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A preliminary checklist of ants from Rwanda (Hymenoptera, Formicidae)

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Front cover: Worker of *Odontomachus troglodytes* collected with pitfall trap on 26.vi.2017 by Venuste Nsengimana in Rubona (Rwanda) in a banana plantation. © Julien Lalanne.

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Abstract

The main purpose of this study was to develop a preliminary checklist of ants known from Rwanda. Notes about repositories are provided for each species record, and ants that are likely to be endemic to Rwanda were identified. Results showed that ants were collected in different areas of Rwanda. Known ant species from the country comprised 6 subfamilies, 26 genera and 71 species, dominated by the subfamily Myrmicinae, Ponerinae, and Formicinae. Among the 71 ant species, 10 are at present considered endemic to Rwanda. This checklist will serve as a baseline survey for future research. We recommend further studies including new field data collections to validate and update this preliminary checklist.

Keywords: distribution, endemism, Formicidae, Rwanda

Introduction

Ants are among the most dominant groups of the phylum Arthropoda (BERNADOU *et al*., 2013). Different ecological studies qualified ants as good biological indicators that can be used to assess effects of environmental changes on biodiversity and on environmental factors (NSENGIMANA *et al.*, 2018; SALAS-LOPEZ *et al.*, 2018). Some species of ants are used by humans as sources of food (AYIEKO *et al.*, 2012), whereas others are used in pharmaceutical and biomedical applications (RAMÓN & DONOSO, 2015). Other ant species play fundamental roles in agroecosystem functions, where they provide multiple services comprising biological pest control (BIZUMUNGU & MAJER, 2019), plant pollination (GÓMEZ & ZAMORA, 1992), soil bioturbation (DIAMÉ *et al.*, 2017), and seed dispersal (BENNETT & KREBS, 1987).

In Rwanda, different studies on ants have been conducted and these generated a large number of species records in literature and collections (http://antsofafrica.org). These data are spread among institutions outside of Rwanda. As a consequence, no specific checklist of the ants of Rwanda has been developed, and there is no clue which species might be endemic in the country. In order to generate a better understanding of ant biodiversity in Rwanda, this study emphasizes on the importance of compiling a species checklists as baseline study (FRANCO *et al.*, 2019). This checklist enhances the taxonomic knowledge of ants in Rwanda and is a first step towards a species distribution database, useful in the identification of gaps in sampling and range extensions of certain species. In addition, it can be used in ecological studies, species distributions modeling and conservation strategies (PFEIFFER *et al.*, 2011; BRUFORD *et al.*, 2013). Further, data summarized in a checklist can provide important information to understand ant population structure, and ant community composition in Rwanda.

Material & methods

Data were collected from published papers on ants of Rwanda (NSENGIMANA *et al.*, 2018; BIZIMUNGU & MAJER, 2019). Data were also collected from the following online repositories of specimen records and institutes:

Antmaps	A comprehensive global database of ant species distribution records including written records, museum databases, and online specimen databases. Available at https://antmaps.org/
Ants of Africa	Catalogue notes on all ant species described from sub-Saharan Africa. Available at http://antsofafrica.org/
AntWeb	Specimen-level data and the images linked to them. Available at https://www.antweb.org/
GBIF	Global Biodiversity Information Facility. An international network and research infrastructure providing access to species occurrences records. Available at https://www.gbif.org/
RBINS	Royal Belgian Institute of Natural Sciences

The species to be considered in the checklist should occurring in at least one published reference or data source and having minimum information such as the known locality, where the species was sampled in Rwanda. Further, specimens identified only to a level higher than species were not included (FRANCO *et al.*, 2019). The validity of the species' names presented are in accordance with the most recent classification following Ant Catalogue (2020). Genera and species names are arranged in alphabetical order for each subfamily. In addition, references of original descriptions and local distributions are listed for all species, as was done by RASHEED *et al.* (2019), and details of the voucher specimen number were provided when available.

Results

All data comprised 71 species of 26 genera and 6 subfamilies: Amblyioponinae with 1 genus and 1 species; Dorylinae with 1 genus and 7 species; Porceratinae with 1 genus and 5 species; Formicinae with 3 genera and 12 species; Myrmicinae with 11 genera and 33 species; and Ponerinae with 9 genera and 14 species. The genera *Strumigenys* and *Tetramorium* were represented by 9 species each, followed by *Camponotus* with 8 species, *Dorylus* with 7 species, *Hypoponera* and *Discothyrea* with 5 species each, *Pheidole* with 4 species, and *Polyrhachis* with 3 species. Genera *Monomorium*, *Myrmicaria*, *Bothroponera*, were represented by 2 species each. The remaining genera were represented by one species each.

A total of 10 ant species was found to be likely endemic to Rwanda. These species include *Discothyrea gryphon* Hita-Garcia & Lieberman, 2019, *Discothyrea schulzei* Hita-Garcia & Lieberman, 2019, *Dorylus bishyiganus* Van Boven, 1972, *Hypoponera dema* Bolton & Fisher, 2011, *Hypoponera hebes* Bolton and Fisher, 2011, *Hypoponera venusta* Bolton & Fisher, 2011, *Strumigenys dagon* Bolton, 1983, *Strumigenys datissa* Bolton, 1983, *Strumigenys gatuda* Bolton, 1983, and *Strumigenys murshila* Bolton, 1983. Eight out of 10 ant species were sampled at Rangiro (Western Rwanda). *Dorylus bishyiganus* was collected at Bishyiga (South Western Rwanda) while *D. gryphon* was sampled at Kayove (Northern Western Rwanda). A list of all ants of Rwanda, with the area of collection, specimen type and voucher specimen number are presented here. Species that are likely to be endemic to Rwanda are indicated by *.

Amblyoponinae

1. *Prionopelta humicola* Terron, 1974

Prionopelta humicola TERRON, 1974: 115. Data about the species were found at https://www.antweb.org.

