Documenting museum records of West African Coccinellidae (Coleoptera) in Benin and Senegal

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Academic editor: Dmitry Schigel

Abstract

Background

This work provides a preliminary inventory of West African Coccinellidae.

This was based on the West African Coccinellidae (WAC) specimens in the holdings of insect collections at the Laboratoire de Zoologie des Invertébrés Terrestres at the Institut Fondamental d'Afrique Noire Cheikh Anta Diop (IFAN), Senegal and the Biodiversity Center at the International Institute of Tropical Agriculture (IITAB), Benin.

New information

A total of 129 species representing 11 tribes and 40 genera is reported, including one species of the subfamily Microweiseinae and 128 species of the subfamily Coccinellinae. The geographic distribution of collection localities is presented for these species. *Cheilomenes lunata* (Fabricius, 1775), *Cheilomenes propinqua* (Mulsant, 1850), *Cheilomenes sulphurea* (Olivier, 1791), *Chnootriba elaterii* (Rossi, 1794), *Chnootriba similis* (Thunberg, 1781), *Exochomus laeviusculus* Weise, 1909, *Hyperaspis delicatula* (Mulsant, 1850) and *Hyperaspis pumila* Mulsant, 1850 are the best represented species in these collections.

Keywords

Africa, Coccinelloidea, Coccinellinae, distribution, diversity, insect collection, inventory, Microweiseinae, taxonomy, museum, systematics, lady beetles, ladybugs.

Introduction

Natural history museums play a critical role in science and education (Gropp 2018, Holmes et al. 2016). They contribute fundamental data, necessary for understanding the biodiversity of Earth across temporal and geographic ranges. Biological information derived from specimen data provides essential information supporting a wide range of basic and applied biological endeavours. Museum specimens often play an important role in the recognition of threatened taxa, allowing the scientific community to propose appropriate action (e.g. Thomson et al. 2018, Mikula et al. 2018). Other activities that benefit from specimen-based biological information include the monitoring of environmental change, protecting public health and safety and enhancing agriculture, to name a few (Suarez and Tsutsui 2004).

In agriculture, biological collections can provide vitally important information about pest species, including phenology, food preferences, behaviour, ecological associations etc. (Escalona et al. 2017). For invasive species, museum data can help to identify the point of entry, the date of introduction, the rate of expansion and the native distributional range, which is where natural enemies (potential biocontrol agents) might be found.

The full benefits of natural history museums can only be realised if these collections are known and accessible to the public and scientific communities worldwide, thereby enabling cooperation between local and distant scientists to explore and advance our knowledge of global biodiversity. Unfortunately, access to biological collections is limited for researchers in some regions, like Africa. Much of the available museum material of African origin is housed in natural history museums or private collections in Europe (Klopper et al. 2002, Miller and Rogo 2001). There are some major African national or regional natural history museums. The majority of their holdings comprise subsets of material that was collected by missionaries, explorers and scientists from European institutions (Medler 1980, Scholtz and Mansell 2017). There are some natural history museums in West Africa, but these have remained overlooked by the research community.

Coccinellidae Latreille, 1807, commonly known as ladybugs, are small beetles ranging from 0.8 to 18 mm (Seago et al. 2011). Although some coccinellids are phytophagous or fungivorous (Iperti 1999), nearly 70% of species are considered predaceous, preying on aphids, mealybugs, scale insects, thrips, leaf hoppers, mites and other soft bodied insects (Giorgi et al. 2009, Riddick 2017, Shah and Khan 2014, Ślipiński and Tomaszewska 2010, Szawaryn et al. 2015). One of the earliest and most successful examples of biocontrol was the management of cottony-cushion scale, *Icerya purchasi* Maskell, 1879, on citrus crops using the vedalia lady beetle, *Rodolia cardinalis* (Mulsant, 1850), in California during the 1890s.

Due to their economic importance, major regional taxonomic works have been published for the coccinellid faunas of North America, Europe, Palearctic Region, Russian Far East,

other parts of the former USSR, Oriental region, Central Asia, Japan, Vietnam, China and Australia (e.g. Giorgi et al. 2009, Tomaszewska and Szawaryn 2013, Tomaszewska and Ślipiński 2013, Ślipiński et al. 2012). Unfortunately, nothing comparable exists for Africa. The identification of African lady beetles has been done almost exclusively by European entomologists and explorers (Medler 1980). As a result, valuable reference specimens and their associated collection data are often inaccessible to researchers and agencies in Africa (Scholtz and Mansell 2017).

Coccinellidae has been the focus of several recent phylogenetic studies as researchers attempt to understand the evolution of the group and to improve its classification (e.g. Escalona and Ślipiński 2012, Kobayashi et al. 2011, Nedved and Kovář 2012, Robertson et al. 2015, Seago et al. 2011, Tomaszewska and Szawaryn 2013, Tomaszewska and Ślipiński 2013, Ślipiński et al. 2012). Unfortunately, endemic African taxa are very poorly represented in these studies, probably because appropriate material was unavailable and because the state of taxonomy for those groups was not mature.

Although Africa is well known for its rich and charismatic vertebrate diversity, there is far less appreciation for the great diversity of other taxa there. It is estimated that 100,000 species of insects are currently known from the continent and conservative estimates put the total number of insect species there at about 600,000, yet few research collections of insects exist on the continent (Miller and Rogo 2001). While entomological research collections in some African countries (e.g. Algeria, Egypt, Ghana, Kenya, Libya, Malawi, Morocco, Mozambique, South Africa, Tanzania, Uganda and Zambia) have appeared for some time in registries of museums (e.g. Arnett et al. 1993, Evenhuis 2019), others remain virtually unknown to the outside world, especially those in French West African countries (*Afrique Occidentale Française*). This is true for the two largest reference collections of arthropods in West Africa, the Biodiversity Center at the International Institute of Tropical Agriculture (IITAB) in Benin and the Laboratoire de Zoologie des Invertébrés Terrestres at the Institut Fondamental d'Afrique Noire Cheikh Anta Diop (IFAN) in Senegal. These two important resources were absent from compilations of insect and spider collections of the world until just recently when they were added to a web-based listing of biological collections by Evenhuis (2019) following an enquiry by the senior author.

The Laboratoire de Zoologie des Invertébrés Terrestres (formerly Section Entomologie) was created in 1945 by André Villiers. It is housed in the Institut Fondamental d'Afrique Noire Cheikh Anta Diop (IFAN), Université Cheikh Anta Diop, Dakar in Senegal (Fig. 1a–b). The IFAN insect collection was established to serve as a centre for entomological collection-based research in West Africa. With over 400,000 specimens, the IFAN insect museum is the largest insect collection in West Africa. Dr. Abdoul Aziz Niang, a specialist of Phlebotomine sandflies (Diptera: Psychodidae), is the current Curator and Director of the IFAN insect collection.

The International Institute of Tropical Agriculture (IITA) is a non-profit international research organisation founded in 1967. Headquartered in Ibadan, Nigeria, IITA is a member of the Consultative Group for International Agricultural Research. IITA has

stations and hubs in Central, Eastern, Southern and West Africa (www.iita.org). The IITAB, IITA Biodiversity Center (formerly IITA insect centre or museum) is housed at the Benin Station of IITA in Calavi, Cotonou, Benin (Fig. 1c–d). With over 365,000 specimens, the IITAB collection is the second largest insect collection in West Africa. Dr. Georg Goergen, Entomologist and Biosystematist, is the current Curator and Director of the IITAB.

The taxonomic impediment, which affects biologists around the world, impacts West African researchers especially hard. Most African scientists must rely on distant experts for the identification of insect specimens. Africa produces far fewer trained insect taxonomists than any other continent in the world (de Carvalho et al. 2005). This gap in taxonomic knowledge has also limited the assessment of biodiversity in Africa (Coleman 2015). Currently, the Biodiversity Center of IITA, Benin (IITAB) is one of the major insect identification hubs in Africa.

The IFAN and IITA insect collections are the two largest in West Africa, a region situated between the Tropic of Cancer and Equator, covering 6,140,000 km^2, approximately one fifth of Africa. More than 75% of the land consists of plains lying below an elevation of 300 m. The region includes 16 countries: Benin, Burkina Faso, Cape Verde, Côte d'Ivoire, Gambia, Ghana, Guinea, Guinea-Bissau, Liberia, Mali, Mauritania, Niger, Nigeria, Senegal, Sierra Leone and Togo. Additionally, the United Nations recognises Saint Helena (a United Kingdom Overseas Territory), Ascension and Tristan da Cunha as part of West Africa (Comité Inter-états de Lutte contre la Sécheresse dans le Sahel 2016, Kabo-bah and Diji 2018) (Fig. 2).

Given the importance of coccinellids and the patchy knowledge of their diversity in West Africa, we summarised data about the taxonomic holdings of this family in IFAN and IITAB insect collections with the goals of raising the visibility of those institutions and providing a preliminary inventory of West African Coccinellidae (WAC). This work represents part of ongoing research on the WAC by the senior author, who is currently developing a formal taxonomic catalogue of West African Coccinellidae.

Materials and methods

Museum specimens were studied at the IFAN and IITAB insect collections in West Africa. We photographed specimens and recorded label data (e.g. taxonomic determination, collection locality, collection date, associated plants, collector, determiner etc.).

The taxonomic names that were recorded on museum specimens were put in a database and updated to currently valid names using the systematics literature. Aberrations, variations and subspecies were not included in the database except when museum specimens were identified as such. References are provided, when appropriate, to clarify the current classification for species. In some cases, specimen determinations were made (by KH) using the literature along with examination of reference collections of authoritatively identified material at the Musée Royal de l'Afrique Centrale (MRAC), Museum für Naturkunde der Humboldt-Universität (ZMHB), Museum of Comparative

Zoology (MCZ), National Museum of Natural History (NMNH) and University of Georgia Collection of Arthropods (UGCA). Annotations are given when an invalid determination on a specimen label has been updated to the currently valid taxonomic name.

Many museums and institutions kindly assisted this study by hosting visits, providing data or initiating loans of specimens for this and related studies. These collections and institutions include the following:

CERAAS, Centre d'Etude Régional pour l'Amélioration de l'Adaptation à la Sécheresse, Université Cheikh Anta Diop de Dakar, Senegal.

IFAN, Institut Fondamental d'Afrique Noire Cheikh Anta Diop, Dakar, Senegal.

IITAB, International Institute of Tropical Agriculture, Benin Station, Cotonou, Benin.

MCZ, Museum of Comparative Zoology, Harvard University, Cambridge, MA, U.S.A.

MRAC, Musée Royal de l'Afrique Centrale, Tervuren, Belgium.

NMNH, National Museum of Natural History (formerly USNM: United States National Museum), Washington D.C., U.S.A.

