TRANSACTIONS AMERICAN ENTOMOLOGICAL SOCIETY

RESEARCH ARTICLE

TAES 143:501-510
ISSO 0002-8320
http://taes.entomology-aes.org/

Geographic distribution of the African weaver ant, *Oecophylla longinoda*

JAMES K WETTERER

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

ABSTRACT

African weaver ants, *Oecophylla longinoda* (Latreille, 1802), are conspicuous arboreal ants, well known in the humid tropics of Africa. Weaver ants build large distinctive nest structures in trees by binding together clusters of leaves using a silk-like substance. Although many regard weaver ants as pests due to their bite, local people also use weaver ants for food, medicine, and as biological control agents. Here, I mapped the geographic distribution of *O. longinoda* based on >500 site records from 34 countries: Angola, Benin, Burkina Faso, Burundi, Cameroon, Central African Republic, Congo-Brazzaville, Congo-Kinshasa, Equatorial Guinea, Ethiopia, Gabon, Gambia, Ghana, Guinea, Guinea-Bissau, Ivory Coast, Kenya, Liberia, Malawi, Mali, Mozambique, Niger, Nigeria, Rwanda, Sao Tomé and Principe, Senegal, Sierra Leone, South Africa, South Sudan, Tanzania, Togo, Uganda, Zambia, and Zimbabwe. The documented range of *O. longinoda* is confined almost entirely within areas with Tropical (Group A) climates as defined by the Köppen-Geiger system: rainforest (Af), monsoon (Am), and savanna (Aw). This range map based on site records corrects inaccuracies in earlier published range maps, and allows prediction of areas where *O. longinoda* might be expected to occur, but it has not yet been reported.

Key words: biocontrol, biogeography, entomophagy, geographic range, tailor antPage Break

INTRODUCTION

Weaver ants (*Oecophylla* spp.) are conspicuous arboreal ants, well known in the humid tropics of Africa, Asia, Australia, and the Western Pacific. Weaver ants build large distinctive nest structures in trees by binding together bunches of leaves using a silk-like substance secreted by the larvae. Groups of *Oecophylla* workers hold the leaves together while other workers move the silk-producing larvae back and forth across the gap, effectively weaving the leaves together. Weaver ant colonies are polydomous (i.e., having multiple nests), with each nest being about 5-30 cm in diameter. Hölldobler (1979) found that colonies can have hundreds of nests spread across as many as 17 trees over a 1600 m^2 area. The name *Oecophylla* derives from the Greek: oikos (house) and phyllo (leaf).

Many people regard weaver ants as pests due to their bite. In many regions, however, people use weaver ants for food, medicine, and/or as biological control agents. *Oecophylla* workers show much geographic variation in color. Their morphology, behavior, and nest construction, however, are so distinctive that they can be easily identified through written accounts and from photographs. There are currently two currently recognized species of weaver ants: *Oecophylla smaragdina* (Fabricius, 1775) in Asia, Australia, and the Western Pacific, and *Oecophylla longinoda* (Latreille, 1802) in Africa.

Melville (1849) gave an early account of *O. longinoda* around her home in Freetown, Sierra Leone: “Many of the trees as well as the bush

Publication date: 25 May 2017

are infested too with large red ants, that make their nests of the leaves. Clusters of these glued-up leaves, covered over with their industrious tenants, hang from every branch, disfiguring the unfortunate tree more than can be described. The waspish nature of the insects themselves deters me from making a minute examination of their houses, which seem to be very ingeniously constructed. When one of the nests receives a sharp thrust from a walking-stick, the ants sally forth in great wrath, and some march determinedly up to the top of the aggressing cane, evincing their soldier-like disposition by sundry sharp bites on the hand which conducted the attack. The bite is not venomous, nor so painful as the sting of a bee, yet it is severe enough; and woe to the adventurous climber who ascends an orange-tree inhabited by these ants, for in an instant he is assailed by them in myriads!"

In many regions, weaver ants are eaten as a delicacy and serve as a source of traditional medicine. For example, Melville (1849) wrote that in Sierra Leone a local woman, "told me that in her country they take the red ants' nests, open them, and drink the white water inside for 'cough medicine' ... "what she called the 'cough water' ... was actually the ant in its grub state!" In Mbandaka, Congo-Kinshasa, locals consume both adult and larval weaver ants (Chinn 1945). In Cameroon, the Bafia, Bamileke, Eton, and Ewondo people consume weaver ants as an aphrodisiac (Van Huis 2003).