DETAILS: Locality where the specimen was collected in Rwanda: Rangiro (Latitude: -2.4045, Longitude: 29.1606, elevation: 1800 m).

CURRENT LOCATION OF TYPE SPECIMEN: Museum of Natural History, Geneva. Specimen voucher number: https://www.antweb.org/specimen/CASENT0102504.

Dorylinae

2. *Dorylus bishyiganus* van Boven, 1972*

Dorylus bishyiganus VAN BOVEN, 1972: 140. Data about the species were found at https://www.antweb.org.

DETAILS: Locality where the specimen was collected in Rwanda: Bishyiga (Latitude: -2.534140, Longitude: 29.757220, Elevation: 2520 m).

CURRENT LOCATION OF TYPE SPECIMEN: No valid extant specimen.

3. *Dorylus moestus* Emery, 1895

Dorylus moestus EMERY, 1895: 720. Data about the species were found at http://antsofafrica.org/.

DETAILS: Locality where the specimen was collected in Rwanda: Rambura.

4. *Dorylus affinis* Shuckard, 1840

Dorylus affinis SHUCKARD, 1840: 316. Data about the species were found in STITZ (1911), WHEELER (1925) and at http://antsofafrica.org/.

DETAILS: Locality where the specimen was collected in Rwanda: Lac Karago.

5. *Dorylus brevipennis* Emery, 1895

Dorylus brevipennis EMERY, 1895: 721. Data about the species are available at http://antsofafrica.org/ and https://antmaps.org/.

DETAILS: Locality where the specimen was collected in Rwanda: Rubona (Latitude: -2.66267, Longitude: 29.79519, elevation: 1750 m).

6. *Dorylus stadelmanni* Emery, 1895

Dorylus stadelmanni EMERY, 1895: 722. Data about the species were found in WHEELER (1925) and at http://antsofafrica.org/.

DETAILS: Locality where the specimen was collected in Rwanda: Gishwati (Latitude: Unknown, Longitude: Unknown, elevation: 2000 m).

7. *Dorylus congolensis* Santschi, 1910

Dorylus congolensis SANTSCHI, 1910 :352. Data about the species were found in the publication of NSENGIMANA *et al*. (2018).

DETAILS: Locality where the specimen was collected in Rwanda: Arboretum of Ruhande (Latitude: -2.53414, Longitude: 29.75722, elevation: 1737 m).

CURRENT LOCATION OF TYPE SPECIMEN: Royal Belgian Institute of Natural Sciences (RBINS). Specimen voucher number: IG 33.894.

8. *Dorylus fulvus* (Westwood, 1839)

Typhlopone fulva WESTWOOD, 1839: 219. Information about the species were found in WHEELER (1925), at http://antsofafrica.org/ and https://antmaps.org/.

DETAILS: Locality where the specimen was collected in Rwanda: Gishwati (Latitude: Unknown, Longitude: Unknown, elevation: 2000 m).

Formicinae

9. *Camponotus fulvopilosus* (Emery, 1895)

Typhlopone fulva EMERY, 1895: 54. Information about the species were found at http://antsofafrica.org/ and https://antmaps.org/.

DETAILS: Locality where the specimen was collected in Rwanda: Gishwati (Latitude: Unknown, Longitude: Unknown, elevation: 2000 m).

10. *Camponotus cinctellus* (Gerstäcker, 1859)

Formica cinctella GERSTÄCKER, 1859: 262. Data about the species were found in two published papers: NSENGIMANA *et al*. (2018), BIZIMUNGU & MAJER (2019). They were also found at http://antsofafrica.org/, and https://antmaps.org/.

DETAILS: Locality where the specimen was collected in Rwanda: Bicumbi (Latitude: -1.99, Longitude 30.218, elevation: 1737 m), Arboretum of Ruhande (Latitude: -2.53414, Longitude: 29.75722, elevation: 1421 m), Rubona (Latitude: -2.66267, Longitude: 29.79519, elevation: 1750 m).

CURRENT LOCATION OF THE SPECIMEN: Specimens collected at the Arboretum of Ruhande and Rubona are housed at the Royal Belgian Institute of Natural Sciences (RBINS). Specimen voucher number: IG 33.894.

11. *Camponotus flavomarginatus* Mayr, 1862

Camponotus flavomarginatus MAYR, 1862: 664. Data were found at http://antsofafrica.org/, and in the publication of BIZIMUNGU & MAJER (2019).

DETAILS: Locality where the specimen was collected in Rwanda: Bicumbi (Latitude: -1.99, Longitude 30.218, elevation: 1737 m).

12. *Camponotus rufoglaucus syphax* Wheeler, 1922

Camponotus rufoglaucus WHEELER, 1922: 246. Data were found at http://antsofafrica.org/, and in publication of BIZIMUNGU & MAJER (2019).

DETAILS: Locality where the specimen was collected in Rwanda: Bicumbi (Latitude: -1.99, Longitude 30.218, elevation: 1737 m).

13. *Camponotus zimmermanni* Forel, 1894

Camponotus zimmermanni FOREL, 1894: 66. Data were found at http://antsofafrica.org/, and in publication of BIZIMUNGU & MAJER (2019).

DETAILS: Locality where the specimen was collected in Rwanda: Bicumbi (Latitude: -1.99, Longitude 30.218, elevation: 1737 m).

14. *Camponotus caesar* Forel, 1886

Camponotus caesar FOREL, 1886: 162. Data were found at http://antsofafrica.org/, and in publication of BIZIMUNGU & MAJER (2019).

DETAILS: Locality where the specimen was collected in Rwanda: Bicumbi (Latitude: -1.99, Longitude 30.218, elevation: 1737 m).

15. *Camponotus flavomarginatus* Mayr, 1862

Camponotus flavomarginatus MAYR, 1862: 664. Data were found at http://antsofafrica.org/, and in publication of BIZIMUNGU & MAJER (2019).