UCAD, Université Cheikh Anta Diop de Dakar, Dakar, Senegal.

UEM/IPD, Unité d'Entomologie Médicale, Institut Pasteur de Dakar, Dakar, Senegal.

UGA, University of Georgia, Athens GA, U.S.A.

UGCA, University of Georgia Collection of Arthropods, Georgia Museum of Natural History, Athens, GA, U.S.A.

ZMHB, Museum für Naturkunde der Humboldt-Universität, Berlin, Germany.

Other abbreviations used in the text:

DRC, Democratic Republic of the Congo.

The updated specimen database was used to produce the first list of West African coccinellid diversity (Table 1) and to explore general characteristics about the museum holdings. Valid taxonomic names and tribal placement follow Seago et al. (2011). Generic and species names are arranged alphabetically. The lists of synonyms provided below valid names are not exhaustive, but instead include only junior synonyms that have been used in literature regarding West African taxa or ones that appear on specimen determination labels in the focal collections.

Checklist of West African Coccinellidae in IFAN and IITAB museums (see Table 1 for more details)

Serangium kunowi Weise, 1892

Distribution: Zambia

Brumoides foudrasii (Mulsant, 1850)

Distribution: Benin, Gambia, Guinea, Nigeria, Senegal

Chilocorus distigma (Klug, 1835)

Distribution: Mozambique

Chilocorus dorhni Mulsant, 1850

Distribution: Senegal

Chilocorus schioedtei Mulsant, 1850

Distribution: Benin, Cameroon

Chilocorus simoni Sicard, 1907

Distribution: South Africa

Exochomus flavipes (Thunberg, 1781)

Distribution: Gabon

Exochomus laeviusculus Weise, 1909

Distribution: Benin, Côte d'Ivoire, Guinea, Mali, Mauritania, Senegal, Togo

Exochomus nigrifrons Gerstäcker, 1871

Distribution: Mali, Senegal

Parexochomus nigripennis (Erichson, 1843)

Distribution: Mali, Senegal

Exochomus pulchellus Gerstäcker, 1871

Distribution: Gambia, Niger, Rwanda, Senegal

Exochomus troberti Mulsant, 1850

Distribution: Burkina Faso

Aulis annexa Mulsant, 1850

Distribution: Senegal

Clitostethus flavotestaceus Mader, 1955

Distribution: Senegal

Nephus flavomaculatus Fürsch, 1966

Distribution: Benin, Nigeria

Nephus vetustus Weise, 1915

Distribution: Gabon

Nephus phenacoccophagus Fürsch, 1987

Distribution: Nigeria

Nephus kamburovi Fürsch, 1992

Distribution: Malawi

Nephus oblongosignatus Mulsant, 1850

Distribution: Tanzania

Nephus ornatulus Korschefsky, 1931

Distribution: DRC

Nephus sudanicus Weise, 1925

Distribution: Mauritania

Scymnobius bilucernarius (Mulsant, 1850)

Distribution: Mexico

Scymnus canariensis Wollaston, 1864

Distribution: São Tome and Principe, Senegal

Scymnus casstroemi Mulsant, 1850

Distribution: Guinea, Senegal

Scymnus gnavus Weise, 1895

Distribution: Guinea

Scymnus kibonotensis Weise, 1910

Distribution: Côte d'Ivoire, Guinea, Nigeria

Scymnus levaillanti Mulsant, 1850

Distribution: Nigeria, Malawi

Scymnus pruinosus Weise, 1895

Distribution: Zambia

Scymnus monroviae Casey, 1899

Distribution: Benin, Côte d'Ivoire, Guinea, Niger, Senegal, Togo

Scymnus nigrosellatus Mader, 1950

Distribution: Zambia

Scymnus quadrivittatus Mulsant, 1850

Distribution: Nigeria

Scymnus rubiginosus Mader, 1950

Distribution: Côte d'Ivoire, Guinea, Senegal

Scymnus scapuliferus Mulsant, 1850

Distribution: Benin, Côte d'Ivoire, Guinea, Nigeria, Madagascar, Senegal, Togo

Scymnus schoutedeni Mader, 1950

Distribution: Senegal

Scymnus senegalensis Mader, 1955

Distribution: Côte d'Ivoire, Gambia, Guinea, Mali, Mauritania, São Tome and Principe, Senegal

Scymnus villiersi Mader, 1955

Distribution: Niger, Senegal

Stethorus aethiops Weise, 1899

Distribution: Benin, Ghana, Guinea-Bissau, Mozambique

Stethorus endroedyi Fürsch, 1970

Distribution: Malawi

Stethorus jejunus Casey, 1899

Distribution: Ghana, Nigeria, Mozambique

Adalia bipunctata (Linnaeus, 1758)

Distribution: Cameroon

Anisolemnia decempustulata Weise, 1888

Distribution: Togo

Bulaea anceps (Mulsant, 1850)

Distribution: Mozambique

Caria welwitschii Crotch, 1874

Distribution: Guinea

Cheilomenes aurora Gerstäcker, 1871

Distribution: Tanzania

Cheilomenes lunata (Fabricius, 1775)

Distribution: Benin, Burkina Faso

Cheilomenes sulphurea (Olivier, 1791)

Distribution: Angola, Cameroon

Cheilomenes propinqua (Mulsant, 1850)

Distribution: Côte d'Ivoire, Gabon

Cheilomenes quadrilineata (Mulsant, 1850)

Distribution: Senegal

Coccinella intermedia (Crotch, 1874)

Distribution: São Tome and Principe

Coccinella septempunctata Linnaeus, 1758

Distribution: Cape Verde

Declivitata hamata (Thunberg, 1808)

Distribution: Senegal

Declivitata uncifera Fürsch, 1967

Distribution: Cameroon

Harmonia vigintiduomaculata (Fabricius, 1792)

Distribution: Benin, Liberia, Nigeria, Togo

Hippodamia variegata (Goeze, 1777)

Distribution: Colombia, Nigeria, Senegal, Tanzania

Lemnia machadoi Mader, 1952

Distribution: Cameroon

Megalocaria dilatata (Fabricius, 1775)

Distribution: Benin

Micraspis lineola (Fabricius, 1775)

Distribution: Togo

Micraspis striata (Fabricius, 1792)

Distribution: Côte d'Ivoire, Gabon

Psyllobora bisoctonotata (Mulstant, 1850)

Distribution: Senegal

Psyllobora lutescens (Crotch, 1874)

Distribution: Guatemala

Psyllobora variegata (Fabricius, 1781)

Distribution: South Africa

Xanthadalia effusa (Erichson, 1843)

Distribution: Benin, DRC

Xanthadalia rufescens Mulsant, 1850

Distribution: Benin, Mali, Mauritania, Senegal

Diomus hennesseyi Fürsch, 1987

Distribution: Nigeria

Chnootriba elaterii (Rossi, 1794)

Distribution: Benin, Côte d'Ivoire, Gambia, Guinea, Liberia, Mali, Mauritania, Nigeria, São Tome and Principe, Senegal

Chnootriba hirta (Thunberg, 1781)

Distribution: Guinea, Tanzania

Chnootriba similis (Thunberg, 1781)

Distribution: Benin, Burkina Faso

Cleta punctipennis (Mulsant, 1850)

Distribution: Togo

Cleta sahlbergi (Mulsant, 1850)

Distribution: Côte d'Ivoire, Kenya

Epilachna bissexguttata Weise, 1895

Distribution: Côte d'Ivoire, DRC

Epilachna bomparti Mulsant, 1850

Distribution: Liberia, Senegal

Epilachna colorata Mulsant, 1850

Distribution: Cameroon

Epilachna iocosa (Mader, 1941)

Distribution: South Africa

Epilachna nigritarsis Mulsant, 1850

Distribution: Cameroon

Epilachna vigintipunctata Mulsant, 1850

Distribution: Liberia, Tanzania

Henosepilachna atropos (Sicard, 1912)

Distribution: Equatorial Guinea

Henosepilachna bisseptemnotata (Mulsant, 1853)

Distribution: Tanzania

Henosepilachna clavareaui (Weise, 1901)

Distribution: Benin

Henosepilachna ertli (Weise, 1906)

Distribution: Côte d'Ivoire, Liberia

Henosepilachna fulvosignata (Reiche, 1847)

Distribution: Côte d'Ivoire

Henosepilachna moseri (Weise, 1903)

Distribution: Equatorial Guinea

Henosepilachna reticulata (Olivier, 1791)

Distribution: Benin, Mali, Niger, Nigeria, Senegal

Henosepilachna simplex (Weise, 1895)

Distribution: Liberia

Solanophila canina (Fabricius, 1781)

Distribution: Guinea

Solanophila dregei (Mulsant, 1850)

Distribution: Côte d'Ivoire

Solanophila scalaris (Gerstäcker, 1871)

Distribution: Tanzania

Hyperaspis aestimabilis Mader, 1955

Distribution: Angola, DRC

Hyperaspis centralis Mulsant, 1850

Distribution: Mexico

Hyperaspis delicatula (Mulsant, 1850)

Distribution: Benin, Gambia, Ghana, Guinea-Bissau, Nigeria, Malawi

Hyperaspis lugubris (Randall, 1838)

Distribution: Ghana, Nigeria

Hyperaspis maindroni (Sicard, 1929)

Distribution: Mauritania, Niger, Senegal

Hyperaspis merckii (Mulsant, 1850)

Distribution: Mauritania, Senegal

Hyperaspis pumila Mulsant, 1850

Distribution: Gambia, Guinea, Guinea-Bissau, Niger, Nigeria, Senegal, Togo

Hyperaspis senegalensis (Mulsant, 1850)

Distribution: Gambia, Ghana, Nigeria, Senegal, Sierra Leone, Malawi

Hyperaspis sericea Fürsch, 1972

Distribution: Malawi

Hyperaspis vinciguerra Capra, 1929

Distribution: Gambia, Senegal, Malawi

Tenuisvalvae notata (Mulsant, 1850)

Distribution: Benin, Bolivia

Ortalia ovulum Weise, 1898

Distribution: Liberia, Mali, Togo

Rodolia cardinalis (Mulsant, 1850)

Distribution: Kenya

Rodolia iceryae Janson in Ormerod, 1887

Distribution: Senegal

Rodolia occidentalis Weise, 1898

Distribution: Benin, Ghana, Nigeria, Senegal

Rodolia senegalensis Weise, 1913

Distribution: Senegal

Platynaspis capicola Crotch, 1874

Distribution: DRC

Platynaspis ferruginea Weise, 1895

Distribution: Benin, Togo

Platynaspis kollari Mulsant, 1850

Distribution: Liberia

Platynaspis obscura Gorham, 1901

Distribution: Côte d'Ivoire, Liberia

Platynaspis pilosa Sicard, 1930

Distribution: South Africa

Platynaspis rufipennis Gerstäcker, 1871

Distribution: Côte d'Ivoire, Liberia, Niger

Platynaspis vittigera Weise, 1895

Distribution: DRC

Pharoscymnus sexguttatus (Gyllenhall, 1808)

Distribution: Ghana

"Leis" "maculata"

Distribution: Côte d'Ivoire

Analysis

The taxonomically updated list of coccinellid species, present in the IFAN and IITAB collections, includes 129 species, representing 40 genera assigned to 11 tribes and two subfamilies following the classification of Seago et al. (2011). A total of 751 West African coccinellid specimens was recorded for the two collections. Of those, 385 specimens (68 spp., 30 genera) are deposited at IITA, while 366 specimens (84 spp., 31 genera) are at IFAN Table 1.

