands moist forests ecoregion (NT0134) of the World

Wildlife Foundation (WWF 2014a). At lower elevations on the mountain, much of the land is made up of abandoned plantations, now covered by secondary growth of native tree species interspersed with exotic fruit trees not natural to the island. The base of Mt. Scenery and a number of surrounding lower hills make up the mesophilic zone of the island and consist of dry tropical woodlands (Fig. 3). This vegetation equates to the Leeward Islands dry forests ecoregion (NT0220) (WWF 2014b). The remainder of the island, stretching down to the seashore, is the xerophilic zone; it falls steeply, sometimes precipitously, to the sea and consists of grassland and croton thickets (Fig. 4) corresponding to Leeward Islands xeric scrub (NT1310) (WWF 2014c). This dry habitat is most extensive on the south and east sides of Saba.

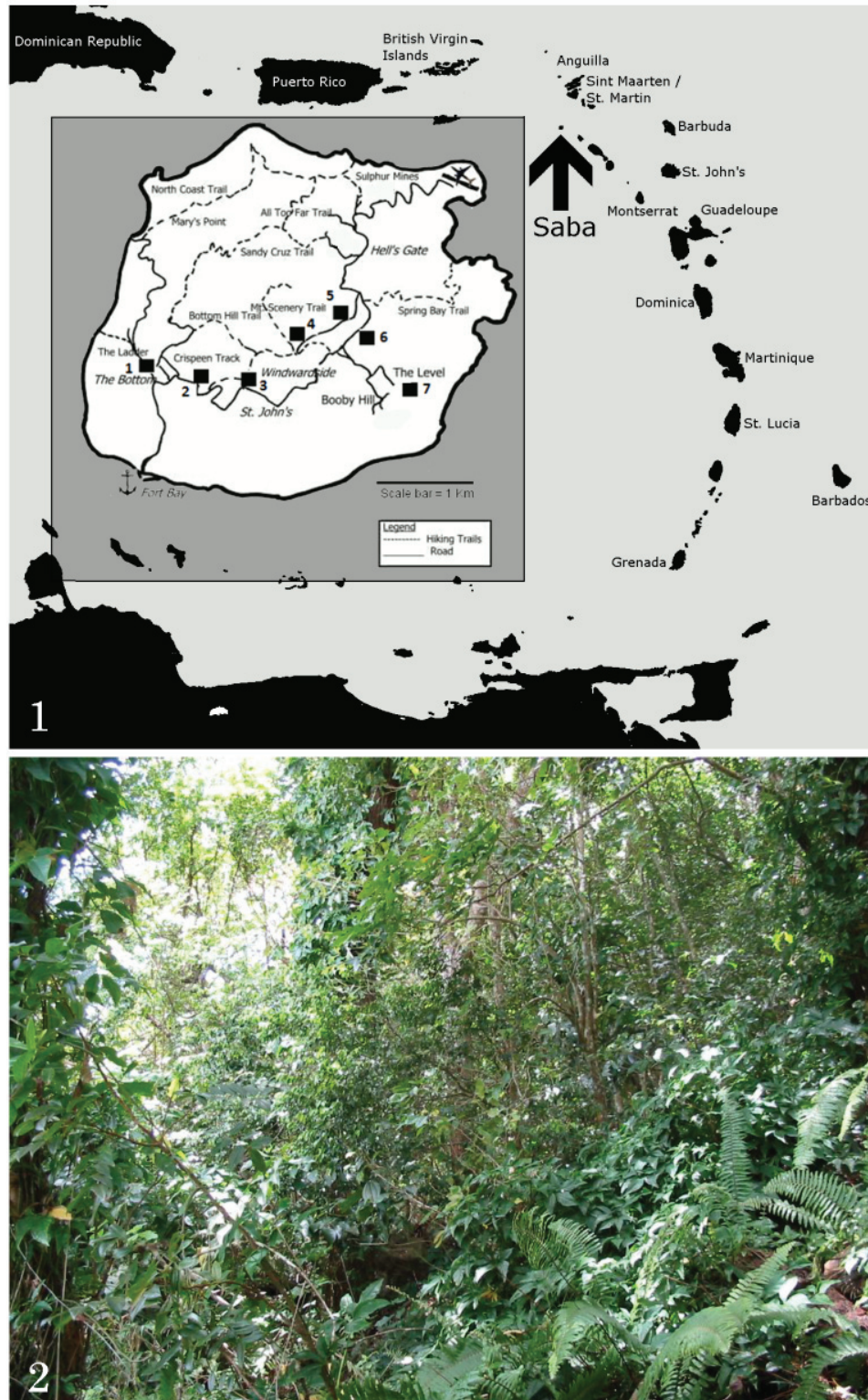
The compact juxtaposition of three distinct ecoregions makes for a relatively rich flora on such a small island. According to Rojer (1997), there are 61 species of pteridophytes, including four tree ferns, 45 monocotyledons, including nine orchids, and over 350 dicotyledons. There are also many species of grasses and sedges that are not listed (MPT Gillett, pers. obs.). Such a variety of plants would be expected to be associated with a rich insect fauna. However, little work seems to have been done on recording the insects and other invertebrates of the island. There is a list of 27 butterfly species given by Rojer (1997), which is incomplete (MPT Gillett, pers. obs.), and elsewhere, the same report lists a total of only 70 species of Saba insects, including butterflies, recorded in the literature. These include a number of true bugs (Heteroptera), ants, bees and wasps (Hymenoptera), longhorn and darkling beetles (Coleoptera), and hoverflies and mosquitos (Diptera). The only other information comes in the form of scattered records, such as the five species of longhorn beetles (Cerambycidae) mentioned for Saba by Chalumeau and Touroult (2005) in a recent book on the fauna of the Lesser Antilles, but the information seems to have come from the same source as above, since many more cerambycid species are currently to be found on Saba (MPT Gillett pers. obs.). Few other records are available for beetles, although Peck (2009) estimated the number of species of Coleoptera on Saba at around 440. Recently, a series of articles by Stewart Peck (e.g. Peck 2006, 2009, 2010, 2011) has contributed enormously to the faunistics of Coleoptera in the West Indies. In an inventory of the known fauna of the northern Leeward Islands, Peck (2011) recorded from Saba a total of 13 species of Coleoptera in three families (Coccinellidae, Tenebrionidae, and Cerambycidae). Since then a further two recently described species, in an additional two families (Buprestidae and Leiodidae), have been recorded from Saba (Maier and Ivie 2013; Peck and Cook 2014), resulting in a grand total of only 15 species recorded in the literature from that island.