DETAILS: Locality where the specimen was collected in Rwanda: Bicumbi (Latitude: -1.99, Longitude 30.218, elevation: 1737 m).

16. *Camponotus maculatus* (Fabricius, 1782)

Formica maculata FABRICIUS 1782: 491. Data about the species were found at http://antsofafrica.org/ and in the publication of NSENGIMANA *et al*. (2018).

DETAILS: Locality where the specimen was collected in Rwanda: Arboretum of Ruhande (Latitude: -2.53414, Longitude: 29.75722, elevation: 1737 m).

TYPE SPECIMEN: Syntype.

CURRENT LOCATION OF TYPE SPECIMEN: Museum of Natural History, Geneva. Specimens collected at the Arboretum of Ruhande are housed at the Royal Belgian Institute of Natural Sciences (RBINS). Specimen voucher number:

https://www.antweb.org/specimen/CASENT0910057, and IG 33.894 respectively.

17. *Paraparatrechina subtilis* (Santschi, 1920)

Prenolepis (Nylanderia) subtilis SANTSCHI, 1920: 174. Data about the species were found in LAPOLLA *et al.* (2010), at https://www.gbif.org/, https://www.antweb.org/, and https://antmaps.org/.

DETAILS: Locality where the specimen was collected in Rwanda: Rangiro (Latitude: -2.4045, Longitude: 29.1606, elevation: 1800 m).

TYPE SPECIMEN: Syntype.

CURRENT LOCATION OF TYPE SPECIMEN: British Museum of Natural History (present name Natural History Museum, London). Specimen voucher number:

https://www.antweb.org/specimen/CASENT0178760.

18. *Polyrhachis gagates* Smith, 1858

Polyrhachis gagates SMITH, 1858: 71. Data about the species were found at http://antsofafrica.org/ and https://antmaps.org/.

DETAILS: Locality where the specimen was collected in Rwanda: Kibungo, Nyanza (BOLTON, 1973).

19. *Polyrhachis militaris* (Fabricius, 1782)

Formica militaris FABRICIUS, 1782: 493. Data about the species were found at https://antmaps.org/ and in the publication of NSENGIMANA *et al*. (2018).

DETAILS: Locality where the specimen was collected in Rwanda: Arboretum of Ruhande (Latitude: -2.53414, Longitude: 29.75722, elevation: 1737 m).

CURRENT LOCATION OF SPECIMENS: Specimens collected at the Arboretum of Ruhande are housed at the Royal Belgian Institute of Natural Sciences (RBINS). Specimen voucher number: IG 33.894.

20. *Polyrhachis rugulosus* Mayr 1862

Polyrhachis rugulosus MAYR 1862: 685. Data about the species were found in EMERY (1912), at http://antsofafrica.org/ and https://antmaps.org/.

DETAILS: Locality where the specimen was collected in Rwanda: Rambura.

Myrmicinae

21. *Calyptomyrmex rennefer* Bolton, 1981

Calyptomyrmex rennefer BOLTON, 1981: 72. Data were found at https://www.gbif.org/ and https://www.antweb.org/.

DETAILS: Locality where the specimen was collected in Rwanda: Kayove (Latitude: -1.88333, Longitude: 29.35, elevation: 2100 m), Rangiro (Latitude: -2.3833, Longitude: 29.1667, elevation: 1800 m).

TYPE SPECIMEN: Holotype, Current location of type specimen: Australian National Insect Collection. Specimen voucher number: https://www.antweb.org/specimen/ANIC32-051657.

22. *Carebara vidua* Smith, 1858

Carebara vidua SMITH, 1858: 179. Data about the species were found in EMERY (1912), at http://antsofafrica.org/ and https://antmaps.org/.

DETAILS: Locality where the specimen was collected in Rwanda: Byumba.

23. *Crematogaster castanea inversa* Forel, 1907

Crematogaster tricolor var. *iversa* FOREL, 1907: 81. Data about the species were found at http://antsofafrica.org/ and https://antmaps.org/.

DETAILS: Locality where the specimen was collected in Rwanda: Lake Kivu.

24. *Cyphoidris werneri* Bolton, 1981*

Cyphoidris werneri BOLTON, 1981: 259. Data about the species were found at https://www.gbif.org/, https://www.antweb.org/, https://antmaps.org/.

DETAILS: Type locality where the specimen was collected in Rwanda: Rangiro (Latitude: -2.3833, Longitude: 29.1667, elevation: 1800 m).

TYPE SPECIMEN: Paratype.

CURRENT LOCATION OF TYPE SPECIMEN: British Museum of Natural History, London (present name Natural History Museum, London). Specimen voucher number: https://www.antweb.org/specimen/CASENT0900965.

25. *Meranoplus inermis* Emery, 1895

Meranoplus inermis EMERY, 1895. Data about the species were found at https://antmaps.org/, and in the publication of NSENGIMANA *et al*. (2018).

DETAILS: Locality where the specimen was collected in Rwanda: Arboretum of Ruhande (Latitude: -2.53414, Longitude: 29.75722, elevation: 1737 m).

CURRENT LOCATION OF SPECIMENS: Specimen collected at the Arboretum of Ruhande are available at the Royal Belgian Institute of Natural Sciences (RBINS). Specimen voucher number: IG 33.894.

26. *Monomorium afrum* André, 1884

Monomorium afrum ANDRÉ, 1884: 244. Data about the species were found in BOLTON (1987) at http://antsofafrica.org/ and https://antmaps.org/.

DETAILS: Locality where the specimen was collected in Rwanda: Kagitumba.

27. *Monomorium vecte* Bolton, 1987

Monomorium vecte BOLTON, 1987: 419. Data about the species were found in BOLTON (1987) at http://antsofafrica.org/.