Weaver ants are so conspicuous and recognizable that they have common names throughout their range. Common names for *O. longinoda* include African weaver ant, tailor ant, sewing ant, red tree ant, red ant, fourmi fileuse (French), fourmi tisserande (French), oecophylle (French), wevermier (Dutch), Weberameise (German), papa-mel (Portuguese), and formiga-tecelã (Portuguese). In Tanzania, *O. longinoda* is called mangongongo in Wamwera and malumila or majimoto in Swahili (Cashewnut Board of Tanzania 2008). In Benin, farmers call the weaver ant tantanpouro and cocombissi in the local languages of Bariba and Dendi (Sinzogan et al. 2008). In Malawi, *O. longinoda* is called mzukira and msuchila in the Chichewa language (Morris 2004). In Mali, the Bambara name for *O. longinoda* is kowulu, meaning dog of the lowlands, a name which "hints to the perceived aggressive nature of the ants and their preference for the more humid valley bottoms" (Van Mele et al. 2009).

Numerous papers on weaver ants (Cole and Jones 1948, Lokkers 1986, Azuma et al. 2002, 2006, Dlussky et al. 2008, Crozier et al. 2010) include crude range maps. Here, I document in detail the known geographic distribution of the African weaver ant, *Oecophylla longinoda* (Fig. 1). I used information of climate to infer ecological requirements of *O. longinoda*.

METHODS

Although there have been several local varieties described within *Oecophylla longinoda*, these names have not been applied in any consistent manner, and the status of these taxa are unclear. Therefore, I treat all *Oecophylla* records from Africa as *O. longinoda*.

I obtained unpublished *O. longinoda* site records from museum specimens in the collections of the Smithsonian Institution and through personal communications from S. Vasconcelos (Guinea-Bissau), R.G. Rwegasira (Tanzania), V. Perrichot (Congo-Brazzaville), J. Miller (Togo), D. King (Nigeria), Phil Hönle (Ivory Coast), K. Gomez (many sites), S. De Greef (Gabon), J. Fellowes (Congo-Kinshasa), and O.F. Aidoo (Ghana). In addition, I used on-line databases with collection information on specimens by the Field Museum, Antweb (www.antweb.org), and the Global Biodiversity Information Facility (www.gbif.org). Because the genus *Oecophylla* is so easy to recognize, I was able to obtain many site records based on photos published on the internet at a variety of sites, including www.flickr.com, yourshot.nationalgeographic.com, www.inaturalist.org, www.ispotnature.org, and www.projectnoah.org.

Geographic coordinates for sites came from

published references, from specimen labels, geotagged photos, or I looked up the coordinates. For older references and specimens, some site names were no longer in use or are now spelled differently and I searched, not always successfully, to determine current names.

In classifying climates, I followed the Köppen-Geiger system which considers only precipitation and temperature variation through the year (Peel et al. 2007). Of the 30 possible climate categories, the ten that occur in and adjacent to areas occupied by *O. longinoda* are as follows: Tropical climates (Group A; shades of blue in Fig. 2) rainforest (Af), monsoon (Am), and tropical savanna (Aw). Arid climates (Group B; oranges and red in Fig. 2) hot semi-arid (BSh) and hot desert (BWh). Temperate/ Subtropical climates (Group C; greens and yellows in Fig. 2) humid subtropical (Cfa), dry winter subtropical (Cwa), highland subtropical (Cwb), warm Mediterranean (Csa), and temperate Mediterranean (Csb). For more details on the Köppen-Geiger classification system, see Peel et al. (2007). I classified records using the designations of climate-data.org.

RESULTS

I mapped the geographic distribution of *O. longinoda* based on >500 site records (Fig. 1) from 34 countries (Table 1). The northernmost records come from Records ranged from Niayes, Senegal (15.0°N; Diamé et al. 2015) in the north to St Lucia Estuary, South Africa (28.4°S; Crewe and Thompson 1979 and many geotagged photos) in the south.

For four countries, the occurrence records I found for *O. longinoda* included no specific "point locales." I mapped WARDA's (2006) records of *O. longinoda* from Burundi and Rwanda to Bujumbura and Kigali, respectively. Chevalier (1905) wrote that *O. longinoda* was common on cacao plantations in Sao Tomé. I mapped this as a single record at the center of the island of Sao Tomé. Vanderplank (1960) reported *O. longinoda* in Northern Rhodesia (now Zambia). I mapped this as a single point in a forested area in the Eastern Province with a tropical Aw climate.