Most specimens (62%) were curated under currently valid names; however, 38% of specimens were labelled using junior synonyms. At IITA, 83% of the specimens were labelled using currently valid species names, while at IFAN, 39% of specimens were labelled using valid names.

Five genera comprise 57% of the specimens: *Exochomus* (6%), *Chnootriba* (9%), *Scymnus* (13%), *Cheilomenes* (14%) and *Hyperaspis* (15%) (Fig. 3)**.** Twenty-five (of 40) genera each represent less than 1% of the total specimens. The remaining genera (*Chilocorus, Declivitata, Epilachna*, *Henosepilachna, Nephus, Platynaspis*, *Rodolia, Stethorus* and *Xanthadalia*) each account for between 2 and 5% of the overall specimen total.

Cheilomenes lunata (Fabricius, 1775), *Cheilomenes propinqua* (Mulsant, 1850), *Cheilomenes sulphurea* (Olivier, 1791)*, Chnootriba elaterii* (Rossi, 1794), *Chnootriba similis* (Thunberg, 1781), *Exochomus laeviusculus* Weise, 1909, *Hyperaspis delicatula* (Mulsant, 1850) and *Hyperaspis pumila* Mulsant, 1850, are the most abundant species in the collections (Fig. 6). Specimens identified as *Scymnus* sp. make up the third most numerous group appearing in these collections.

Geographic distribution

The coccinellid holdings in these two collections originated in 35 countries with 85% of specimens coming from West African countries, 14% coming from other African countries (DRC, Gabon, Madagascar, Malawi, Mozambique, Rwanda, Tanzania and Zambia) and 1% from non-African countries. More than half (66%) of West African material, housed in

these two collections, came from just five countries: Senegal (27%), Nigeria (26%), Benin (5%), Liberia (4%) and Côte d'Ivoire (4%).

West African specimens housed in the IFAN museum were collected from 22 African countries. Most of these specimens (77%) were from five countries: Senegal (49%), Liberia (8%), Côte d'Ivoire (8%), Guinea (6%) and Mali (6%) (Fig. 4). The coccinellid specimens in the IITA originated in 25 countries, including 10 non-West African countries and four non-African countries (Bolivia, Columbia, Guatemala and Mexico). Most lady beetle specimens in the IITA museum (72%) were collected from five West African countries: Nigeria (50%), Benin (6%), Gambia (5%), Ghana (5%) and Senegal (5%). Two non-West African countries were represented: DRC (5%) and Malawi (5%) (Fig. 5).

Temporal distribution

Coccinellid material in the IFAN and IITA insect collections differ in temporal coverage (IFAN: 1900–1994; IITAB: 1950–2009) (Fig. 7). In the IFAN collection, the oldest specimens were all collected in 1900 and represent the following species: *Adalia bipunctata* (Linnaeus, 1758), *Anisolemnia decempustulata* Weise, 1888, *Aulis annexa* Mulsant, 1850, *Brumoides foudrasii* (Mulsant, 1850), *Caria welwitschii* Crotch, 1874, *Cheilomenes aurora* Gerstäcker 1871, *Cheilomenes lunata* (Fabricius, 1775) and *Chnootriba elaterii* (Rossi, 1794). A single specimen of *Stethorus aethiops* Weise, 1899, collected in 1950, represents the oldest coccinellid record in the IITAB collection.

Both collections show a spike in growth of coccinellid holdings during one decade, but not the same one (Fig. 7). While 17% of the IFAN WAC specimens were collected between 1900 and 1944, the great majority (73%) were collected between 1945 and 1954. Only 5% of the specimens were added between 1955 and 1994. No new coccinellid material has been added since 1994.

The IITAB WAC records indicate that 6% of specimens were collected between 1950 and 1979, 80% from 1980 to 1989 and 14% between 1990 and 2009. No new coccinellid material was added after 2009.

Discussion

Data records compiled from collection labels in the IFAN and IITAB insect collections show that both collections combined provide an historical record of West African coccinellid diversity spanning over a century. It is clear that much coccinellid diversity in this region remains unrecorded though.

Very little published information is available about African coccinellids. Fürsch (1992) reports 70 species from Western Uganda. In Algeria, 75 species were recorded (Lakhal et al. 2018). The West African region, with its surface area of 6,140,000 km^2, is nearly 26 times the size of Uganda (236,040 km^2) and more than twice the size of Algeria.

West Africa, with its diverse ecosystems, landscapes, bioclimatic regions and vegetation (desert, rain forest, savannah), should support one of the highest diversities of coccinellids in all of Africa. The current total of 129 known coccinellid species from West Africa is surprisingly low for such a heterogeneous region.

The two focal collections of this study, the largest biodiversity centres in West Africa, differ in their taxonomic coverage. The IFAN holds more West African coccinellid diversity (31 gen., 84 spp.) than IITA (30 gen., 68 spp.). One possible explanation for the higher taxonomic diversity at IFAN is that their coccinellid records span nearly a century (1900–1994) while records at IITA only range from 1950 to 2009. In addition, the holdings at IFAN were enhanced by many expeditions to other West African countries, especially Côte d'Ivoire, Liberia, Mali, Mauritania, Senegal and Togo (Paulian et al. 1983).

A species name can become invalid due to the discovery of an older valid name or due to subsequent reclassification of the species in a different genus. Even though there was more taxonomic diversity represented at IFAN, 61% of species names used in the collection have not been updated to the valid names used in the current classification. At IITAB, however, most coccinellid species names (83%) were current and valid. It should also be noted that the various researchers, who have served as curators of IFAN insect collection, were taxonomists. Even though their expeditions and fieldwork focused on insect biodiversity in general, their efforts were concentrated on their respective specialities. These researchers each left Africa after some time and were no longer involved in the curation of these collections (e.g. André Villiers: 1945–1956, Michel Condamin: 1950–1973 and 1978–1988; Roger Roy: 1958–1992, Bernadette Soltani: 1988, Aïssatou Dramé: 1988–1991, Sun Heat Han: 1992–1996) (A. Niang pers. comm.). These are some of the potential reasons why the taxonomy of the coccinellid holdings at these museums was not current.

The IITA arthropod collection plays a crucial taxonomic role by providing essential, authoritative insect identifications amongst other services (e.g. biodiversity monitoring, pest management control etc.). IITA research has contributed to the description of more than 120 arthropod species (Ortiz 2017). This position of the IITA helps to explain why the identifications of its WAC specimens are more current: the IITAB WAC collection is newer than the one at IFAN.

Considering the numbers of specimens, *Exochomus* (6%), *Chnootriba* (9%), *Scymnus* (13%), *Cheilomenes* (14%) and *Hyperaspis* (15%) are the most strongly represented West African genera in the two collections. *Cheilomenes lunata*, *Cheilomenes propinqua*, *Cheilomenes sulphurea*, *Chnootriba elaterii* and *Chnootriba similis* are the most commonly collected species. Whereas *Cheilomenes lunata*, *C. propinqua* and *C. sulphurea* are widespread aphid predators, *Chnootriba elaterii* and *Ch. similis* are serious herbivorous pests of major staple crops. All these species may have been collected more often because they are relatively large, more colourful than many other coccinellids in the region and are regularly occurring on many cultivated and wild plants. In contrast, the collection, preparation and identification of tiny, brown coccinellids, like *Scymnus* species, are more difficult and time consuming. Drab, minute coccinellids could

have been abundantly collected in field samples, but might never have been prepared, identified and curated. As a result, these less conspicuous coccinellids could be greatly under-represented in museum holdings even though they might be very common and important in various agroecosystems.

Many predaceous species are represented in the holdings, such as *Exochomus flavipes* (Thunberg, 1781)*, Exochomus laeviusculus* Weise, 1909, *Stethorus jejunus* Casey, 1899, *Hyperaspis delicatula*, *H. pumila*, *Rodolia cardinalis* (Mulsant, 1850) and *Scymnus senegalensis* Weise, 1913. Some of these species are poorly represented in these collections, but this is likely due to collection and preparation biases, rather than actual rarity in the region. Although these relative abundance numbers of specimens in the collections are not the result of systematic and long-term sampling efforts, the simple spatial and temporal records of occurrence for these species in the region provide important information that could facilitate entomological research and pest management programmes in the sub-region.

Records of material in both IFAN and IITAB show that more than 60% of WAC specimens were collected from five countries (Senegal, Nigeria, Benin, Liberia and Côte d'Ivoire). These countries might have experienced more collecting effort because they either house the museums (Benin and Senegal) or because they are neighbouring countries where museum expeditions could be easily conducted (Côte d'Ivoire, Liberia, Nigeria). Benin, Côte d'Ivoire, Nigeria and Senegal have been agricultural research and trade centres in West Africa since the colonial period (Paulian et al. 1983). IFAN (Senegal), IITA (Benin, Nigeria) and ORSTOM (Côte d'Ivoire) were originally established to promote scientific research before the 1950s. Studies conducted through those organisations have continued to be published in more recent years (Chazeau and Couturier 1985, Fürsch 1991a, Sæthre et al. 2011), generating specimens for the museums.

The collecting efforts that built these museum holdings were haphazard, not the result of long-term, systematic monitoring efforts in the region. More than 23% of IITAB WAC specimens were collected from the IITA Station in Ibadan, Nigeria, while 17% of IFAN WAC were collected in Dakar, Senegal. Despite the high historical value of both collections, the geographic record is uneven. Some countries were far more heavily sampled over the years than others.

The coccinellid material housed in both collections is diverse, but there is a surprising lack of overlap in taxa between the two collections, even though they are in neighbouring countries that have similar ecological habitats. At IFAN, there are 56 WAC species that are not present in IITAB. There are 35 WAC species represented in the IITAB holdings that are not found in the IFAN collection. The lack of overlap could be due to collecting biases in the projects or expeditions that occurred at each institution. A large percentage of taxa represented in these museums was collected by only a few individuals (Fig. 3) which is consistent with that scenario. In fact, the combined WAC diversity at these two collections (40 genera, 129 species), represents only 75% of genera and 50% of the species already known to occur in the region as reported in the literature (KH). This lack of overlap between collections may be due in part from being at an early stage of

discovery and collection development for WAC diversity. It is clear that there is a need for much more thorough study and sampling in order to accurately assess the diversity of this important group across West Africa.