DETAILS: Locality where the specimen was collected in Rwanda: Kayove (Latitude: -1.88333, Longitude: 29.35, elevation: 2100 m).

28. *Myrmicaria opaciventris congolensis* Forel, 1909

Myrmicaria eumenoides var *congolensis* FOREL, 1909: 59. Data about the subspecies were found at http://antsofafrica.org/ and https://antmaps.org/.

DETAILS: Locality where the specimen was collected in Rwanda: Kigali.

29. *Myrmicaria opaciventris* Emery, 1893

Myrmicaria opaciventris EMERY, 1893: 221. Data about the species were found in the publication of NSENGIMANA *et al*. (2018).

DETAILS: Locality where the specimen was collected in Rwanda: Arboretum of Ruhande (Latitude: -2.53414, Longitude: 29.75722, elevation: 1737 m), Rubona (Latitude: -2.66267, Longitude: 29.79519, elevation: 1750 m).

CURRENT LOCATION OF SPECIMENS: Specimens are available at the Royal Belgian Institute of Natural Sciences (RBINS). Specimen voucher number: IG 33.894.

30. *Pheidole megacephala* (Fabricius, 1793)

Formica megacephala FABRICIUS, 1793: 361. Data about the species were found at http://antsofafrica.org/, and in the publication of BIZIMUNGU & MAJER (2019).

DETAILS: Locality where the specimen was collected in Rwanda: Bicumbi (Latitude: -1.99, Longitude 30.218, elevation: 1737 m).

31. *Pheidole megacephala melancholica* Santschi, 1912

Pheidole 10unctulate st. melancholica SANTSCHI, 1912: 164. Data about the species were in STITZ (1911) at http://antsofafrica.org/, and https://antmaps.org/.

DETAILS: Locality where the specimen was collected in Rwanda: Lac Muhazi (Latitude: -1.8722, Longitude: 30.3574, elevation: Unknown).

32. *Pheidole punctulata* Mayr, 1866

Pheidole punctulata MAYR, 1866: 899. Data about the species were found at https://www.gbif.org/, and https://www.antweb.org/.

DETAILS: Locality where the specimen was collected in Rwanda: Lac Muhazi (Latitude: -1.8722, Longitude: 30.3574, elevation: Unknown).

TYPE SPECIMEN: Syntype.

CURRENT LOCATION OF TYPE SPECIMEN: Natural History Museum, Genoa. Specimen voucher number: https://www.antweb.org/specimen/CASENT0904196.

33. *Pristomyrmex trogor* Bolton, 1981

Pristomyrmex trogor BOLTON, 1981: 287. Data about the species were found at https://www.gbif.org/, and https://www.antweb.org/.

DETAILS: Locality where the specimen was collected in Rwanda: Gishwati (Latitude: Unknown, Longitude: Unknown, elevation: 2000 m).

TYPE SPECIMEN : Paratype.

CURRENT LOCATION OF TYPE SPECIMEN : Musée Royale d'Afrique Centrale. Specimen voucher number: hhtps://www.antweb.org/specimen/CASENT0901704.

34. *Strumigenys adrasora* Bolton, 1983

Strumigenys adrasora BOLTON, 1983: 364. Data about the species were found at https://www.gbif.org/, and https://www.antweb.org/.

DETAILS: Locality where the specimen was collected in Rwanda: Rangiro (Latitude: -2.4045, Longitude: 29.1606, elevation: 1800 m).

TYPE SPECIMEN: Paratype:

CURRENT LOCATION OF TYPE SPECIMEN: British Museum of Natural History (present name Natural History Museum, London). Specimen voucher number: https://www.antweb.org/specimen/CASENT09000607.

35. *Strumigenys bequaerti* Santschi, 1923

Strumigenys (Cephaloxys) bequaerti SANTSCHI, 1923: 268. Data about the species were found at https://www.gbif.org/, and https://www.antweb.org/.

DETAILS: Locality where the specimen was collected in Rwanda: Rugege – current Nyungwe National Park- (Latitude: Unknown, Longitude: Unknown, elevation: 2100 m).

TYPE SPECIMEN : Syntype.

CURRENT LOCATION OF TYPE SPECIMEN : Musée Royale d'Afrique Centrale. Specimen voucher number: https://www.antweb.org/specimen/CASENT000306.

36. *Strumigenys truncatidens* (Brown, 1950)

Smithistruma (Smithistruma) truncatidens BROWN, 1950:43. Reported by BOLTON (1983). Data about the species were collected at http://antsofafrica.org/ and https://antmaps.org/.

DETAILS: Locality where the specimen was collected in Rwanda: Kayove. (Latitude: -1.88333, Longitude: 29.35, elevation: 2100 m).

37. *Strumigenys dagon* (Bolton, 1983)*

Glamyromyrmex dagon BOLTON, 1983: 325. Data about the species were found at, https://antmaps.org/, https://www.gbif.org/, https://www.antweb.org/ and http://antsofafrica.org/.

DETAILS: Locality where the specimen was collected in Rwanda: Rangiro (Latitude: -2.3833, Longitude: 29.1667, elevation: 1800 m).

TYPE SPECIMEN: Paratype.

CURRENT LOCATION OF TYPE SPECIMEN: British Museum of Natural History, London (present name Natural History Museum, London). Specimen voucher number: https://www.antweb.org/specimen/CASENT0900049.

38. *Strumigenys datissa* (Bolton, 1983)*

Smithistruma datissa BOLTON, 1983: 289. Data about the species were found at https://antmaps.org/, https://www.gbif.org/, https://www.antweb.org/ and http://antsofafrica.org/.

DETAILS: Locality where the specimen was collected in Rwanda: Rangiro (Latitude: -2.3833, Longitude: 29.1667, elevation: 1800 m).

TYPE SPECIMEN: Paratype.

CURRENT LOCATION OF TYPE SPECIMEN: British Museum of Natural History, London (present name Natural History Museum, London). Specimen voucher number: https://www.antweb.org/specimen/CASENT0900071.