I approximated locations for two of Emery's (1899) sites, where Vittorio Bottego collected *O. longinoda* in southwestern Ethiopia between Baddítu (5.5°N, 37.8°E) and Dimè (6.3°N, 36.4°E), and between Dimè and Bass Narok (Lake Turkana; northern tip at 4.3°N, 36.0°E), as the midway points (i.e., 5.9°N, 37.1°E and 5.3°N, 36.2°E). Tragically, Bottego died on this expedition and his body was never recovered.

Weber (1949) gave a rough outline of the range of *O. longinoda,* writing: "the distribution in Africa of *Oecophylla* lies largely between 15 degrees North Latitude and 15 degrees South Latitude with an extension southward along the Indian Ocean coast." Several other *Oecophylla* studies included crude distribution maps for *O. longinoda* (Cole and Jones 1948, Lokkers 1986, Azuma et al. 2002, 2006, Dlussky et al. 2008, Crozier et al. 2010). Comparison of these maps with the present analysis indicates that these earlier maps include numerous significant inaccuracies; most notably, all these maps omit the range of *O. longinoda* in the southeastern Africa in Zambia, Zimbabwe, Malawi, Mozambique, and South Africa. Cole and Jones (1948) also incorrectly included the Seychelles within the range of *O. longinoda*. Lokkers (1986) showed *O. longinoda* occurring across the entire Horn of Africa, including eastern Ethiopia and all of Somalia and Djibouti, arid areas for which I have not found any site records. Azuma et al. (2002, 2006) repeated Lokkers' (1986) map. Dlussky et al.'s (2008) map for *O. longinoda* differed somewhat from Lokkers' (1986) map, mainly through eliminating the northeast part of the range in Ethiopia, Somalia, and Djibouti, but extending the range in the northwest across arid northern Senegal into southern Mauritania, beyond the documented range of *O. longinoda*. Crozier et al. (2010) repeated Dlussky et al.'s (2008) map exactly.

Comparing the documented distribution of *O. longinoda* (Fig. 1) with a Köppen-Geiger climate map of Africa (Fig. 2) indicates that nearly all records of *O. longinoda* came from

sites within the macro-scale areas classified on the map as having Tropical (Group A) climates: rainforest (Af), monsoon (Am), and savanna (Aw) (shades of blue in Fig. 2). Several mapped locales appear to fall in areas outside the Group A climate zone in Fig. 2, but are classified as tropical savanna (Aw) by climate-data.org, including: Nkhotakota National Park, Malawi (www.flickr.com/photos/catsitchyfeet/7739593250), Nkhata Bay, Malawi (1970; E.C.G. Pinhey; Field Museum), Bukama, Congo-Kinshasa (Bequaert 1913), and Harar, Ethiopia (Santschi 1919). In all these cases, it appears that the records came from sites with local microclimates that differ from surrounding areas.

Sites classified as having Arid (Group B) climates (orange in Fig. 1) were all from hot semi-arid (BSh) areas: Dakar, Senegal (André 1890), Dodoma, Tanzania (1926; W.M. Mann; USNM), three *Jatropha curcas* plantations in Niger (Abdoul Habou 2013), and 15 mango orchards in Senegal (Diamé et al. 2015).

The records classified on the map as having a Subtropical (Group C) climate (green in Fig. 1) came from orange orchards in Rusitu Valley, Chimanimani District, Zimbabwe (Musasa et al. 2013) and 13 sites in and around the St. Lucia Estuary, South Africa (Crewe and Thompson 1979 and photos on flickr.com, ispotnature.org, and by A. Wild). Climate-data.org does not provide a classification for Rusitu Valley, but nearby Chimanimani is classified as highland subtropical (Cwb). *Oecophylla* are known in Zimbabwe only in Rusitu Valley (S.T. Musasa, pers. comm.). Climate-data.org classifies the climate of St. Lucia, South Africa as humid subtropical (Cfa).

DISCUSSION

Oecophylla longinoda has site records broadly spread across regions of Africa with Tropical climates as defined by the Köppen-Geiger classification system (Group A; shades of blue in Fig. 2). Areas with Arid climates (Group B; red, orange, and pink in Fig. 2) may be generally too dry for *O. longinoda*, whereas areas with Temperate and Subtropical climates (Group C; greens and yellows in Fig. 2) may be generally too cool for *O. longinoda*. The documented range of *O. longinoda* appears to be largely bounded by deserts (in the north and east) and highlands (across most of the south). Along the east coast of South Africa, the range of *O. longinoda* appears to be limited by latitude.