The subfamily Dynastinae, commonly named rhinoceros beetles on account of the secondary sexual characters that are often expressed as horns and protuberances adorning males (rarely females), contains some 800 species and six tribes in the New World (Ratcliffe and Cave 2006). These beetles vary greatly in size but are generally moderate to very large sized insects, often reaching lengths in excess of 10 cm in tropical species of the tribe Dynastini. Most species that have been studied pass the larval stage feeding either in decomposing plant matter or on plant roots, but there remains much to be discovered in this field. The adults are usually nocturnal and are attracted to artificial lights, where they are most often collected. Apart from this, little remains known about adult behaviour.

In the West Indies or Caribbean region there are approximately 60 species and 17 genera of Dynastinae known to date (Ratcliffe and Cave 2008). Chalumeau (1983) recorded 13 species (and an additional two subspecies) in eight genera from the Lesser Antilles, although this work focused on only some of the islands (Guadeloupe to Martinique). A recent study of the Coleoptera of Dominica recorded 10 species (and two subspecies) and seven genera from that island (Peck 2006). No Dynastinae, or indeed other Scarabaeoidea, have hitherto been specifically cited from Saba, although a comprehensive inventory of the Dynastinae fauna of the West Indies is currently being completed by Ratcliffe and Cave (2014). The present article serves to provide new records of three species of dynastines from Saba.

Methods

One of us (MPTG) was resident on Saba during 2006–2007 and 2010–to present and regularly collected insects during that time. Specimens of Dynastinae were collected throughout this period. Most specimens were attracted to and collected from lights in the two localities of The Level and The Bottom (Fig. 1).



Figures 1–2. Collecting localities of Dynastinae on Saba 1) Map showing location of Saba (indicated by arrow) in the Lesser Antilles, and inset, larger-scale map of Saba, with the dynastine collecting localities numbered as follows: 1: The Bottom; 2: Crispeen track; 3: Windwardside; 4: Upper Mountain Road; 5: Lower Mountain Road; 6: English Quarter; 7: The Level. 2) Secondary hygrophilic rainforest on Maskerhorn Hill above Windwardside, Saba. Dynastines found here include *Cyclocephala mafaffa* and *Phileurus valgus antillarum*. Photograph by M. P. T. Gillett.