39. *Strumigenys gatuda* (Bolton, 1983)*

Smithistruma gatuda BOLTON, 1983: 292. Data about the species were found at, https://antmaps.org/, https://www.gbif.org/, https://www.antweb.org/ and http://antsofafrica.org/ant_species_2012/distribution/rwanda.htm.

DETAILS: Locality where the specimen was collected in Rwanda: Rangiro (Latitude: -2.3833, Longitude: 29.1667, elevation: 1800 m).

TYPE SPECIMEN: Paratype.

CURRENT LOCATION OF TYPE SPECIMEN: British Museum of Natural History, London (present name Natural History Museum, London). Specimen voucher number: https://www.antweb.org/specimen/CASENT0900072.

40. *Strumigenys murshila* Bolton, 1983*

Strumigenys murshila BOLTON, 1983: 380. Data about the species were found at https://antmaps.org/, https://www.gbif.org/, https://www.antweb.org/ and http://antsofafrica.org/ant_species_2012/distribution/rwanda.htm.

DETAILS: Locality where the specimen was collected in Rwanda: Rangiro (Latitude: -2.3833, Longitude: 29.1667, elevation: 1800 m).

TYPE SPECIMEN: Paratype.

CURRENT LOCATION OF TYPE SPECIMEN: Museum of Natural History, Geneva. Specimen voucher number: https://www.antweb.org/specimen/CASENT0102568.

41. *Strumigenys sahura* (Bolton, 1983)*

Glamyromyrmex sahurus BOLTON, 1983: 326. Data about the species were found at https://antmaps.org/, https://www.gbif.org/, https://www.antweb.org/ and http://antsofafrica.org/ant_species_2012/distribution/rwanda.htm.

DETAILS: Locality where the specimen was collected in Rwanda: Rangiro (Latitude: -2.3833, Longitude: 29.1667, elevation: 1800 m).

TYPE SPECIMEN: Paratype.

CURRENT LOCATION OF TYPE SPECIMEN: British Museum of Natural History, London (present name Natural History Museum, London). Specimen voucher number: https://www.antweb.org/specimen/CASENT0900050.

42. *Strumigenys sarissa* Bolton, 1983

Strumigenys sarissa BOLTON, 1983: 390. Data about the species were found in BOLTON (1983), at https://antmaps.org/, https://www.gbif.org/, and https://www.antweb.org/ and at http://antsofafrica.org/ant_species_2012/distribution/rwanda.htm..

DETAILS: Locality where the specimen was collected in Rwanda: Kayove (Latitude: -1.88333, Longitude: 29.35, elevation: 2100 m).

TYPE SPECIMEN: Paratype.

CURRENT LOCATION OF TYPE SPECIMEN: Museum of Natural History, Geneva. Specimen voucher number: https://www.antweb.org/specimen/CASENT0102626/43.

43. *Syllophopsis sersalata* (Bolton, 1987)

Monomorium sersalatum BOLTON, 1987:424. Data about the species were found at https://antmaps.org/, https://www.gbif.org/, https://www.antweb.org/ and http://antsofafrica.org/ant_species_2012/distribution/rwanda.htm.

DETAILS: Locality where the specimen was collected in Rwanda: Kamiranzovu. (Latitude: -2.0508, Longitude: 30.4833, elevation: 1900 m).

TYPE SPECIMENS: Holotype, paratype.

CURRENT LOCATION OF TYPE SPECIMENS: Holotype: Museum of Natural History, Genoa. Specimen voucher number: htpps://www.antweb.org/specimen/CASENT0911198. Paratype British Museum of Natural History, London (present name Natural History Museum, London). Specimen voucher number: htpps://www.antweb.org/specimen/CASENT0902227.

44. *Tetramorium aculeatum* (Mayr, 1866)

Macromischa aculeata MAYR, 1866: 507. Data about the species were collected at https://www.gbif.org/ and https://www.antweb.org/.

DETAILS: Locality where the specimen was collected in Rwanda: East Muhabura (Latitude: Unknown, Longitude: Unknown, elevation: 2100 m).

CURRENT LOCATION OF TYPE SPECIMEN : Musée Royale d'Afrique Centrale.

45. *Tetramorium dedefra* (Bolton, 1976)

Triglyphothrix dedefra BOLTON, 1976: 322. Data about the species were found at https://antmaps.org/ and in the publication of NSENGIMANA *et al*. (2018).

DETAILS. Locality where the specimen was collected in Rwanda: Rwanda, Arboretum of Ruhande (Latitude: -2.53414, Longitude: 29.75722, elevation: 1737 m).

CURRENT LOCATION OF SPECIMENS: Specimens collected at the Arboretum of Ruhande are available at the Royal Belgian Institute of Natural Sciences (RBINS). Specimen voucher number: IG 33.894.

46. *Tetramorium delagoense* Forel, 1894

Tetramorium simillimum st. delagoense FOREL, 1894: 80. Data about the species were found at https://antmaps.org/ and in the publication of NSENGIMANA *et al*. (2018).

DETAILS: Locality where the specimen was collected in Rwanda: Arboretum of Ruhande (Latitude: -2.53414, Longitude: 29.75722, elevation: 1737 m).

CURRENT LOCATION OF SPECIMENS: Specimens collected at the Arboretum of Ruhande are available at the Royal Belgian Institute of Natural Sciences (RBINS). Specimen voucher number: IG 33.894.

47. *Tetramorium laevithorax* Emery, 1985

Tetramorium laevithorax EMERY, 1895: 39. Data about the species were found at https://antmaps.org/ and in the publication of NSENGIMANA *et al*. (2018).

DETAILS: Locality where the specimen was collected in Rwanda: Arboretum of Ruhande, Rubona agricultural research station (Latitude: -2.66267, Longitude: 29.79519, elevation: 1750 m).