The new range map based on site records corrects inaccuracies in earlier published range maps. In addition, the close match between climate and distribution allow prediction of areas where *O. longinoda* might be likely to occur, but I have not found any records. For example, the climate map suggests that most of South Sudan and a corridor of land through western Ethiopia has suitable climate for *O. longinoda*. A large part of western Zambia also would appear to be suitable.

Oecophylla longinoda has been found at a few sites that would seem, on a macro scale, to be semi-arid. In semi-arid regions, *O. longinoda* appears to be able to persist by inhabiting areas with higher water availability, such as riparian environments, irrigated land, and urban areas. The range of *O. longinoda* may be limited not so much by its own climatic tolerance, but rather by presence of suitable trees. Bequaert (1913) wrote (in French): "The curious nests of this species are not uncommon in the Bukama [Congo-Kinshasa] area, but one finds them in the humid, shady places, for example in gallery forests that edge most rivers." *Oecophylla longinoda* may also be able to persist in trees along rivers through semi-arid and arid areas where they have not yet been recorded, such as along the Jubba River of Somalia and the Dinder River of Sudan.

Many researchers have promoted the use of weaver ants in orchards as an eco-friendly alternative to chemical pest control, reporting an increase in productivity associated with this practice (e.g., Van Mele 2008). Using weaver ants to protect crops within the ants' native range has great potential benefits. However, importing weaver ants into localities where these ants are not native would likely have a great negative

effect on the native fauna, particularly in areas where there are large swaths of non-agricultural land with suitable climate for the ants, such as Madagascar or much of the New World tropics. The catastrophic ecological and economic results of numerous exotic species introduction, both accidental and intentional around the world has still not taught everyone its cautionary lessons.

Wetterer (2017) documented the distribution of the Australasian weaver ant, *O. smaragdina*. This was a larger, more complex task than for *O. longinoda* because it involved many more records for *O. smaragdina* (>2700), spread across a broader area with a greater variety of climates. It is possible that both *O. longinoda* and *O. smaragdina* are actually species groups rather than single species. Researchers have begun to analyze the genetic diversity of *O. smaragdina* in Asia and Australia (e.g., Azuma et al. 2002, 2006, M. Janda, pers. comm.). Genetic analyses also should be done to evaluate whether *O. longinoda* represents multiple species. If there are multiple weaver ant species in Africa, this information may be important considering using weaver ants for biological control, both because different species may have ecological differences and to avoid moving species to areas where they are not native.

ACKNOWLEDGEMENTS

I thank M. Wetterer for comments on this manuscript; T. Schultz and E. Okonski for help at the Smithsonian; S. Vasconcelos, R.G. Rwegasira, V. Perrichot, J. Miller, D. King, Phil Hönle, K. Gomez, S. De Greef, J. Fellowes, and O.F. Aidoo for sending unpublished records; D.P. Wojcik and S.D. Porter for compiling their valuable FORMIS bibliography; R. Pasos and W. Howerton of the FAU library for processing so many interlibrary loans; Florida Atlantic University for financial support.Page Break

REFERENCES

Abdoul Habou Z (2013) *Insects associated with Jatropha curcas L. in Niger and evaluation of the insecticidal activity of its oil*. Ph.D. dissertation. University of Liege-Gembloux Agro Bio-Tech, Liege, 126 pp.

Alibert H (1951) Les insectes vivant sur les cacaoyers en Afrique Occidentale. *Mémoires de l'Institut Français d'Afrique Noire* 15: 1-174.

André E (1890) Matériaux pour servir à la faune myrmécologique de Sierra-Leone (Afrique occidentale). *Revue d'Entomologie (Caen)* 9: 311-327.

André E (1895) Formicides de l'Ogooué (Congo français). *Revue d'Entomologie (Caen)* 14: 1-5.

Azuma N, Kikuchi T, Ogata K, Higashi S (2002) Molecular phylogeny among local populations of weaver ant *Oecophylla smaragdina*. *Zoological Science* 19: 1321–1328

Azuma N, Ogata K, Kikuchi T, Higashi S (2006) Phylogeography of Asian weaver ants, *Oecophylla smaragdina*. *Ecological Research* 21: 126-136.

Bequaert J (1913) Notes biologiques sur quelques fourmis et termites du Congo Belge. *Revue de Zoologie Africaine (Bruxelles)* 2: 396-431.

Carpenter GDH (1913) Notes on the struggle for existence in tropical Africa. *Bedrock* 2: 358-376.