Specimens were identified using the standard reference works (Endrödi 1985; Chalumeau 1983; Lachaux 1992). Locality and temporal distributional data for each species was collated and is listed for each species.

Material examined. The specimens listed below are housed in the Michael P. T. Gillett Collection, Birmingham (MGCB) and the Natural History Museum, London (BMNH), United Kingdom.

Systematic section

Tribe CYCLOCEPHALINI

Genus *CYCLOCEPHALA* Dejean

Cyclocephala mafaffa Burmeister, 1847

Figure 5

Specimens examined: 31

Saba locality data. The Level; English Quarter (Windwardside); Upper Mountain Road; Crispeen. These records constitute **NEW COUNTRY/ISLAND RECORDS**.

Temporal data. February (1), April (7), May (19), June (3), and October (1).

Distribution. *Cyclocephala mafaffa* is a widespread species occurring from Mexico to Ecuador and the Brazilian Amazon (Ratcliffe and Cave 2006). In the West Indies the species has only been recorded from Guadeloupe, Montserrat, St. Christopher (Chalumeau 1983; Peck 2011), and now Saba. It is curious that such a distinctive and fairly large species has not been collected on other islands, although it is also difficult to believe that its distribution could be so restricted in the region.

Remarks. Chalumeau (1983) and Ratcliffe and Cave (2006) summarised what little biological information is available for this species. Like elsewhere in its range, when encountered, the beetles are often covered in sticky pollen and nectar, and are therefore presumably pollinators of various plants, possibly including *Philodendron lingulatum* (L.) K. Koch and *P. giganteum* Schott (Aroidea) occurring on Saba.

Tribe PENTODONTINI

Genus *TOMARUS* Erichson

Tomarus cuniculus (Fabricius, 1801)

Figure 6

Specimens examined: 128

Saba locality data. The Level; English Quarter (Windwardside); Windwardside; The Bottom; Upper Mountain Road (Maskerhorne Hill); Lower Mountain Road (Windwardside); Crispeen. These records constitute **NEW COUNTRY/ISLAND RECORDS**.

Temporal data. January (1), February (2), March (5), April (9), May (49), June (19), July (18), August (5), September (1), October (11), and November (7).

Distribution. Widely distributed from the southern United States (Florida) to northeastern South America (Endrödi 1985; Peck and Thomas 1998). The species is widespread across much of the West



Figures 3–4. Dynastinae habitats on Saba. **3)** The middle slopes of Great Hill near The Bottom, Saba, with typical vegetation of the island's mesophilic zone. The dynastine *Phileurus valgus antillarum* was bred from larvae collected at this locality. **4)** Spring Bay, Saba, showing the dry grassland and steep slopes that are typical of the xerophilic zone of the island at its southern and western edges. No dynastines were collected in this zone. Photographs by M. P. T. Gillett.

Indies, with records from Anguilla, Antigua, Bahamas, Barbados, Bermuda, the Cayman Islands, Cuba, La Désirade, Dominica, Guadeloupe, Guana, Hispaniola, Les Saintes, Jamaica, Marie-Galante, Martinique, Mona, Montserrat, Nevis, Puerto Rico, St. Barthélémy, St. Croix, St. John, St. Martin, St. Thomas, St. Vincent, and Trinidad (Peck et al. 2014; Ratcliffe and Cave 2008).

Remarks. Peck (2014) noted that the larvae of *T. cuniculus* are a pest of sugar cane but can also be saprophagous or coprophagous. The adults are attracted to lights.

Tribe PHILEURINI

Genus *PHILEURUS* Latreille

Phileurus valgus antillarum Prell, 1912

Figure 7

Specimens examined: 17

Saba locality data. The Level; Maskerhorne Hill; Mount Scenery; Great Hill. These records constitute **NEW COUNTRY/ISLAND RECORDS**.

Temporal data. January (1), February (1), March (3), April (3), May (1), June (7) and October (1).

Distribution. *Phileurus valgus antillarum* is restricted to the islands of the West Indies. It has been previously recorded from the Bahamas, Barbados, the Cayman Islands, Cuba, La Désirade, Dominica, Grenada, Guadeloupe, Jamaica, Marie-Galante, Martinique, Montserrat, Puerto Rico, St. Barthélemy, St. Croix, St. Martin, and St. Vincent (Peck et al. 2014; Ratcliffe and Cave 2010). The nominate subspecies is widely distributed from the southern United States to Argentina (Ratcliffe and Cave 2006).