CURRENT LOCATION OF SPECIMENS: Specimens collected at the Arboretum of Ruhande are available at the Royal Belgian Institute of Natural Sciences (RBINS). Specimen voucher number: IG 33.894.

48. *Tetramorium metactum* Bolton, 1980

Tetramorium metactum BOLTON, 1980: 280. Data about the species were collected at https://www.gbif.org/ and https://www.antweb.org/.

DETAILS: Locality where the specimen was collected in Rwanda: Gishwati forest (Latitude: Unknown, Longitude: Unknown, elevation: 2100 m).

CURRENT LOCATION OF THE SPECIMEN: Musée Royale d'Afrique Centrale. Specimen voucher number: https://www.antweb.org/specimen/MRACFOR000235.

49. *Tetramorium mossamedense* Forel, 1901

Tetramorium caespitum var.Mossamedensis FOREL, 1901: 306. Data about the species were found at https://antmaps.org/ and in the publication of NSENGIMANA *et al*. (2018).

DETAILS: Locality where the specimen was collected in Rwanda: Arboretum of Ruhande (Latitude: -2.53414, Longitude: 29.75722, elevation: 1737 m).

CURRENT LOCATION OF THE SPECIMEN: Specimens collected at the Arboretum of Ruhande are available at the Royal Belgian Institute of Natural Sciences (RBINS). Specimen voucher number: IG 33.894.

50. *Tetramorium muscorum* Arnold, 1926

Tetramorium (Triglyphothrix) muscorum ARNOLD, 1926: 274. Data about the species were collected at https://www.gbif.org/ and https://www.antweb.org/.

DETAILS: Locality where the specimen was collected in Rwanda: Rwanda, Rangiro (Latitude: -2.4045, Longitude: 29.1606, elevation: 1800 m).

TYPE SPECIMEN: Unknown:

CURRENT LOCATION OF THE SPECIMEN: Francisco Hita Garcia personal collection (FHGC). Specimen voucher number: https://www.antweb.org/specimen/CASENT0741072/3.

51. *Tetramorium simillimum* (Smith, 1851)

Myrmica simillima SMITH, 1851: 118. Data about the species were found at https://antmaps.org/ and in the publication of NSENGIMANA *et al*. (2018).

DETAILS: Locality where the specimen was collected in Rwanda: Arboretum of Ruhande (Latitude: -2.53414, Longitude: 29.75722, elevation: 1737 m).

CURRENT LOCATION OF SPECIMENS: Specimens collected at the Arboretum of Ruhande are available at the Royal Belgian Institute of Natural Sciences (RBINS). Specimen voucher number: IG 33.894.

52. *Tetramorium zonacaciae* (Weber, 1943)

Xiphomyrmex zonacaciae Weber, 1943: 376. Data about the species were found at https://antmaps.org/ and in the publication of NSENGIMANA *et al*. (2018).

DETAILS: Locality where the specimen was collected in Rwanda: Arboretum of Ruhande (Latitude: -2.53414, Longitude: 29.75722, elevation: 1737 m), Rubona agricultural research station (Latitude: -2.66267, Longitude: 29.79519, elevation: 1750 m).

CURRENT LOCATION OF SPECIMENS: Specimens collected at the Arboretum of Ruhande and Rubona are available at the Royal Belgian Institute of Natural Sciences (RBINS). Specimen voucher number: IG 33.894.

Ponerinae

53. *Bothroponera crassa* (Emery, 1877)

Ponera crassa EMERY, 1877: 366. Data about the species were found at https://antmaps.org/ and in the publication of NSENGIMANA *et al*. (2018).

DETAILS: Locality where the specimen was collected in Rwanda: Rubona agricultural research station (Latitude: -2.66267, Longitude: 29.79519, elevation: 1750 m).

CURRENT LOCATION OF SPECIMENS: Specimens collected at the Arboretum of Ruhande are available at the Royal Belgian Institute of Natural Sciences (RBINS). Specimen voucher number: IG 33.894.

54. *Bothroponera talpa* André, 1890

Bothroponera talpa ANDRÉ, 1980. Data about the species were found at https://antmaps.org/ and in the publication of NSENGIMANA *et al*. (2018).

DETAILS: Locality where the specimen was collected in Rwanda: Arboretum of Ruhande (Latitude: -2.53414, Longitude: 29.75722, elevation: 1737 m).

CURRENT LOCATION OF SPECIMENS: Specimens collected at the Arboretum of Ruhande are available at the Royal Belgian Institute of Natural Sciences (RBINS). Specimen voucher number: IG 33.894.

55. *Hypoponera dema* Bolton & Fisher, 2011*

Hypoponera dema BOLTON & FISHER, 2011: 40. Data about the species were collected at https://www.gbif.org/ and https://www.antweb.org/.

DETAILS: Type locality Rwanda: Rangiro (Latitude: -2.4045, Longitude: 29.1606, elevation: 1800 m).

TYPE SPECIMENS: Holotype, paratype.

CURRENT LOCATION OF TYPE SPECIMENS: Holotype: Museum of Natural History, Geneva. Specimen voucher number: https://www.antweb.org/specimen/CASENT0911172. Paratype: British Museum of Natural History, London (present name Natural History Museum, London). Specimen voucher number: https://www.antweb.org/specimen/CASENT0226546.

56. *Hypoponera hebes* Bolton & Fisher, 2011*

Hypoponera hebes BOLTON & FISHER, 2011: 56. Data about the species were collected at https://antmaps.org/, https://www.gbif.org/ and https://www.antweb.org/.

DETAILS: Type locality: Rangiro (Latitude: -2.4045, Longitude: 29.1606, elevation: 1800 m). TYPE SPECIMEN: Holotype, paratype.