Cashewnut Board of Tanzania (2008) Majimoto, rafiki wa mkulima. http://www.cashewnut-tz.org/docs/majimoto,%20rafiki%20wa%20mkulima.pdf

Chevalier A (1908) Le cacaoyer dans l'Ouest Africain. *Les Vegetaux Utiles de l'Afrique Tropicale Francaise; Etudes Scientifiques et Agronomiques* 4: 1-476.

Chinn M (1945) Notes pour l'etude de l'alimentation des indigenes de la province de Coquilhatville. *Annales de la Société Belge de Médecine Tropicale* 25: 57-149.

Cole AC Jr, Jones JW (1948) A study of the weaver ant, *Oecophylla smaragdina* (Fab.). *American Midland Naturalist* 39: 641-651.

Crewe RM, Thompson PR (1979) *Oecophylla* silk: functional adaptation in a biopolymer. *Naturwissenschaften* 66: 57-58.

Crozier RH, Newey PS, Schlüns EA, Robson SKA (2010) A masterpiece of evolution - *Oecophylla* weaver ants (Hymenoptera: Formicidae). *Myrmecological News* 13: 57-71.

Diamé L, Grechi I, Rey J-Y, Sané CAB, Diatta P, Vayssières J-F, Yasmine A, De Bon H, Diarra K (2015) Influence of *Oecophylla longinoda* Latreille, 1802 (Hymenoptera: Formicidae) on mango infestation by *Bactrocera dorsalis* (Hendel) (Diptera: Tephritidae) in relation to Senegalese orchard design and management practices. *African Entomology* 23: 294-305.

Dlussky GM, Wappler T, Wedmann S (2008) New middle Eocene formicid species from Germany and the evolution of weaver ants. *Acta Palaeontologica Polonica* 53: 615-626.

Duncan I (1999) *Second review of progress on cashew production, processing and marketing in Cooperativa Reforma Agraria La Marañonera de R. L. Coralama*. Rural Equitable Economic Growth Activity Contract No. 519-C-00-94-00154-00. 26 pp.

Emery C (1899) Formiche dell'ultima spedizione Bottego. *Annali del Museo Civico di Storia Naturale* 39[=(2)19]: 499-501.

Emery C (1892) Voyage de M. Ch. Alluaud dans le territoire d'Assinie (Afrique occidentale) en juillet et août 1886. Formicides. *Annales de la Société Entomologique de France* 60: 553-574.

Forel A (1879) Études myrmécologiques en 1879 (deuxième partie [1re partie en 1878]). *Bulletin de la Société Vaudoise des Sciences Naturelles* 16: 53-128.

Gerstäcker A (1871) Beitrag zur Insektenfauna von Zanzibar. *Archiv für Naturgeschichte, Berlin* 37: 345-363.

Hölldobler B (1979) Territories of the African weaver ant (*Oecophylla longinoda* (Latreille)). A field study. *Zeitschrift für Tierpsychologie* 51 (29): 201-213.

Kelemu S, Niassy S, Torto B, Fiaboe K, Affognon H, Tonnang H, Maniania NK, Ekesi S (2015) African edible insects for food and feed: inventory, diversity, commonalities and contribution to food security. *Journal of Insects as Food and Feed* 1: 103-119.

Kohl HJ (1905) Zur Biologie der spinnenden Ameisen. *Natur und Offenbarung* 52: 166-169.

Lamborn WA (1913) A large lepidopterous pupa, probably Lycaenid, found in the leaf-nest of *Oecophylla*, in the Lagos District. *Transactions of the Entomological Society of London* 60: xxxii-xxxiv.

Latreille PA (1802) *Histoire naturelle des fourmis, et recueil de mémoires et d'observations sur les abeilles, les araignées, les faucheurs, et autres insectes*. Crapelet, Paris. 445 pp.

Lokkers C (1986) The distribution of the weaver ant, *Oecophylla smaragdina* (Fabricius) (Hymenoptera: Formicidae) in northern Australia. *Australian Journal of Zoology* 34: 683-687.

Mayr G (1862) Myrmecologische Studien. *Verhandlungen der Kaiserlich-Königlichen Zoologisch-Botanischen Gesellschaft in Wien* 12: 649-776.

Mayr G (1893) Formiciden von Herrn Dr. Fr. Stuhlmann in Ost-Afrika gesammelt. *Jahrbuch der Hamburgischen Wissenschaftlichen Anstalten* 10: 194-201.

Mayr G (1896) Beiträge zur Kenntniss der Insektenfauna von Kamerun. 5. Formiciden gesammelt von Herrn Yngve Sjöstedt. *Entomologisk Tidskrift* 17: 225-252.