Remarks. Two larvae found in Great Hill in a dead branch were reared and hatched in May and June. Chalumeau (1983) recorded the species as not very common, although he mentions it being more abundant between March and June in Guadeloupe, where it occurs throughout the island at elevations up to about 500 m. The adults are attracted to lights, and the larvae have been recorded feeding on decomposing logs or trunks of *Inga ingoides* (Richard) and *Mangifera indica* Linnaeus (Peck et al. 2014).

Some nomenclatorial confusion has affected the status of the West Indian population of this species. It has previously been cited as *P. valgus capra* Bates 1888 (e.g. Ratcliffe and Cave 2006). However, as Ratcliffe et al. (2013) pointed out later, the type of *Phileurus capra* Bates is not from the West Indies. Therefore, the correct name for the Caribbean subspecies is *Phileurus valgus antillarum* Prell, described from Guadeloupe (Prell 1912).

Discussion

Despite the fact that fieldwork for this study only recorded three species (a small but important contribution to the fauna of this tiny, though diverse island), because collecting took place over several years and across all months, it is likely that any additional species on Saba, if present, will probably be either very rare, restricted to higher elevations or not readily attracted to lights.

Despite the proximity of other islands, Saba is a distinct bio-geographical entity. It lies on its own bank that is separated by deep water from the neighbouring St. Kitts bank with its islands of St. Eustatius, St. Christopher (St. Kitts), and Nevis, as well as from the geologically older islands of the outer group, including St. Maarten/St. Martin and St. Bartholémy (St. Barts). All of these neighbouring islands are clearly visible from Saba, suggesting that biological exchange by flying, wind-borne, and water-borne terrestrial organisms is not only possible between islands, but likely. Therefore, additional



5



6



7



Figures 5–7. Dynastinae of Saba. 5) *Cyclocephala mafaffa* Burmeister. 6) *Tomarus cuniculus* (Fabricius). 7) *Phileurus valgus antillarum* Prell. Scales in millimetres. Photographs by Harry Taylor.

species of Dynastinae may eventually be recorded from Saba, having reached there via these means, although whether they are able to effectively colonise the island will remain to be seen.

Acknowledgments

We are grateful to Paul Schoolmeesters (Belgium) for his generous help in finding literature, and to Harry Taylor of the Natural History Museum photographic unit for the specimen photographs. Brett Ratcliffe (University of Nebraska, Lincoln) and William Warner (Chandler, Arizona) are gratefully acknowledged for their critical reviews of the original manuscript.