It is noteworthy that both collections include African coccinellids from outside West Africa. The IITAB also has material from Central and South America (Bolivia, Columbia, Guatemala and Mexico). These non-West African specimens were probably received as exchanges between international collaborators who were conducting general systematics research or were collaborating with the various Insect Pest Management programmes carried out by IITA. These collaborations with researchers from around the world might help to explain why the identifications of material at IITAB were taxonomically more current than at IFAN. In fact, most of the IITAB coccinellids were identified by a German researcher, Helmut Fürsch, a taxonomic authority of Afrotropical Coccinellidae.

The IFAN and IITA WAC collections each show a history that is marked by three distinct periods of development. For IFAN, these significant periods occurred in 1900-1944, 1945-1954 and 1955-1994. IFAN holds some material that predates the establishment of the insect collection in the 1940s. This older material (collected 1900-1944) came from many European collections and collectors (e.g. P. Daget, E. Fleutiaux, M. Griaule, T. Jackson, Delattre, H. Junod, A. Vuillet etc.). In 1945, André Villiers established the IFAN entomology section and began to organise many expeditions to African locations, including Cameroon (1939, 1951), Senegal (1945–1956), Casamance, Senegal (1946), Mali (1946, 1947), Guinea (1946, 1954), Côte-d'Ivoire (1946, 1955), Guinea Bissau (1947), Aïr Mountains, Niger (1947), Senegalese Ferlo (1948, 1950), Mauritania (1948–1953), southern Nigeria (1949), Benin and Togo (1950), southern Togo (1950), Sudan region (border of Senegal with South of Sahara), Fernando-Poo Island, Equatorial Guinea (1951) and Niokolo-Koba National Park, Senegal (1955, 1956). These field trips and Villiers' collaborations with a network of foreign entomologists resulted in a decade (1945–1954) during which most of IFAN WAC specimens (73% of the total WAC holdings) were collected. The period of rapid growth of WAC holdings at IFAN ceased after Villiers returned to the Muséum National d'Histoire Naturelle (Paris) in 1956. Although he organised many subsequent trips to Africa between 1961 and 1977, that was a period of great change in the region. In the 1960s, most West African countries became independent and experienced major transitions and restructuring of administration.

The noteworthy periods of development for the IITAB WAC collection were 1950–1979, 1980–1989 and 1990–2009. Not surprisingly, IFAN's slower growth in the 1960s coincided with the lowest rate of growth for IITA's new collection. In the late 1970s, however, there were major pest outbreaks (e.g. Maize streak virus, cassava mealybug, cassava green mite, mango mealybug, fruit tree mealybug etc.) that led IITA scientists to establish collaborative integrated pest management programmes with Central and South American researchers at the International Center for Tropical Agriculture (CIAT) (Agounké et al. 1988, Ortiz 2017). These biological control programmes were very successful in importing, rearing and releasing natural enemies to manage these pests (Agounké et al. 1988, Ortiz 2017). During research trials for those projects, insects were

sampled from agricultural lands. In fact, more than 40% of WAC specimens in the IITA museum were collected between 1979 and 1989 on cassava alone. It is likely that many coccinellids in the IITA collection were collected because the 1970s pest outbreaks pushed the institution to establish partnerships with stakeholders, international researchers and other African research institutions. From 1990 to the present, records from the IITA museum show a very significant decrease in the number of coccinellids collected. This decreased rate of growth could be explained by the spectacular success of the biological pest control programme carried out by IITA on cassava, mango trees and other crops, thereby reducing the need for field sampling. In addition to the identified material referred to in the present paper, there is still a huge backlog of unidentified coccinellid specimens at IITAB. The non-WAC specimens obtained at that same time are another benefit from those same events and resulting collaborations.

Despite the success of IPM programmes and taxonomic expeditions led by IFAN and IITA in many African countries, it is clear that some groups of West African coccinellid genera with high known diversity were poorly sampled (e.g. species of *Adalia*, *Anisolemnia*, *Clitostethus*, *Coccinella*, *Diomus*, *Megalocaria*, *Micraspis*, *Nephus*, *Psyllobora*, *Rodolia*, *Scymnus* etc.). For example, 22 species of *Nephus* have been reported to occur in West Africa (KH), yet only 6 are represented in these collections.

This gap in taxonomic knowledge about lady beetles mirrors the situation seen in many other insect taxa in West Africa. The assessment of biodiversity in the region has been hampered historically by a lack of local taxonomic expertise, inaccessibility of scientific literature, rarity of reliable arthropod reference collections, limited scientific infrastructure and a lack of financial resources. Recent advances in systematics, especially in “cybertaxonomy,” now provide web-based taxonomic tools, diverse publication outlets and easy access to a wealth of digitised scientific resources including technical literature, high quality photographs, specimen data etc., thereby reducing the taxonomic impediment for researchers in places like West Africa. If coupled with strategic development of international, institutional collaborations to conduct biodiversity surveys and inventory projects, great progress could be made towards filling large taxonomic and geographical gaps in our knowledge of West African insects.

Acknowledgements

This work was made possible through the assistance of numerous volunteers and staff at various institutions. We are grateful to the following people for their kind assistance: Kyky Komla Ganyo (CERAAS/UCAD), team members of Grain de Sel Togo, Inc., Mawufe Agbodzavu and Mawuko Sokame (ICIPE), Mouhamadou M. Ndiaye (IFAN), Ghislain Tepa-Yotto and Francis Tchibozo (IITA), Philip Perkins (MCZ), Muriel Van Nuffel and Eliane De Coninck (MRAC), Floyd W. Shockley (NMNH), Ibrahima Dia (UEM/IPD), Demba Sarr (UGA), Edward R. Hoebeke (UGCA) and Johannes Frisch and Bernd Jaeger (ZMHB). We also thank Wioletta Tomaszewska and anonymous reviewers for their helpful comments and criticism on an earlier version of this manuscript.

This study was done in partial fulfillment of the senior author's Ph.D. dissertation requirements at the University of Georgia. The senior author wishes to thank his advisory committee members K.G. Ross, M.D. Toews and J.V. McHugh.

This project was supported by the following grants: Borlaug LEAP grant #016258-97 (to KH), H.H. Ross Fund grant (to KH), Fulbright Foreign Student Program Scholarship from Institute of International Education (to KH), Global Programs Graduate International Travel Award from the University of Georgia (to KH), West African Research Center (WARC) Travel Grant (to KH) and the Department of Entomology at the University of Georgia.

References

- Agounké D, Agricola U, Bokonon-Ganta HA (1988) *Rastrococcus invadens* Williams (Hemiptera: Pseudococcidae), a serious exotic pest of fruit trees and other plants in West Africa. Bulletin of Entomological Research 78 (4): 695-702. https://doi.org/10.1017/S0007485300015558
- Ali M, Ahmed K, Ali S, Raza G, Hussain I, Nafees MA, Anjum SI (2018) An annotated checklist of Coccinellidae with four new records from Pakistan (Coleoptera, Coccinellidae). Zookeys 803: 93-120. https://doi.org/10.3897/zookeys.803.22543
- Arnett R, Nishida G, Samuelson GA (1993) The insect and spider collections of the world. 2nd. Sandhill Crane Press, Inc., Gainesville, Florida, USA, 310 pp.
- Biranvand A, Tomaszewska W, Li W, Nicolas V, Shakarami J, Fekrat L, Hesami S (2017a) Review of the tribe Chilocorini Mulsant from Iran (Coleoptera, Coccinellidae). Zookeys 712: 43-68. https://doi.org/10.3897/zookeys.712.20419
- Biranvand A, Tomaszewska W, Nedvěd O, Khormizi MZ, Nicolas V, Canepari C, Shakarami J, Fekrat L, Fürsch H (2017b) Review of the tribe Hyperaspidini Mulsant (Coleoptera: Coccinellidae) from Iran. Zootaxa 4236 (2): 311-326. https://doi.org/10.11646/zootaxa.4236.2.6
- Chazeau J, Couturier G (1985) Coléoptères Coccinellidae de Côte d'Ivoire: la faune de la forêt de Taï. Revue Française d'Entomologie 7 (5): 309-330.
- Coleman C (2015) Taxonomy in times of the taxonomic impediment - Examples from the community of experts on amphipod crustaceans. Journal of Crustacean Biology 35: 729-740. https://doi.org/10.1163/1937240X-00002381
- Comité Inter-états de Lutte contre la Sécheresse dans le Sahel (2016) Landscapes of West Africa – A window on a changing world. U.S. Geological Survey. EROS, Garretson, SD, US. URL: https://eros.usgs.gov/westafrica/
- Coutanceau J (2008) Le genre *Harmonia* (Mulsant, 1846) (Coleoptera Coccinellidae). Harmonia 1: 4-16.
- de Carvalho M, Bockmann F, Amorim D, de Vivo M, de Toledo-Piza M, Menezes N, de Figueiredo J, McEachran J (2005) Revisiting the taxonomic impediment. Science 307 (5708). https://doi.org/10.1126/science.307.5708.353b
- Eizaguirre S (2007) Revisión de los coleópteros coccinélidos de las Islas Canarias (Coleoptera: Coccinellidae). Boletín Sociedad Entomológica Aragonesa 41: 101-118.