Melville EH (1849) *A Residence at Sierra Leone. Described from a Journal Kept on the Spot, and from Letters Written to Friends at Home. By a Lady*. J. Murray. London. 359 pp.

Morris B (2004) *Insects and Human Life*. Berg. New York. 317 pp.

Musasa ST, Mvumi BM, Manditsera FA, Chinhanga J, Musiyandaka S, Chigwedere C (2013) Postharvest orange losses and small-scale farmers' perceptions on the loss causes in the fruit value chain: a case study of Rusitu Valley, Zimbabwe. *Food Science and Quality Management* 18: 1-8.

Ouedraogo SN (2002) *Etude diagnostique des problèmes phytosanitaires du manguier (Mangifera indica L.), de l'oranger (Citrus sinensis (L.) Osbeck) et du mandarinier (Citrus reticulata Blanco) dans la province du Kénédougou*. Thesis. Université Polytechnique de Bobo-Dioulasso, Burkina Faso, 153 pp.

Peel MC, Finlayson BL, McMahon TA (2007) Updated world map of the Köppen-Geiger climate classification. *Hydrology and Earth System Sciences* 11: 1633-1644.

Prance GT, White F (1988) The genera of Chrysobalanaceae: a study in practical and theoretical taxonomy and its relevance to evolutionary biology. *Philosophical Transactions of the Royal Society of London. Series B, Biological* 320 (1197): 1-184.

Radoszkowsky O (1881) Hymenoptères d'Angola. *Jornal de Sciencias Mathematicas, Physicas e Naturaes* 8(31): 197-221.

Santschi F (1910) Formicides nouveaux ou peu connus du Congo français. *Annales de la Société Entomologique de France* 78: 349-400.

Santschi F (1914) Formicides de l'Afrique occidentale et australe du voyage de M. le Professeur F. Silvestri. *Bollettino del Laboratorio di Zoologia Generale ed Agraria, Portici* 8: 309-385.

Sinzogan AAC, Van Mele P, Vayssieres J-F (2008) Implications of on-farm research for local knowledge related to fruit flies and the weaver ant *Oecophylla longinoda* in mango production. International Journal of Pest Management 54: 241-246.

Stitz H (1910) Westafrikanische Ameisen. I. *Mitteilungen aus den Zoologischen Museum in Berlin* 5: 125-151.

Stitz H (1916) Formiciden. *Ergebnisse der Zweiten Deutschen Zentral-Afrika Expedition* 1: 369-405.

Topper CP, Caligari PDS, Camara M, Diaora S, Djaha A, Coulibaly F, Asante AK, Boamah A, Ayodele EA, Adebola PO (2001) *West Africa Regional Cashew Survey (covering the countries Guinea, Guinea Bissau, Cote d'Ivoire, Ghana and Nigeria). Volume 1*. BioHybrids Agrisystems Ltd., Reading. Report number BHA 01109.

Van Huis A (2003) Medical and stimulating properties ascribed to arthropods and their products in sub-Saharan Africa. pp. 367-381 In: Motte-Florac E, Thomas JMC (eds) *Insects in Oral Literature and Tradition*. Peeters Publishing, Paris-Louvain.

Van Mele P, Cuc NTT, Seguni Z, Camara K, Offenberg J (2009) Multiple sources of local knowledge: a global review of ways to reduce nuisance from the beneficial weaver ant *Oecophylla*. *International Journal of Agricultural Resources, Governance and Ecology* 8: 484-504.

Van Mele P (2008) Biological control with the weaver ant *Oecophylla longinoda* in Africa: a review of research and development efforts to link farmers to organic markets. *Outlooks on Pest Management* 180-183.

Vanderplank FL (1960) The bionomics and ecology of the red tree ant, *Oecophylla* sp., and its relationship to the coconut bug *Pseudotheraptus wayi* Brown (Coreidae). *Journal of Animal Ecology* 29: 15-33.

Vayssières J-F, Sanogo F, Noussourou M (2004) Inventaire des espèces de mouches des fruits (Diptera : Tephritidae) inféodées au manguier au Mali et essais de lutte raisonnée. *Fruits* 59: 3-16.

WARDA (2006) Tree-dwelling weaver ant. *Africa Rice Center (WARDA) Annual Report* 2005-2006: 19-20.

Weber NA (1943) The ants of the Imatong Mountains, Anglo-Egyptian Sudan. *Bulletin of the Museum of Comparative Zoology* 93: 263-389.

Weber NA (1949) The functional significance of dimorphism in the African ant, *Oecophylla*. *Ecology* 30: 397-400.

