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A revision of the wax scale insects (Hemiptera: Sternorrhyncha: Coccoidea: Ceroplastinae) of the Afrotropical Region

CHRIS J. HODGSON¹ & ANA L.B.G. PERONTI²

¹*Department of Biodiversity and Biological Sytematics, The National Museum of Wales, Cathays Park, Cardiff, CF10 3NP, Wales.
hodgsoncj@cardiff.ac.uk*

²*Departemento de Ecologia e Biologia Evolutiva, UFSCar, Caixa Postal 676, 13.565-905 São Carlos-SP, anaperonti@hotmail.com.br*



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Abstract

This paper reviews all species within the scale insect subfamily Ceroplastinae (Hemiptera: Sternorrhyncha: Coccoidea: Coccidae) known from the Afrotropical Region (here including the whole of Africa, the Atlantic islands of Azores, Madeira, Canary Is., São Tomé, Príncipe, and Cape Verde Is., and the Indian Ocean islands of Madagascar, Seychelles, Mauritius, Réunion, Comoros, and Aldabra). At the start of the review, there were 64 species of wax scale insects and subspecies in 4 genera recorded from this area. This paper describes or redescribes 58 species, 9 of them new, and synonymises 18 species. We consider that these species are best placed in 19 species-groups and 2 genera, *Ceroplastes* Grey and *Waxiella* De Lotto, based on adult female morphology. Only 1 species and 1 subspecies previously recorded from Africa have not been seen (*Waxiella erithraeus* (Leonardi) and *Waxiella mimosae neghelii* (Bellio)). The precise identity of species close to *C. rusci* (Linnaeus) in Africa still requires further study, probably using molecular analysis as several records are considered to refer to cryptic or sibling species. The records of *C. ceriferus* (Fabricius) and *C. actiniformis* Green from Africa are considered to be misidentifications. The new species are: *C. balachowskyi* Hodgson & Peronti **spec. nov.**, *C. danielae* Hodgson & Peronti **spec. nov.**, *C. delottoi* Hodgson & Peronti, **spec. nov.**, *C. elaeis* Hodgson & Peronti, **spec. nov.**, *C. ghesquierei* Hodgson & Peronti **spec. nov.**, *C. jos* Hodgson & Peronti **spec. nov.**, *C. mori* Hodgson & Peronti **spec. nov.**, *C. neobrachystegiae* Hodgson & Peronti **spec. nov.** and *C. newsteadi* Hodgson & Peronti **spec. nov.** The new synonymies are: *Ceroplastes longicauda sapii* Hall **syn. nov.** of *C. longicauda* Brain.; *Ceroplastes candela* Cockerell & King **syn. nov.** of *Gascardia madagascariensis* Targioni Tozzetti (now in *Ceroplastes*); *C. combreti* Brain **syn. nov.** of *G. madagascariensis*; *C. uapacae* Hall **syn. nov.** of *C. personatus* Newstead; *C. vinsonioides* Newstead **syn. nov.** of *C. personatus*; *C. fumidus* De Lotto **syn. nov.** of *Coccus rusci* Linnaeus (now in *Ceroplastes*); *C. hololeucus* De Lotto **syn. nov.** of *C. singularis* Newstead; *C. spicatus* Hall **syn. nov.** of *C. eucleae* Brain; *C. coniformis* Newstead **syn. nov.** of *C. theobromae* Newstead; *C. constricta* De Lotto **syn. nov.** of *C. lamborni* Newstead; *Ceroplastes egbarum fulleri* Cockerell & Cockerell **syn. nov.** of *C. egbara* Cockerell (now in *Waxiella*); *Ceroplastes egbarum rhodesiensis* Hall **syn. nov.** of *C. egbara*; *Ceroplastes martinoi* Almeida **syn. nov.** of *C. egbara*; *Ceroplastes ugandae* Newstead **syn. nov.** of *C. egbara*; *Ceroplastes zonatus* Newstead **syn. nov.** of *C. egbara*; *Ceroplastes berliniae* Hall **syn. nov.** of *C. subsphaerica* Newstead (now in *Waxiella*); *Ceroplastes berlineae enkeldoorni* Hall **syn. nov.** of *C. subsphaerica*; and *Waxiella tamaricis* Ben-Dov **syn. nov.** of *C. mimosae* Signoret (now in *Waxiella*). A neotype is designated for *Coccus rusci* Linnaeus (now *Ceroplastes rusci* (L.)). The subspecies *Ceroplastes africanus senegalensis* Marchal is here raised to specific rank and transferred to *Waxiella* as *W. senegalensis* (Marchal) **stat. nov.** *Ceroplastes luteolus* De Lotto, previously synonymised with *C. brevicauda* Hall, and *C. tenuitectus* Green, previously synonymised with *C. rusci* (L.), are here accepted as good species (**stat. rev.**). *Ceroplastes cirripediformis* Comstock is recorded from Africa (South Africa) for the first time. *Waxiella uvariae* (Marchal) is transferred back to *Ceroplastes* as *C. uvariae* Marchal **stat. rev.** Due to the large number of synonymies introduced here and in order to stabilise the status of some of the species, lectotypes have been designated for the following species: *C. afrinanus senegalensis* Marchal; *C. berliniae* Hall; *C. berliniae enkeldoorni* Hall; *C. bipartitus* Newstead; *C. brevicauda* Hall; *C. coniformis* Newstead; *C. egbarum*