- Escalona H, Ślipiński SA (2012) Generic revision and phylogeny of Microweiseinae (Coleoptera: Coccinellidae). Systematic Entomology 37 (1): 125-171. https://doi.org/10.1111/j.1365-3113.2011.00601.x
- Escalona H, Zwick A, Li H, Li J, Wang X, Pang H, Hartley D, Jermiin L, Nedvěd O, Misof B, Niehuis O, Ślipiński A, Tomaszewska W (2017) Molecular phylogeny reveals food plasticity in the evolution of true ladybird beetles (Coleoptera: Coccinellidae: Coccinellini). BMC Evolutionary Biology 17 (151): 1-11. [In English]. https://doi.org/10.1186/s12862-017-1002-3
- Evenhuis N (2019) The insect and spider collections of the world website. http://hbs.bishopmuseum.org/codens/codens-inst.html. Accessed on: 2019-6-15.
- Fürsch H (1966) Die *Scymnus*-Arten Westafrikas (Col. Cocc.). Entomologische Arbeiten aus dem Museum G. Frey Tutzing bei München 17: 135-192.
- Fürsch H (1975) Mission entomologique du Musée Royal de l'Afrique Centrale aux Monts Uluguru, Tanzanie: 6. Coleoptera Coccinellidae. Revue Zoologique Africaine 89 (3): 723-731.
- Fürsch H (1979) Insects of Saudi Arabia. Coleoptera: Fam. Coccinellidae. Fauna of Saudi Arabia 1: 235-248.
- Fürsch H (1987) Die afrikanischen Vertreter der Gattungen *Micraspis*, *Declivitata* und *Xanthadalia*. Mitteilungen der Münchner Entomologische Gesellschaft 77: 5-31.
- Fürsch H (1991a) Annotated checklist of Coccinellidae from Senegal and Gambia. Coccinella 3 (1): 31-41.
- Fürsch H (1991b) Die Epilachnini Afrikas südlich der Sahara (Coleoptera: Coccinellidae). Zeitschrift für Entomologie 1 (3): 217-320.
- Fürsch H (1992) Coccinellids of the Kibale Forest Western Uganda: A comparison between virgin and managed sites. Tropical Zoology 5 (2): 155-166. https://doi.org/10.1080/03946975.1992.10539190
- Fürsch H (2002) The *Lemnia* species of the Aethiopic region Insecta Coleoptera. Faunistische Abhandlungen (Dresden) 1: 285-305.
- Fürsch H (2005) *Bulaea* Mulsant, 1850 and *Isora* Mulsant, 1950 Coleoptera Coccinellidae are synonymous. Entomologische Zeitschrift Stuttgart 115 (5): 227-232.
- GBIF Secretariat (2019) *Hippodamia variegata* (Goeze, 1777). GBIF Backbone Taxonomy. Checklist dataset accessed via GBIF.org on 2019-09-26. URL: https://www.gbif.org/species/1043082
- Giorgi JA, Vandenberg N, McHugh J, Forrester J, Ślipiński SA, Miller K, Shapiro L, Whiting M (2009) The evolution of food preferences in Coccinellidae. Biological Control 51 (2): 215-231. https://doi.org/10.1016/j.biocontrol.2009.05.019
- Gordon R (1985) The Coccinellidae (Coleoptera) of America North of Mexico. Journal of the New York Entomological Society 93 (1): i-iii, 1-912.
- Gordon R, González GF (2002) South American Coccinellidae (Coleoptera). Part IX: A systematic revision of *Scymnobius* Casey (Scymninae: Scymnini). Frustula Entomologica 25: 57-85.
- Gordon RD (1987a) The first North American records of *Hippodamia variegata* (Goeze) (Coleoptera: Coccinellidae). Journal of the New York Entomological Society 95 (2): 307-309.
- Gordon RD (1987b) A catalogue of the Crotch collection of Coccinellidae (Coleoptera). Occasional Papers on Systematic Entomology 3: 1-46.

- Gordon RD, Canepari C (2008) South American Coccinellidae (Coleoptera), Part XI: a systematic revision of Hyperaspidini (Hyperaspidinae). Annali del Museo Civico di Storia Naturale “G. Doria” 99: 245-512.
- Gropp R (2018) Specimens, collections, and tools for future biodiversity-related research. BioScience 68 (1): 3-4. https://doi.org/10.1093/biosci/bix155
- Heinrichs EA, Barrion AT (2004) Rice-feeding insects and selected natural enemies in West Africa: biology, ecology and identification. International Rice Research Institute (IRRI), Manila, 242 pp.
- Hodek I, Van Emden HF, Honek A (2012) Ecology and behaviour of the ladybird beetles (Coccinellidae). Wiley-Blackwell, Chichester, West Sussex; Hoboken, NJ, 600 pp. https://doi.org/10.1002/9781118223208
- Holmes M, Hammond T, Wogan GU, Walsh R, LaBarbera K, Wommack E, Martins F, Crawford J, Mack K, Bloch L, Nachman M (2016) Natural history collections as windows on evolutionary processes. Molecular Ecology 25 (4): 864-881. https://doi.org/10.1111/mec.13529
- Hounkpati K, Forrester J, McHugh J (2019) Neotype designation for *Rodolia iceryae* Janson in Ormerod, 1887 (Coleoptera: Coccinellidae). Zootaxa 4563 (2): 396-400. https://doi.org/10.11646/zootaxa.4563.2.12
- Iperti G (1999) Biodiversity of predaceous coccinellidae in relation to bioindication and economic importance. Agriculture, Ecosystems & Environment 74 (1): 323-342. https://doi.org/10.1016/S0167-8809(99)00041-9
- Jadwiszczak A, Węgrzynowicz P (2003) World Catalogue of Coccinellidae Part I — Epilachninae. Mantis, Olsztyn, 264 pp.
- Kabo-bah A, Diji C (2018) Sustainable Hydropower in West Africa: Planning, Operation, and Challenges. Academic Press, 232 pp. https://doi.org/10.1016/B978-0-12-813016-2.00013-7
- Klopper R, Smith G, Chikuni A (2002) The Global Taxonomy Initiative in Africa. Taxon 51 (1): 159-165. https://doi.org/10.2307/1554974
- Kobayashi N, Kumagai M, Minegishi D, Tamura K, Aotsuka T, Katakura H (2011) Molecular population genetics of a host-associated sibling species complex of phytophagous ladybird beetles (Coleoptera: Coccinellidae: Epilachninae). Journal of Zoological Systematics and Evolutionary Research 49 (1): 16-24. https://doi.org/10.1111/j.1439-0469.2010.00581.x
- Kovář I (2007) Coccinellidae. In: Löbl I, Smetana A (Eds) Catalogue of Palaearctic Coleoptera. Vol. 4. Elateroidea, Derodontoidea, Bostrichoidea, Lymexyloidea, Cleroidea, Cucujoidea. Apollo Books, Stentrup, 71–74, 568–630 pp.
- Łączyński P, Tomaszewska W (2012) *Chapinaria*, new genus of Chilocorini for *Endochilus meridionalis* Sicard from Africa (Coleoptera: Coccinellidae). Annales Zoologici 62: 1-9. https://doi.org/10.3161/000345412X633658
- Lakhal MA, Ghezali D, Nedvěd O, Doumandji S (2018) Checklist of ladybirds of Algeria with two new recorded species (Coleoptera, Coccinellidae). Zookeys 774: 41-52. https://doi.org/10.3897/zookeys.774.23895
- Li W, Huo L, Wang X, Chen X, Ren S (2016) The genera *Exochomus* Redtenbacher, 1843 and Parexochomus Barovsky, 1922 (Coleoptera: Coccinellidae: Chilocorini) from China, with descriptions of two new species. The Pan-Pacific Entomologist 91 (4): 291-304. https://doi.org/10.3956/2015-91.4.291

- Mader L (1941) Coccinellidae. I. Teil. Exploration du Parc National Albert. Mission G. F. de Witte (1933-1935) 34: 1-206.
- Mader L (1954) Coccinellidae. III. Teil. Exploration du Parc National Albert, Mission G.F. De Witte (1933–1935) 80: 1-208.
- Medler JT (1980) Insects of Nigeria: check list and bibliography. American Entomological Institute, Ann Arbor, vii, 919 pp.
- Mikula P, Csanády A, Hromada M (2018) A critical evaluation of the exotic bird collection of the Šariš Museum in Bardejov, Slovakia. Zookeys 776: 139-152. https://doi.org/10.3897/zookeys.776.24462
- Miller SE, Rogo L (2001) Challenges and opportunities in understanding and utilisation of African insect diversity. Cimbebasia 17: 197-218.
- Mohamed KA, Abdel-Hakam AE, Sherif FH, Mohammad MMB (2018) Taxonomical revision on certain species of subfamily Chilocorinae (Coleoptera: Coccinellidae) in Egypt. Academic Journal of Entomology 11 (1): 18-28. https://doi.org/10.5829/idosi.aje.2018.18.28
- Nattier R, Jourdan H, Mille C, Chazeau J (2015) An annotated checklist of the Coccinellidae (Coleoptera) from New Caledonia. Zootaxa 4058 (3): 301-331. https://doi.org/10.11646/zootaxa.4058.3.1
- Nedved O, Kovář I (2012) Phylogeny and classification. In: Hodek I, van Emden HF, Honek A (Eds) Ecology and behaviour of the ladybird beetles. 1-12 pp. https://doi.org/10.1002/9781118223208.ch1
- Nematollahi MR (2016) Datasheet reports on *Diuraphis noxia* (Russian wheat aphid). Unpublished https://doi.org/10.13140/RG.2.1.1156.8402
- Nicolas V (2013) Additif à la faune des coccinelles de Mayotte (Coleoptera, Coccinellidae). Harmomia, Coccinelles du Monde 10: 3-4.
- Ortiz R (2017) IITA: 50 years after, transforming Africa's agriculture and nourishing rural development. International Institute of Tropical Agriculture, Ibadan, Nigeria. URL: https://cgspace.cgiar.org/handle/10568/83011
- Paulian R, Descarpentries A, Quentin RM (1983) André Villiers (1915-1983). L'Entomologiste 39 (4): 151-208.
- Poorani J (2002) An annotated checklist of the Coccinellidae (Coleoptera) (excluding Epilachninae) of the Indian Subregion. Oriental Insects 36 (1): 307-383. https://doi.org/10.1080/00305316.2002.10417335
- Riddick WE (2017) Identification of Conditions for Successful Aphid Control by Ladybirds in Greenhouses. Insects 8 (2). https://doi.org/10.3390/insects8020038
- Robertson J, Ślipiński SA, Moulton M, Shockley F, Giorgi A, Lord N, McKenna D, Tomaszewska W, Forrester J, Miller K, Whiting M, McHugh J (2015) Phylogeny and classification of Cucujoidea and the recognition of a new superfamily Coccinelloidea (Coleoptera: Cucujiformia). Systematic Entomology 40 (4): 745-778. https://doi.org/10.1111/syen.12138
- Sæthre MG, Godonou I, Hofsvang T, Tepa-Yotto GT, James B (2011) Aphids and their natural enemies in vegetable agroecosystems in Benin. International Journal of Tropical Insect Science 31 (1/2): 103-117. https://doi.org/10.1017/S1742758411000191
- Samways M, Osborn R, Hastings H, Hattingh V (1999) Global climate change and accuracy of prediction of species' geographical ranges: Establishment success of introduced ladybirds (Coccinellidae, *Chilocorus* spp.) worldwide. Journal of Biogeography 26 (4): 795-812. https://doi.org/10.1111/j.1365-2699.1999.00318.x