Wetterer JK (2017) Geographic distribution of the weaver ant, *Oecophylla smaragdina*. *Asian Myrmecology* 9: 1-12.

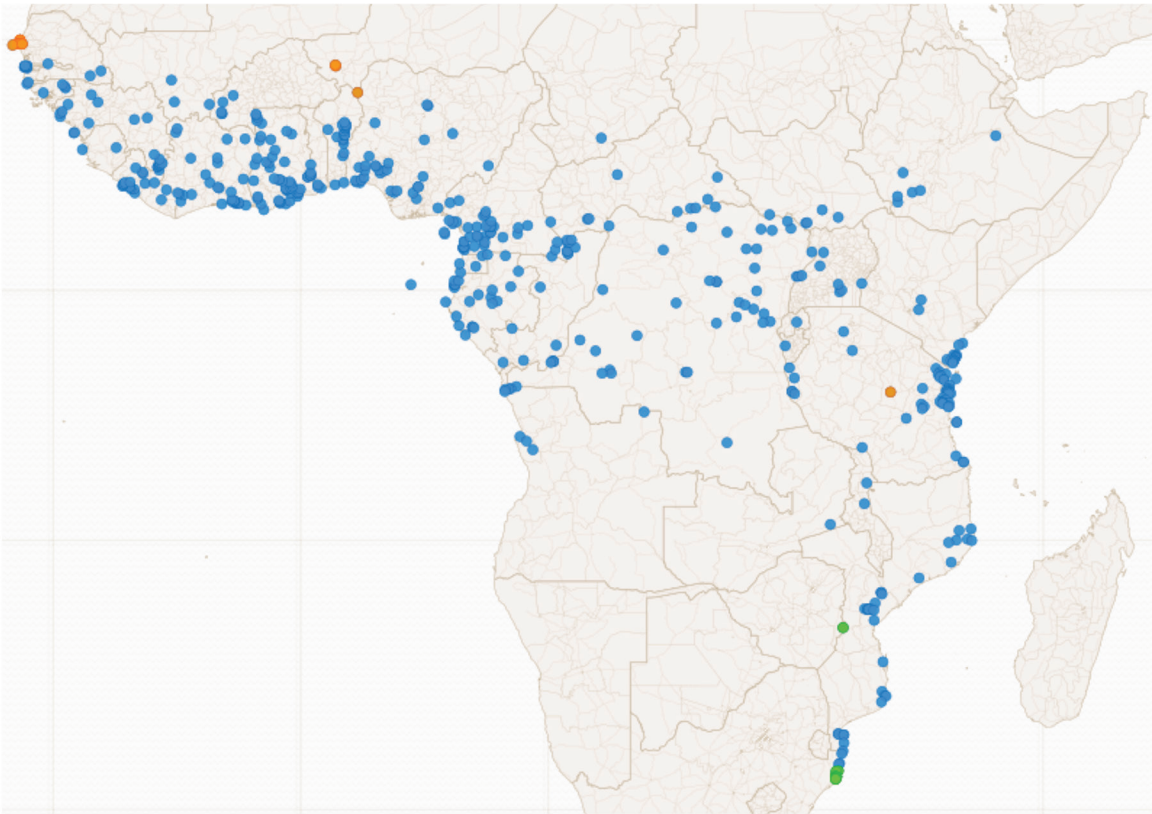

Figure 1. Site records for *Oecophylla longinoda* (mapped using carto.com). Records from sites with Tropical climates (Group A) = blue; with Semi-arid climates (Group B) = orange; with Subtropical climate (Group C) = green.