Literature Cited

- Chalumeau, F. 1983.** Les Coléoptères scarabaeides des petites Antilles (Guadeloupe à Martinique). Encyclopédie Entomologique (series A) 44. Editions Lechevalier; Paris, France. 295 p.
- Chalumeau, F., and J. Touroult. 2005.** Les longicornes des petites Antilles (Coleoptera, Cerambycidae): taxonomie, éthologie, biogéographie. Series Faunistica 51, Pensoft Publishers; Sofia, Bulgaria. 241 p.
- Endrödi, S. 1985.** The Dynastinae of the World. Dr W. Junk; Dordrecht, Netherlands. 800 p., 46 pl.
- Lachaume, G. 1992.** Dynastinae américains. Cyclocephalini - Agaocephalini - Pentodontini - Oryctini - Phileurini. Les Coléoptères du Monde 14. Sciences Nat; Venette, France. 89 p.
- Maier, C. A., and M. A. Ivie. 2013.** New species and records of *Chrysobothris* Eschscholtz (Coleoptera: Buprestidae) from Montserrat, Saba, and Anguilla, with a key to the *Chrysobothris thoracica* species-group in the West Indies. The Coleopterists Bulletin 67(2): 81–88.
- Mittermier, R. A., P. Robles Gil, M. Hoffmann, J. Pilgrim, T. Brooks, C. G. Mittermeier, J. L. Lamoreaux, and G. A. B. Fonseca. 2004.** Hotspots Revisited: Earth's Biologically Richest and Most Endangered Ecoregions. CEMEX, S. A. de C. V.; Mexico City, Mexico. 390 p.
- Myers, N. 2003.** Biodiversity hotspots revisited. BioScience 53: 916–917.
- Myers, N., R. A. Mittermeier, C. G. Mittermeier, G. A. B. da Fonseca, and J. Kent. 2000.** Biodiversity hotspots for conservation priorities. Nature 403: 853–858.
- Peck, S. B. 2006.** The beetle fauna of Dominica, Lesser Antilles (Insecta: Coleoptera): diversity and distribution. Insecta Mundi 20: 165–209.
- Peck, S. B. 2009.** Beetle species diversity in the Lesser Antilles islands: how many species are really there? Insecta Mundi 0078: 1–5.
- Peck, S. B. 2010.** The beetles of the island of St. Vincent, Lesser Antilles (Insecta: Coleoptera): diversity and distribution. Insecta Mundi 0144: 1–78.
- Peck, S. B. 2011.** The diversity and distributions of the beetles (Insecta: Coleoptera) of the northern Leeward Islands, Lesser Antilles (Anguilla, Antigua, Barbuda, Nevis, Saba, St. Barthélemy, St. Eustatius, St. Kitts, and St. Martin-St. Maarten. Insecta Mundi 0159: 1–54.
- Peck, S. B., and J. Cook. 2011.** Systematics, distributions and bionomics of the Catopocerini (eyeless soil fungivore beetles) of North America (Coleoptera: Leiodidae: Catopocerinae). Zootaxa 3077: 1–118.
- Peck, S. B., and D. E. Perez-Gelabert. 2012.** A summary of the endemic beetle genera of the West Indies (Insecta: Coleoptera); bioindicators of the evolutionary richness of this Neotropical archipelago. Insecta Mundi 0212: 1–29.
- Peck, S. B., and M. C. Thomas. 1998.** A distributional checklist of the beetles (Coleoptera) of Florida. Arthropods of Florida and Neighboring Land Areas 16: 1–180.
- Peck, S. B., M. C. Thomas, and R. H. Turnbow, Jr. 2014.** The diversity and distributions of the beetles (Insecta: Coleoptera) of the Guadeloupe Archipelago (Grande-Terre, Basse-Terre, La Désirade, Marie-Galante, Les Saintes, and Petite-Terre), Lesser Antilles. Insect Mundi 0352: 1–156.
- Prell, H. 1912.** Beiträge zur Kenntnis der Dynastinen V. Entomologische Blätter 8: 179–187.
- Ratcliffe, B. C., and R. D. Cave. 2006.** The dynastine scarab beetles of Honduras, Nicaragua and El Salvador. Bulletin of the University of Nebraska State Museum 21: 1–424.

- Ratcliffe, B. C., and R. D. Cave. 2008.** A biotic survey and inventory of the dynastine scarab beetles of Mesoamerica, North America, and the West Indies: review of a long-term, multicountry project. *Zoosystema* 30(3): 651–663.
- Ratcliffe, B. C., and R. D. Cave. 2010.** The Dynastinae (Coleoptera: Scarabaeidae) of the Cayman Islands (West Indies), with descriptions of *Tomarus adoceteus*, new species (Pentodontini) and *Caymania nitidissima*, new genus and species (Phileurini). *Insecta Mundi* 0139: 1–15.
- Ratcliffe, B. C., R. D. Cave, and E. B. Cano. 2013.** The dynastine scarab beetles of Mexico, Guatemala, and Belize (Coleoptera: Scarabaeidae: Dynastinae). *Bulletin of the University of Nebraska State Museum* 27: 1–666.
- Ratcliffe, B. C., and R. D. Cave. 2014.** Un inventaire de la biodiversité des Dynastinae (Coleoptera, Scarabaeidae) des Antilles : présentation du projet. *ACOREP-France, Coléoptères de Petites Antilles* 2: 3–9.
- Rojer, A. 1997.** Biological inventory of Saba. K NAP project 96-10; available at: <http://www.dcbd.nl/document/biological-inventory-saba>. Last accessed: 3 February, 2014.
- WWF. 2014a.** Islands of the Lesser Antilles in the Caribbean, tropical and subtropical moist broadleaf forests; available at: <http://www.worldwildlife.org/ecoregions/nt0134>. Last accessed: 3 February, 2014.
- WWF. 2014b.** Islands of the Lesser Antilles in the Caribbean, tropical and subtropical dry broadleaf forests; available at: <http://www.worldwildlife.org/ecoregions/nt0220>. Last accessed: 3 February, 2014.
- WWF. 2014c.** Islands of the Lesser Antilles in the Caribbean, deserts and xeric shrublands; available at: <http://www.worldwildlife.org/ecoregions/nt1310>. Last accessed: 3 February, 2014.

Received April 28, 2015; Accepted June 26, 2015.
Review Editor Paul Skelley.