- Scholtz CH, Mansell MW (2017) Insect biodiversity in the Afrotropical Region. In: Foottit RG, Adler PH (Eds) Insect Biodiversity. 1. USA, 16 pp. https://doi.org/10.1002/9781118945568.ch5
- Seago A, Giorgi JA, Li J, Ślipiński SA (2011) Phylogeny, classification and evolution of ladybird beetles (Coleoptera: Coccinellidae) based on simultaneous analysis of molecular and morphological data. Molecular Phylogenetics and Evolution 60 (1): 137-151. https://doi.org/10.1016/j.ympev.2011.03.015
- Shah MA, Khan AA (2014) Qualitative and quantitative prey requirements of two aphidophagous coccinellids, Adalia tetraspilota and *Hippodamia variegata*. Journal of Insect Science 14: 72-72. https://doi.org/10.1093/jis/14.1.72
- Ślipiński A, Tomaszewska W (2010) Coccinellidae Latreille, 1802. In: Leschen RA, Beutel RG, Lawrence JF (Eds) Handbook of Zoology. Arthropoda: Insecta. Coleoptera, Beetles, Volume 2: Morphology and systematics (Elateroidea, Bostrichiformia, Cucujiformia partim). Walter de Gruyter GmbH & Co. KG, Berlin/New York, 454– 472 pp.
- Ślipiński SA (2007) Australian ladybird beetles (Coleoptera: Coccinellidae). Their biology and classification. Australian Biological Resources Study, Canberra, ACT, 286 pp.
- Ślipiński SA, Pang H, Booth R (2012) Revision of the Australian Coccinellidae (Coleoptera) Part 8. Genus *Scymnus* Kugelann. Annales Zoologici 62 (4): 679-704. https://doi.org/10.3161/000345412x659731
- Suarez A, Tsutsui N (2004) The value of museum collections for research and society. BioScience 54 (1): 66-74. https://doi.org/10.1641/0006-3568(2004)054[0066:TVOMCF]2.0.CO;2
- Szawaryn K, Bocak L, Ślipiński SA, Escalona H, Tomaszewska W (2015) Phylogeny and evolution of phytophagous ladybird beetles (Coleoptera: Coccinellidae: Epilachnini), with recognition of new genera. Systematic Entomology 40 (3): 547-569. https://doi.org/10.1111/syen.12121
- Thomson S, Pyle R, Ahyong S, Alonso-Zarazaga M, Ammirati J, Araya JF, Ascher J, Audisio TL, Azevedo-Santos V, Bailly N, Baker W, Balke M, Barclay ML, Barrett R, Benine R, Bickerstaff JM, Bouchard P, Bour R, Bourgoin T, Boyko C, Breure AH, Brothers D, Byng J, Campbell D, Ceríaco LP, Cernák I, Cerretti P, Chang C, Cho S, Copus J, Costello M, Cseh A, Csuzdi C, Culham A, D'Elía G, d'Udekem d'Acoz C, Daneliya M, Dekker R, Dickinson E, Dickinson T, van Dijk PP, Dijkstra K, Dima B, Dmitriev D, Duistermaat L, Dumbacher J, Eiserhardt W, Ekrem T, Evenhuis N, Faille A, Fernández-Triana J, Fiesler E, Fishbein M, Fordham B, Freitas AL, Friol N, Fritz U, Frøslev T, Funk V, Gaimari S, Garbino GT, Garraffoni AS, Geml J, Gill A, Gray A, Grazziotin F, Greenslade P, Gutiérrez E, Harvey M, Hazevoet C, He K, He X, Helfer S, Helgen K, van Heteren A, Hita Garcia F, Holstein N, Horváth M, Hovenkamp P, Hwang WS, Hyvönen J, Islam M, Iverson J, Ivie M, Jaafar Z, Jackson M, Jayat JP, Johnson N, Kaiser H, Klitgård B, Knapp D, Kojima J, Kõljalg U, Kontschán J, Krell F, Krisai-Greilhuber I, Kullander S, Latella L, Lattke J, Lencioni V, Lewis G, Lhano M, Lujan N, Luksenburg J, Mariaux J, Marinho-Filho J, Marshall C, Mate J, McDonough M, Michel E, Miranda VO, Mitroiu M, Molinari J, Monks S, Moore A, Moratelli R, Murányi D, Nakano T, Nikolaeva S, Noyes J, Ohl M, Oleas N, Orrell T, Páll-Gergely B, Pape T, Papp V, Parenti L, Patterson D, Pavlinov IY, Pine R, Poczai P, Prado J, Prathapan D, Rabeler R, Randall J, Rheindt F, Rhodin AJ, Rodríguez S, Rogers DC, Roque F, Rowe K, Ruedas L, Salazar-Bravo J, Salvador R, Sangster G, Sarmiento C, Schigel D, Schmidt S, Schueler F, Segers H, Snow N, Souza-Dias PB, Stals R, Stenroos S, Stone RD, Sturm C, Štys P, Teta P,

Thomas D, Timm R, Tindall B, Todd J, Triebel D, Valdecasas A, Vizzini A, Vorontsova M, de Vos J, Wagner P, Watling L, Weakley A, Welter-Schultes F, Whitmore D, Wilding N, Will K, Williams J, Wilson K, Winston J, Wüster W, Yanega D, Yeates D, Zaher H, Zhang G, Zhang Z, Zhou H (2018) Taxonomy based on science is necessary for global conservation. PLOS Biology 16 (3). https://doi.org/10.1371/journal.pbio.2005075

- Tomaszewska W, Ślipiński SA (2013) Revision of the genera *Erithionyx* Blackburn and *Wioletta* Ślipiński (Coleoptera: Coccinellidae: Coccidulini). Australian Journal of Entomology 52: 87-100. https://doi.org/10.1111/aen.12002
- Tomaszewska W, Szawaryn K (2013) Revision of the Asian species of *Afidentula* Kapur, 1958 (Coleoptera: Coccinellidae: Epilachnini). Zootaxa 3608 (1): 26-50. https://doi.org/10.11646/zootaxa.3608.1.2
- Tomaszewska W, Szawaryn K (2016) Epilachnini (Coleoptera: Coccinellidae)—A revision of the world genera. Journal of Insect Science 16 (1): 1-91. https://doi.org/10.1093/jisesa/iew082
- United Nations (2014) Map No. 4533: Map of West Africa. Department of Field Support, Cartographic Section. http://www.un.org/depts/Cartographic/map/profile/westafrica.pdf. Accessed on: 2019-2-15.

Endnotes

*1 This record is based on two specimens collected by R. Borowka on 12 AUG 1992 Citrus mussel scale in Chipata, Zambia. They were originally identified as " *Chilocorus serangium* Kunowi".

*2
This was treated as subspecies of *Exochomus nigrifrons* Gerstäcker, 1871 by Mader (1954: 88) (*Brumus nigrifrons nigerianus* Korschefsky). *Brumus nigrifrons nigerianus* was misspelled. Species of the genus *Brumus* Mulsant, 1850 were transferred to *Exochomus* Redtenbacher, 1843.

*3 This record is based on a single specimen determined as "*Cydonia intermedia* Cramer" by Mader. The holotype for this species is from Abyssinia, now Ethiopia.

*4 This is probably a *nomen nudum*.

Figure 1.

Photos of the two largest West African insect museums: **a.** IFAN, outside view of the museum; **b.** IFAN, inside view of the museum showing insect boxes; **c.** IITAB, outside view of the museum; **d.** IITAB, inside view of the museum showing insect cabinets and drawers.

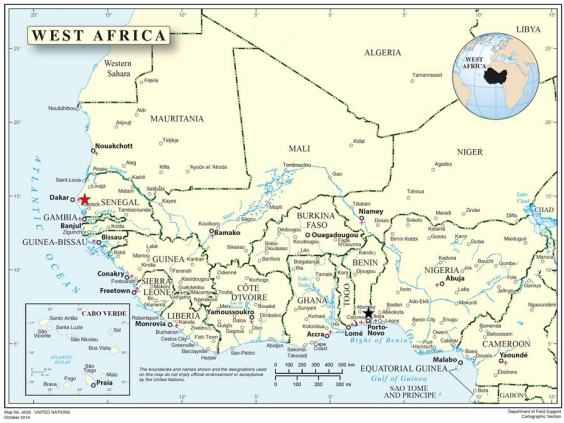

Figure 2.

Map of West Africa (United Nations 2014).

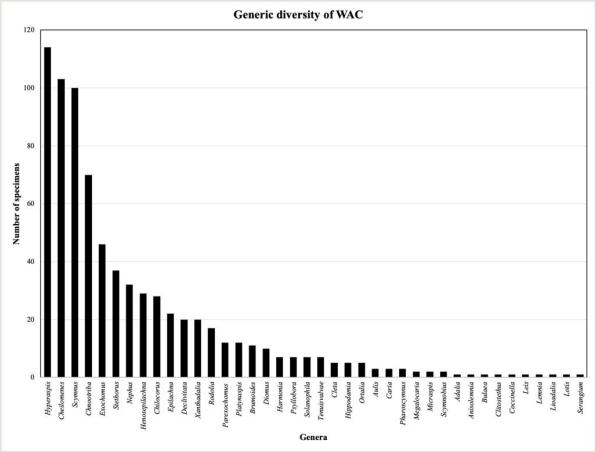

Figure 3.

Generic-level specimen representation in the IFAN and IITAB Collections.

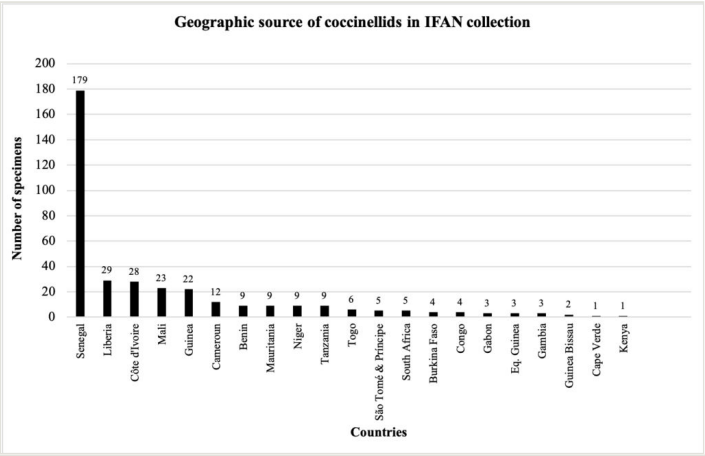

Figure 4.

Geographic source of coccinellid specimens in the IFAN Collection.