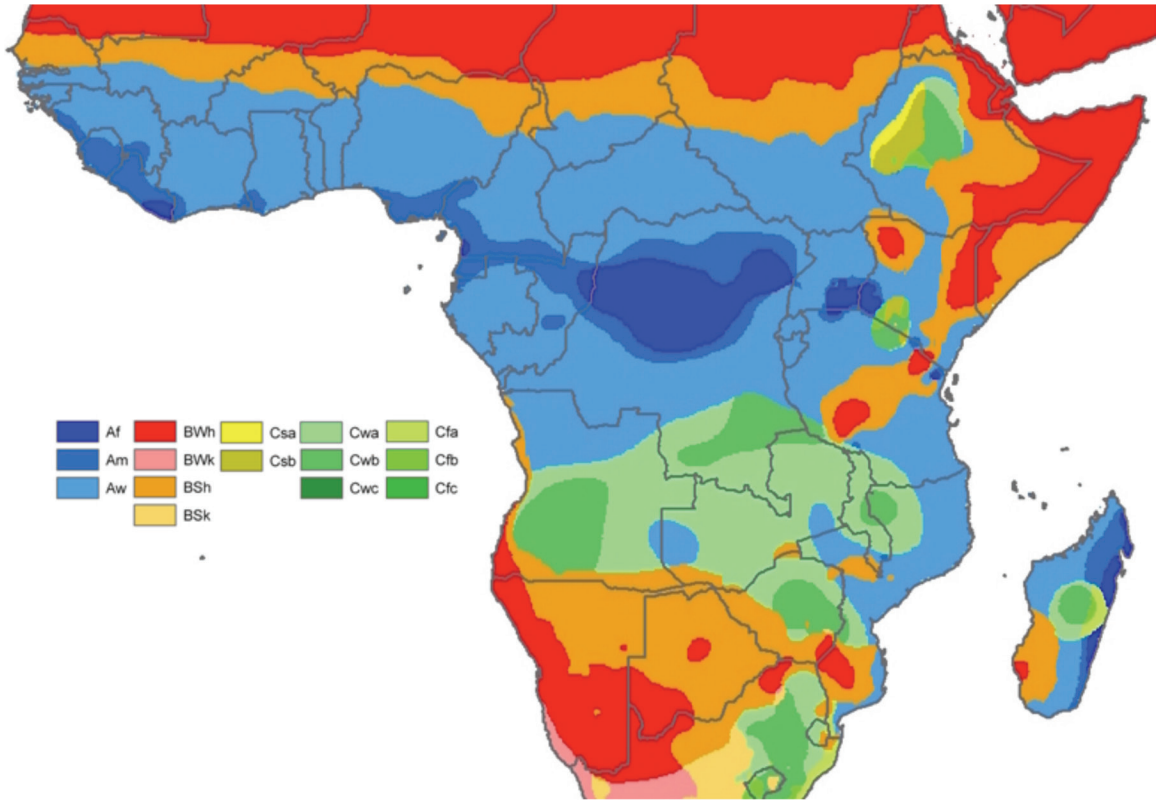

Figure 2. Climate classification in and adjacent to areas occupied by *O. longinoda* based on the Köppen-Geiger system (modified from Peel *et al*. 2007 used under Creative Commons License). Tropical climates (Group A) = shades of blue; Arid climates (Group B) = oranges and red; Temperate/ Subtropical climates (Group C) = greens and yellows. See Methods for more details.

Table 1. Earliest known records for *Oecophylla longinoda*. USNM = Smithsonian Institution.

Country	Earliest record
Angola	1853–1861 (Radoszkowsky 1881 as *Echophylla virescens*)
Benin	≤1979 (de Souza 1979 in Prance and White 1988)
Burkina Faso	≤1999 (FAO 1999 in Ouedraogo 2002)
Burundi	≤2006 (WARDA 2006)
Cameroon	≤1896 (Mayr 1896)
CAR	1910 (Stitz 1916)
Chad	≤2014 (Kelemu *et al*. 2015)
Congo-Brazzaville	1907 (Santschi 1910)
Congo-Kinshasa	1901 (Kohl 1905)
Equatorial Guinea	≤1910 (Stitz 1910)
Ethiopia	(1895-1897 Emery 1899)
Gabon	≤1895 (André 1895)
Gambia	1886 (Emery 1892)
Ghana	≤1862 (Mayr 1862 as *O. virescens*)
Guinea	≤1914 (Santschi 1914d)
Guinea-Bissau	≤2001 (Topper *et al*. 2001)
Ivory Coast	1886 (Emery 1892)
Kenya	≤1871 (Gerstäcker 1871)
Liberia	1895 (J.G.L. Sharp, USNM): Clay Ashland
Malawi	≤2004 (Morris 2004)
Mali	2000 (Vayssières *et al*. 2004)
Mozambique	≤1879 (Forel 1879 as *O. smaragdina*)
Niger	2010 (Abdoul Habou 2013)
Nigeria	1910 (Lamborn 1913)
Rwanda	≤2006 (WARDA 2006)
Sao Tomé and Principe	≤1908 (Chevalier 1908)
Senegal	≤1802 (Latreille 1802)
Sierra Leone	1841 (Melville 1849)
South Africa	≤1979 (Crewe and Thompson 1979)
South Sudan	1939 (Weber 1943)
Tanzania	≤1893 (Mayr 1893)
Togo	≤1951 (Alibert 1951)
Uganda	1912 (Carpenter 1913)
Zambia	≤1960 (Vanderplank 1960)