CURRENT LOCATION OF TYPE SPECIMENS: Holotype: British museum of Natural History, London (present name Natural History Museum, London). Specimen voucher number: https://www.antweb.org/specimen/CASENT0911174. Paratype: British Museum of Natural History, London (present name Natural History Museum, London). Specimen voucher number: https://www.antweb.org/specimen/CASENT0226553/4.

57. *Hypoponera segnis* Bolton & Fisher, 2011

Hypoponera segnis BOLTON & FISHER, 2011: 99. Data about the species were collected at https://antmaps.org/, https://www.gbif.org/ and https://www.antweb.org/.

DETAILS: Type locality: Kayove (Latitude: -1.6742, Longitude: 29.6894, elevation: 2100 m).

TYPE SPECIMENS: Holotype, paratype.

CURRENT LOCATION OF TYPE SPECIMENS: Holotype, Museum of Natural History, Geneva. Specimen voucher number: https://www.antweb.org/specimen/CASENT0911177. Paratype: British Museum of Natural History, London (present name Natural History Museum, London).

Specimen voucher number: https://www.antweb.org/specimen/CASENT0226545, https://www.antweb.org/specimen/CASENT09025448.

58. *Hypoponera tristis* Bolton & Fisher, 2011

Hypoponera tristis BOLTON & FISHER, 2011: 110. Data were found at: https://antmaps.org/, https://www.gbif.org/ and https://www.antweb.org/.

DETAILS: Type locality: Kayove (Latitude: -1.6742, Longitude: 29.6894, elevation: 2100 m).

TYPE SPECIMEN: Holotype, paratype.

CURRENT LOCATION OF TYPE SPECIMEN: Holotype: Museum of Natural History, Geneva. Specimen voucher number: https://www.antweb.org/specimen/CASENT0911179. Paratype: British Museum of Natural History, London (present name Natural History Museum, London). Specimen voucher number: https://www.antweb.org/specimen/CASENT0226554 and https://www.antweb.org/specimen/CASENT0902556.

59. *Hypoponera venusta* Bolton & Fisher, 2011*

Hypoponera venusta BOLTON & FISHER, 2011: 110. Data were found at: https://antmaps.org/, https://www.gbif.org/ and https://www.antweb.org/.

DETAILS: Locality where the specimen was collected in Rwanda: Rwanda, Rangiro. (Latitude: -2.4045, Longitude: 29.1606, elevation: 1800 m).

TYPE SPECIMEN: Paratype. Current location of type specimen: British Museum of Natural History, London (present name Natural History Museum, London). Specimen voucher number: https://www.antweb.org/specimen/CASENT0102325.

60. *Loboponera edentula* Bolton & Brown, 2002

Loboponera edentula BOLTON & BROWN, 2002: 6. Data were found at https://antmaps.org/, https://www.gbif.org/ and https://www.antweb.org/.

DETAILS: Type locality: Rangiro. (Latitude: -2.4045, Longitude: 29.1606, elevation: 1800 m).

TYPE SPECIMEN: Paratype.

CURRENT LOCATION OF TYPE SPECIMEN: British Museum of Natural History, London (present name Natural History Museum, London). Specimen voucher number: https://www.antweb.org/specimen/CASENT0226553

61. *Mesoponera subiridescens* (Wheeler, 1922)

Euponera (Mesoponera) subiridescens WHEELER, 1922: 83. Data about the species were found in one published paper found at https://antmaps.org/ and in the publication of NSENGIMANA *et al*. (2018).

DETAILS: Locality where the specimen was collected in Rwanda: Arboretum of Ruhande (Latitude: -53414, Longitude: 29.75722, elevation: 1737 m).

CURRENT LOCATION OF SPECIMENS: Specimens collected in Arboretum are available at the Royal Belgian Institute of Natural Sciences (RBINS). Specimen voucher number: IG 33.894.

62. *Odontomachus troglodytes* Santschi, 1914

Odontomachus haematodes var. troglodytes SANTSCHI, 1994: 109. Data about the species were found at https://antmaps.org/ and in the publication of NSENGIMANA *et al*. (2018).

DETAILS: Locality where the specimen was collected in Rwanda: Arboretum of Ruhande (Latitude: -2.53414, Longitude: 29.75722, elevation: 1737 m), Rubona agricultural research station (Latitude: -2.66267, Longitude: 29.79519, elevation: 1750 m).

CURRENT LOCATION OF SPECIMENS: Specimens collected at the Arboretum of Ruhande and Rubona are available at the Royal Belgian Institute of Natural Sciences (RBINS). Specimen voucher number: IG 33.894.

63. *Megaponera analis* (Latreille, 1802)

Formica analis LATREILLE, 1802: 282. The information about the species was found at http://antsofafrica.org/.

DETAILS: Locality where the specimen was collected in Rwanda: Rambura.

64. *Paltothyreus tarsatus* (Fabricius, 1798)

Formica tarsata FABRICIUS 1798: 280. The information about the species was found in EMERY (1912) and at http://antsofafrica.org/.

DETAILS: Locality where the specimen was collected in Rwanda Rambura.

65. *Phrynoponera gabonensis* (André, 1892)

Bothroponera gabonensis ANDRÉ, 1892 :50. Data about the species were found in one published paper at https://antmaps.org/ and in the publication of NSENGIMANA *et al*. (2018).

DETAILS: Locality where the specimen was collected in Rwanda: Arboretum of Ruhande (Latitude: -2.53414, Longitude: 29.75722, elevation: 1737 m).

CURRENT LOCATION OF SPECIMENS: Specimens collected at the Arboretum of Ruhande are available at the Royal Belgian Institute of Natural Sciences (RBINS). Specimen voucher number: IG 33.894.

66. *Plectroctena mandibularis* Smith, 1858

Plectroctena mandibularis SMITH, 1858: 101. The information about the species was found in EMERY (1912) and at http://antsofafrica.org/.

DETAILS: Locality where the specimen was collected in Rwanda: Rambura.