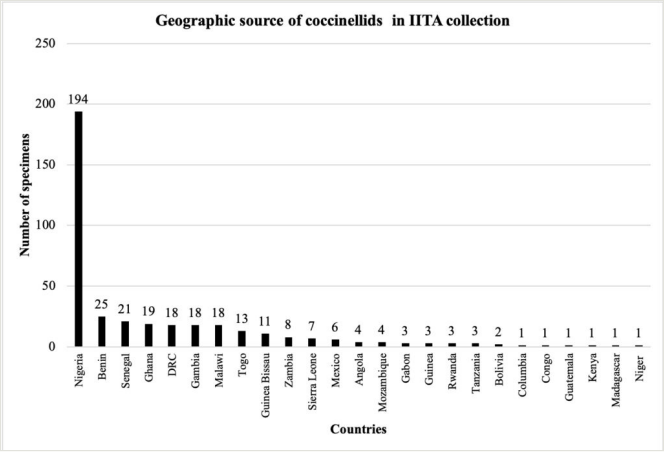

Figure 5.

Geographic source of coccinellid specimens in the IITAB Collection.

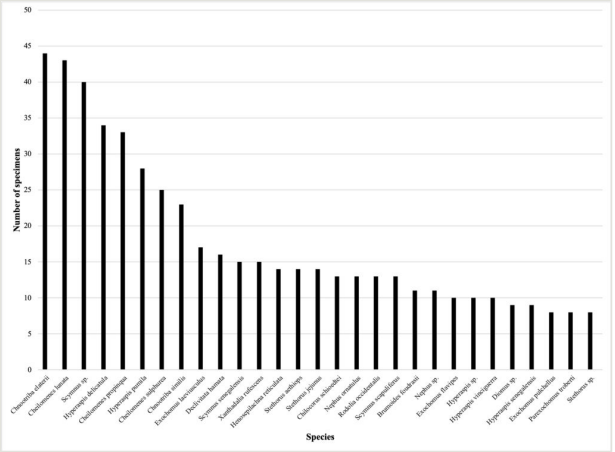

Figure 6.

Specific-level specimen representation of coccinellid holdings of the IFAN and IITAB Collections

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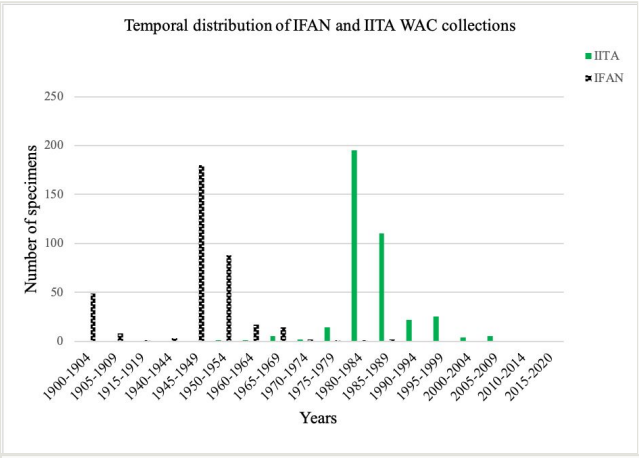

Figure 7.

Temporal distribution of IFAN and IITAB collection of coccinellids.

Table 1.

Updated list of coccinellid holdings of the IFAN and IITAB collections, where: **a***: present at IFAN, but not from West African locality, **b***: present at IITAB, but not from West Africa locality, **a**: present at IFAN, West African source, **b**: present at IITAB, West African source and **ab**: in both museums. The current list is limited to specific rank only. Subspecies and aberrations are mentioned only if they were found on specimen determination labels.

Taxon	Collection localities	Referen
Family Coccinellidae Latreille, 1807		
Subfamily Microweiseinae Leng, 1920		
Tribe Serangiini Pope, 1962		
Serangium kunowi Weise, 1892*[1]	Zambia[b*]	Escalon Ślipińsk
Subfamily Coccinellinae Latreille, 1807		
Tribe Chilocorini Mulsant, 1846		
Brumoides foudrasii (Mulsant, 1850)	Benin[b], Gambia[b], Guinea[b], Nigeria[b], Senegal[a]	Mader 1
= *Exochomus foudrasii* Mulsant, 1850		
Chilocorus distigma (Klug, 1835)	Mozambique[b*], Nigeria[b], Senegal[a]	
Chilocorus dorhni Mulsant, 1850	Senegal[a]	
Chilocorus schioedtei Mulsant, 1850	Benin[ab], Cameroon[a*], Ghana[b*], Guinea[a], Nigeria[b], Senegal[a]	Chazea Couturie Samway
= *Chilocorus discoideus* Crotch, 1874		
Chilocorus simoni Sicard, 1907	South Africa[ab*]	
Exochomus flavipes (Thunberg, 1781)	Gabon[b], Madagascar[b*], Nigeria[b], Senegal[a]	
Exochomus laeviusculus Weise, 1909	Benin[a], Côte d'Ivoire[a], Guinea[a], Mali[a], Mauritania[a], Senegal[a], Togo[a]	
Exochomus nigrifrons Gerstäcker, 1871*[2]	Mali[a], Senegal[ab]	Biranva 2017a, and To 2012
= *Brumus nigrifrons* Gerstäcker, 1871		
= *Brumus fulviventris* Fairmaire, 1884		
= *Brumus trivittatus* Weise, 1891		
= *Brumus nigeriana* Korschefsky, 1938		
= *Brumus nigrifrons nigerianus* Korschefsky, 1938		
Parexochomus nigripennis (Erichson, 1843)	Mali[a], Senegal[a]	Biranva 2017b, Kovář 2
= *Exochomus nigripennis* (Erichson, 1843)		
= *Exochomus nigromaculatus nigripennis* Crotch, 1874		

Exochomus pulchellus Gerstäcker, 1871	Gambia[b], Niger[a], Rwanda[b*], Senegal[a]	
Exochomus troberti Mulsant, 1850	Burkina Faso[a], Nigeria[b], Senegal[a]	Hodek e
= *Exochomus flavipes troberti* Mulsant, 1850		Mohame
		, Kovář
Tribe Coccidulini Mulsant, 1846		
= Scymnini Mulsant, 1846		
= Exoplectrini Crotch, 1874		
Aulis annexa Mulsant, 1850	Senegal[a]	
Clitostethus flavotestaceus Mader, 1955	Senegal[a]	
Nephus flavomaculatus Fürsch, 1966	Benin[b], Nigeria[b]	
Nephus vetustus Weise, 1915	Gabon[b], Nigeria[b]	
Nephus phenacoccophagus Fürsch, 1987	Nigeria[b]	
Nephus kamburovi Fürsch, 1992	Malawi[b*]	
Nephus oblongosignatus Mulsant, 1850	Tanzania[b*]	
Nephus ornatulus Korschefsky, 1931	DRC[b*], Ghana[b], Nigeria[b], Rwanda[*], Senegal[b], Sierra Leone[b], Togo[b]	Fürsch
= *Scymnus ornatulus* Korschefsky, 1931		
Nephus sudanicus Weise, 1925	Mauritania[a]	
Scymnobius bilucernarius (Mulsant, 1850)	Mexico[b*]	Gordon
= *Nephus bilucernarius* (Mulsant, 1850)		Gonzále
Scymnus canariensis Wollaston, 1864	São Tome and Principe[a*], Senegal[a]	
Scymnus casstroemi Mulsant, 1850	Guinea[a], Senegal[a]	
Scymnus gnavus Weise, 1895	Guinea[a]	
Scymnus kibonotensis Weise, 1910	Côte d'Ivoire[a], Guinea[a], Nigeria[b]	
Scymnus levaillanti Mulsant, 1850	Nigeria[b], Malawi[b*]	
Scymnus pruinosus Weise, 1895	Zambia[b*]	
Scymnus monroviae Casey, 1899	Benin[a], Côte d'Ivoire[a], Guinea[a], Niger[a], Senegal[a], Togo[a]	
Scymnus nigrosellatus Mader, 1950	Zambia[b*]	
Scymnus quadrivittatus Mulsant, 1850	Nigeria[b]	
Scymnus rubiginosus Mader, 1950	Côte d'Ivoire[a], Guinea[a], Senegal[a]	
Scymnus scapuliferus Mulsant, 1850	Benin[a], Côte d'Ivoire[a], Guinea[b], Nigeria[b], Madagascar[b*], Senegal[a], Togo[a]	
Scymnus schoutedeni Mader, 1950	Senegal[a]	

Scymnus senegalensis Mader, 1955	Côte d'Ivoire[a], Gambia[a], Guinea[a], Mali[a], Mauritania[a], São Tome and Principe[a], Senegal[a]	
Scymnus villiersi Mader, 1955	Niger[a], Senegal[a]	
Stethorus aethiops Weise, 1899	Benin[b], Ghana[b], Guinea-Bissau[b], Mozambique[b*], Nigeria[b], Sierra Leone[b], Tanzania[b*]	
Stethorus endroedyi Fürsch, 1970	Malawi[b*]	
Stethorus jejunus Casey, 1899	Ghana[b], Nigeria[b], Mozambique[b*], Tanzania[b*]	
Tribe Coccinellini Latreille, 1807		
Adalia bipunctata (Linnaeus, 1758)	Cameroon[a*]	
Anisolemnia decempustulata Weise, 1888	Togo[a]	Chazeau
= *Anisolemnia 10-pustulata* Weise, 1888		Couturie
		Mader 1
Bulaea anceps (Mulsant, 1850)	Mozambique[b*]	Fürsch
= *Isora circularis* Mader, 1941		
Caria welwitschii Crotch, 1874	Guinea[a]	
Cheilomenes aurora Gerstäcker 1871	Tanzania[a*]	Fürsch
= *Cydonia aurora* Gerstäcker, 1871		
Cheilomenes lunata (Fabricius, 1775)	Benin[a], Burkina Faso[a], Cameroon[a*], Côte d'Ivoire[a], Gabon[a*], Gambia[a], Guinea[a], Guinea-Bissau[a], Liberia[a], Mali[a], Senegal[a], West Africa[a], South Africa[a*], Tanzania[a*]	Fürsch
= *Cydonia lunata* (Fabricius, 1775)		
= *Cydonia lunata vulpina* (Fabricius, 1798)		
= *Cydonia lunata vulpiphursa* Olivier, 1791		
Cheilomenes sulphurea (Olivier, 1791)	Angola[b*], Cameroon[a*], Côte d'Ivoire[a], Democratic Republic of Congo (DRC)[b*], Gabon[b*], Ghana[b], Nigeria[b], Malawi[b*], Rwanda[b*], Senegal[a]	Eizaguir
= *Cheilomenes orbicularis* Casey, 1899		
= *Cheilomenes sulphurea sulphurea* (Olivier, 1791)		
Cheilomenes propinqua (Mulsant, 1850)	Côte d'Ivoire, Gabon[b*] , Guinea-Bissau[ab], Mali[a], Mauritania[a], Niger[a], Nigeria[b], Senegal[ab]	Eizaguir
= *Cheilomenes vicina* (Mulsant, 1850)		Fürsch
= *Cydonia vicina* Mulsant, 1850		
= *Cheilomenes vicina vicina* Mulsant, 1850		
=*Cheilomenes propinqua vicina* Mulsant, 1850		
Cheilomenes quadrilineata (Mulsant, 1850)	Senegal[a]	
= *Cydonia 4-lineata* Mulsant, 1850		
Coccinella intermedia (Crotch, 1874)	São Tome and Principe [a*]	Gordon
= *Lioadalia intermedia* Crotch, 1874*[3]		Nemato