Porceratinae

67. *Discothyrea athene* Hita-Garcia & Lieberman, 2019

Discothyrea athene HITA-GARCIA & LIEBERMAN, 2019: 18. Even though the species was indicated by the ant web.org to occur in Kenya, Tanzania and Uganda, HITA-GARCIA & LIEBERMAN (2019) indicated the species was also found in Rwanda.

DETAILS**:** Type locality: Rangiro, (Latitude: -2.39361, Longitude: 29.18278, elevation: 1800 m).

68. *Discothyrea damato* Hita-Garcia & Lieberman, 2019

Discothyrea damato HITA-GARCIA & LIEBERMAN, 2019: 18.

DETAILS: Localities where the specimens were collected in Rwanda: Gisovu, (Latitude: −2.25, Longitude: 29.34, elevation: 2200 m), Kamiranzovu, (Latitude: −2.49, Longitude: 29.15, elevation: 1900 m), and at Kayove, (Latitude: −1.88, Longitude: 29.36, elevation: 2100 m).

69. *Discothyrea gryphon* Hita-Garcia & Lieberman, 2019

Discothyrea gryphon HITA-GARCIA & LIEBERMAN, 2019: 45. Data was found at https://antmaps.org/, https://www.gbif.org/ and https://www.antweb.org/.

DETAILS: Type locality: Kayove (Latitude: -1.6742, Longitude: 29.6894, elevation: 2100 m). Specimen type: Paratype.

CURRENT LOCATION OF TYPE SPECIMEN. California Academy of Science, San Francisco. Specimen voucher number: https://www.antweb.org/specimen/CASENT0247367.

70. *Discothyrea mixta* Brown, 1958

Discothyrea mixta BROWN, 1958: 18 was listed by HITA-GARCIA & LIEBERMAN (2019).

DETAILS: The authors indicated that the species was found in Rwanda at Kayove (Latitude: -1.876, Longitude: 29.357, elevation: 2100 m) and at Rangiro (Latitude: -2.39361, Longitude: 29.18278, elevation: 1800 m).

71. *Discothyrea schulzei* Hita-Garcia & Lieberman, 2019

Discothyrea schulzei HITA-GARCIA & LIEBERMAN, 2019: 68. Data was found at https://antmaps.org/, https://www.gbif.org/ and https://www.antweb.org/.

DETAILS: Type locality: Rangiro (Latitude: -2.4045, Longitude: 29.1606, elevation: 1800 m).

TYPE SPECIMEN: Paratype.

CURRENT LOCATION OF TYPE SPECIMEN: California Academy of Science, San Francisco. Specimen voucher number: https://www.antweb.org/specimen/CASENT0247370.

Discussion

This study lists a total of 6 subfamilies, 26 genera and 71 species of ants in Rwanda. A more extensive representation of the subfamilies of Myrmicinae, Ponerinae and Formicinae and the higher number of the genera *Camponotus* and *Tetramorium* found in this study were also found for the ant community of Kakamega Forest in Kenya (HITA GARCIA *et al.*, 2010). This was also found for all ants known in the Afrotropical region (FISHER & BOLTON, 2016). In comparison with the neighboring countries, the total number of ant species of Rwanda is higher than that of Burundi which counts 4 subfamilies, 10 genera, 22 species and 4 endemic species (ANTWEB, 2020). However, other nearby countries have a higher ant biodiversity: Tanzania: 9 subfamilies, 95 genera, 470 species, and 64 endemic species; Uganda: 9 subfamilies, 80 genera, 282 species and 26 endemic species; and the DR Congo: 6 subfamilies, 74 genera, 545 species and 211 endemic species (ANTWEB, 2020).

Our results list 10 ant species that are likely endemic to Rwanda (See Table 1 where an* is added after their names). Some of these endemic species are discussed here. The species *Cyphoidris werneri* Bolton, 1981 (Myrmicinae**)** is the only African genus characterized by the presence of 12 segments of antennae, a reduced palpomere, and a propodeal spiracle set forward from the margin of the declivity. The genus has four known species, *Cyphoidris exalta* and *Cyphoidris spinosa* from Central Africa; *Cyphoidris parissa* in West Africa, and *Cyphoidris werneri* endemic to Rwanda (BOLTON, 1981). Another species endemic to Rwanda is *Dorylus*

bishyiganus Boven, 1972 (Dorylinae), about which little is known. Recent research indicates that this species belongs to the *Dorylus helvolvus* group together with 22 other species (BOROWIEC, 2016). The next group of endemic species belongs to the genus *Hypoponera* (Ponerinae) with three species endemic to Rwanda: *Hypoponera dema* Bolton & Fisher, 2011, *Hypoponera hebes* Bolton & Fisher, 2011, and *Hypoponera venusta* Bolton & Fisher, 2011.

Almost half of the endemic ant species of Rwanda belongs to the genus *Strumigenys* Smith, 1860. The genus is one of the most conspicuous in the subfamily Myrmicinae (EGUCHI *et al*., 2011). It includes 850 recognized ant species in the Afrotropical region (ANTWEB, 2020). In Rwanda, the genus comprises five species: *Strumigenys dagon* Bolton, 1983, *Strumigenys datissa* Bolton, 1983, *Strumigenys gatuda* Bolton, 1983, *Strumigenys murshila* Bolton, 1983, and *Strumigenys sahura* Bolton, 1983. Less is known about the biology and ecology of *Strumigenys* species endemic to Rwanda.

Conclusion

The list of ant species presented here does not represent the total ant fauna of Rwanda. Detailed further ant faunistic research is recommended to update this preliminary check-list, and to identify new ant species that remain to be documented in Rwanda. We also recommend more surveys to understand the distribution of the country's endemic ant species. Moreover, the development of detailed taxonomic keys for central Africa might allow a better study and description of endemic ant species of Rwanda and could help to further increase knowledge on ant species diversity in Rwanda.

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