= "*Cydonia intermedia*" Cramer		
Coccinella septempunctata Linnaeus, 1758	Cape Verde[a]	
Declivitata hamata (Thunberg, 1808)	Senegal[a]	Fürsch
= *Alesia hamata* (Mulsant, 1850)		
= *Micraspis striata* (Crotch, 1874)		
= *Alesia striata* (Gemminger & Harold, 1876)		
= *Alesia striata hamata* (Weise, 1898)		
= *Declivitata hamata* Fürsch, 1964		
Declivitata uncifera Fürsch, 1967	Cameroon[a*], DRC[b*], Guinea-Bissau[b]	
Harmonia vigintiduomaculata (Fabricius, 1792)	Benin[b], Liberia[a], Nigeria[b], Togo[b]	Coutanc
= *Stictoleis vigintiduomaculata* (Fabricius, 1792)		
= *Stictoleis 22-maculata* (Fabricius, 1792)		
Hippodamia variegata (Goeze, 1777)	Colombia[b*], Nigeria[b], Senegal[b], Tanzania[a*]	GBIF Se 2019, G
= *Adonia variegata* (Goeze, 1777)		
Lemnia machadoi Mader, 1952	Cameroon[a]	Fürsch
= *Dysis sicardi* Mader, 1954		
Megalocaria dilatata (Fabricius, 1775)	Benin[b]	Hodek e Poorani
= *Anisolemnia dilatata* (Fabricius, 1775)		
Micraspis lineola (Fabricius, 1775)	Togo[b]	Nattier e Ślipińsk
= *Alesia lineola* (Fabricius, 1775)		
Micraspis striata (Fabricius, 1792)	Côte d'Ivoire[a], Gabon[b*], Guinea[a], São Tome and Principe[a], Senegal[a*]	Kovář 2 2007
= *Alesia striata* (Fabricius, 1792)		
Psyllobora bisoctonotata (Mulstant, 1850)	Senegal[a]	Ali et al.
Psyllobora lutescens (Crotch, 1874)	Guatemala[b*]	
Psyllobora variegata (Fabricius, 1781)	South Africa[a*]	Nicolas
= *Thea variegata* (Fabricius, 1781)		
Xanthadalia effusa (Erichson, 1843)	Benin[b], DRC[a]	
Xanthadalia rufescens Mulsant, 1850	Benin[b], Mali[a], Mauritania[a], Senegal[a]	Fürsch
Tribe Diomini Gordon, 1999		
Diomus hennesseyi Fürsch, 1987	Nigeria[b]	
Tribe Epilachnini Mulsant, 1846		

Chnootriba elaterii (Rossi, 1794)	Benin[a], Côte d'Ivoire[a], Gambia[a], Guinea[a], Liberia[a], Mali[a], Mauritania[a], Nigeria[b], São Tome and Principe[a*], Senegal[a]	Hodek e Jadwisz Węgrzy Tomasz Szawary
= *Henosepilachna elaterii* (Rossi, 1794)		
= *Epilachna chrysomelina* (Fabricius, 1775)		
= *Epilachna chrysomelina manca* Mader, 1929		
= *Henosepilachna elaterii voltaensis senegalensis* Fürsch, 1964		
Chnootriba hirta (Thunberg, 1781)	Guinea[a], Tanzania[a*]	Tomasz Szawary
= *Henosepilachna hirta* (Thunberg, 1781)		
= *Epilachna hirta* (Thunberg, 1781)		
Chnootriba similis (Thunberg, 1781)	Benin[a], Burkina Faso[a], Côte d'Ivoire[a], DRC[a*], Guinea[a], Liberia[a], Nigeria[b], Senegal[a]	Chazeau Couturie Jadwisz Węgrzy Tomasz Szawary
= *Chnootriba assimilis* Mulsant, 1850		
= *Chnootriba similis* ab. *repanda* Sicard, 1930		
Cleta punctipennis (Mulsant, 1850)	Togo[ab]	Tomasz Szawary
= *Epilachna punctipennis* Mulsant, 1850		
Cleta sahlbergi (Mulsant, 1850)	Côte d'Ivoire[a], Kenya[a*]	Szawary , Tomas Szawary
= *Solanophila sahlbergi* Mulsant, 1850		
Epilachna bissexguttata Weise, 1895	Côte d'Ivoire[a], DRC[a*], Mali[a], Niger[a], Senegal[a]	Jadwisz Węgrzy
= *Epilachna monticola* Weise, 1899		
= *Solanophila monticola* Weise, 1898		
Epilachna bomparti Mulsant, 1850	Liberia[a], Senegal[a]	
Epilachna colorata Mulsant, 1850	Cameroon[a*], Liberia[a]	Jadwisz Węgrzy
= *Epilachna subsignata* Mulsant, 1895		
= *Solanophila subsignata* Mulsant, 1895		
= *Solanophila elliptica* Weise, 1912		
Epilachna iocosa (Mader, 1941)	South Africa[a*]	Jadwisz Węgrzy
= *Solanophila 20-punctata* Mader, 1941		
Epilachna nigritarsis Mulsant, 1850	Cameroon[a*], Liberia[a]	Jadwisz Węgrzy
= *Epilachna impatiens* Fürsch, 1960		
Epilachna vigintipunctata Mulsant, 1850	Liberia[a], Tanzania[a*], Togo[a]	Jadwisz Węgrzy
= *Epilachna punctipennis multinotata* Gerstäcker, 1873		

Henosepilachna atropos (Sicard, 1912)	Equatorial Guinea[a*], Senegal[a]	Jadwisz Węgrzy
= *Epilachna atropos* Sicard, 1912		
Henosepilachna bisseptemnotata (Mulsant, 1853)	Tanzania[a*]	Jadwisz Węgrzy
= *Epilachna bisseptemnotata* Mulsant, 1853		
Henosepilachna clavareaui (Weise, 1901)	Benin[a]	Fürsch
= *Epilachna clavareaui* Weise, 1901		
Henosepilachna ertli (Weise, 1906)	Côte d'Ivoire[a], Liberia[a]	Jadwisz Węgrzy
= *Epilachna ertli* Weise, 1906		
Henosepilachna fulvosignata (Reiche, 1847)	Côte d'Ivoire[a]	Fürsch
Henosepilachna moseri (Weise, 1903)	Equatorial Guinea[a*]	Jadwisz Węgrzy
= *Epilachna moseri* Weise, 1903		
Henosepilachna reticulata (Olivier 1791)	Benin[b], Mali[a], Niger[b], Nigeria[b], Senegal[a]	Jadwisz Węgrzy Heinrich 2004
= *Epilachna reticulata* (Olivier 1791)		
Henosepilachna simplex (Weise, 1895)	Liberia[a]	Jadwisz Węgrzy
= *Epilachna simplex* Weise, 1895		
Solanophila canina (Fabricius, 1781)	Guinea[a]	
Solanophila dregei (Mulsant, 1850)	Côte d'Ivoire[a]	Tomasz Szawary
= *Epilachna dregei* Mulsant, 1850		
Solanophila scalaris (Gerstäcker, 1871)	Tanzania[a*]	Mader 1
= *Epilachna scalaris* (Gerstäcker, 1871)		
Tribe Hyperaspini Mulsant, 1846		
Hyperaspis aestimabilis Mader, 1955	Angola[b*], DRC[b*], Malawi[b*], Zambia[b*]	
Hyperaspis centralis Mulsant, 1850	Mexico	
Hyperaspis delicatula (Mulsant, 1850)	Benin[b], Gambia[b], Ghana[b], Guinea-Bissau[b], Nigeria[b], Malawi[b*], Sénégal[b], Sierra Leone[b], Togo[b]	
Hyperaspis lugubris (Randall, 1838)	Ghana[b], Nigeria[b]	Gordon
= *Hyperaspis jucunda* LeConte, 1852		
Hyperaspis maindroni (Sicard, 1929)	Mauritania[a], Niger[a], Senegal[a]	Biranvar 2017b,
Hyperaspis merckii (Mulsant, 1850)	Mauritania[a], Senegal[a]	

Hyperaspis pumila Mulsant, 1850	Gambia[b], Guinea[b], Guinea-Bissau[b], Niger[a], Nigeria[b], Senegal[b], Togo[b]	Biranvar 2017b
Hyperaspis senegalensis (Mulsant, 1850)	Gambia[b], Ghana[b], Nigeria[b], Senegal[b], Sierra Leone[b], Malawi[b*]	
Hyperaspis sericea Fürsch, 1972	Malawi[b*]	
Hyperaspis vinciguerra Capra, 1929	Gambia[b], Senegal[b], Malawi[b*]	
Tenuisvalvae notata (Mulsant, 1850)	Benin[b], Bolivia[b*], Nigeria[b]	Gordon 2008
= *Hyperaspis notata* Crotch, 1874)		
Tribe Ortaliini Mulsant, 1850		
Ortalia ovulum Weise, 1898	Liberia[a], Mali[a], Togo[b]	
Tribe Noviini Mulsant, 1846		
Rodolia cardinalis (Mulsant, 1850)	Kenya[b*]	
Rodolia iceryae Janson in Ormerod, 1887	Senegal[a]	Hounkpa
= *Rodolia iceryae* Janson, 1887		
= *Rodolia obscura* Weise, 1898		
Rodolia occidentalis Weise, 1898	Benin[a], Ghana[a], Nigeria[a], Senegal[ab]	
Rodolia senegalensis Weise, 1913	Senegal[a]	
Tribe Platynaspini Mulsant, 1846		
Platynaspis capicola Crotch, 1874	DRC[b*], Malawi[b*]	
Platynaspis ferruginea Weise, 1895	Benin[b], Togo[b]	
Platynaspis kollari Mulsant, 1850	Liberia[a]	
Platynaspis obscura Gorham, 1901	Côte d'Ivoire[a], Liberia[a]	
Platynaspis pilosa Sicard, 1930	South Africa[a*]	
Platynaspis rufipennis Gerstäcker, 1871	Côte d'Ivoire[a], Liberia[a], Niger[a]	
Platynaspis vittigera Weise, 1895	DRC[b*]	
Tribe Sticholotidini Weise, 1901		
Pharoscymnus sexguttatus (Gyllenhall, 1808)	Ghana[b]	
Nomen nudum		
"*Leis maculata*"*[4]	Côte d'Ivoire[a]	