fulleri Cockerell & Cockerell; *C. egbarum rhodesiensis* Hall; *C. elytopappi* Brain; *C. eucleae* Brain; *C. eugeniae* Hall; *C. ficus* Newstead; *C. galeatus* Newstead; *C. helichrysi* Hall; *C. lamborni* Newstead; *C. longicauda* Brain; *C. personatus* Newstead; *C. quadrilineatus* Newstead; *C. quadrilineatus simplex* Brain; *C. quadrilineatus royenae* Hall; *C. singularis* Newstead; *C. sinoiae* Hall; *C. tachardiaformis* Brain; *C. tenuitectus* Green; *C. toddaliae* Hall; *C. toddaliae spicatus* Hall; *C. uapacea* Hall; *C. uapacea chrysophyllae* Hall; *C. ugandae* Newstead; *C. uvariae* Marchal; *C. vinsonioides* Newstead; *C. vuilleti* Marchal and *C. zonatus* Newstead. Keys are provided to identify the 19 species-groups recognised from the area here studied and to all species in each species-group. There is a short final discussion, including such topics as the distribution and the relationships of the species found on the Atlantic and Indian Ocean Islands. Maps are provided showing the country distribution of each of the species covered and a list of plant species known as host of Ceroplastinae in the Afrotropical Region is appended.

Introduction

The scale insects or Coccoidea are sap-sucking insects related to the Psylloidea (jumping plant lice), Aphidoidea (aphids) and Aleyrodoidea (whiteflies). Together, these 4 superfamilies comprise the hemipterous suborder Sternorrhyncha, a group characterised by the labium appearing to arise from the prosternum (Gullan & Martin, 2009). The Coccoidea embrace about 31 extant families (although there is some disagreement at the present time about the status of some of these) with perhaps 8,000 species. They are all plant parasites and can be found on almost any part of a plant. A few are virus vectors and many species are extremely important economic pests, attacking agricultural and horticultural crops, forestry and ornamental plants. Their feeding activities directly weaken their host plants through sap loss, and their honeydew soils the leaf surface so that sooty moulds develop, reducing photosynthesis. In addition to their unsightly appearance, the presence of scale insects on plant material is also a major phytosanitary issue.

The family Coccidae is the third largest within the Coccoidea with about 1,200 described species (Ben-Dov, 1993). At the present time, some 12 subfamilies are recognised (Hodgson, 1994) of which the wax scale insects or Ceroplastinae are one of the largest. Members of this subfamily can be recognised by the thick waxy test that covers the whole of the dorsum. They are mainly restricted to the tropics and subtropics but outdoors (i.e., not in conservatories, etc.), they can also occur to about latitudes 45°N and 45°S (see also Qin *et al.*, 1998). Within these limits, wax scale insects are widespread and include a number of species of economic importance. The present work is part of an attempt to revise all the wax scale insects (Ceroplastinae) of the World and covers all species currently known from the Afrotropical Region — here taken to include all of Africa, including the north coast and associated Atlantic islands (usually included in the Palaearctic region) plus Madagascar and associated Indian Ocean islands. The wax scales of the Mediterranean have been revised by Pellizzari and Camporese (1994), those of much of South America by Peronti *et al.* (2008) and Granara de Willink (1999), those from China by Tang (1991) and those from North America by Gimpel *et al.* (1974). The wax scales of the remaining geographic areas are in the process of being studied (Peronti & Hodgson, *in prep.*).

Many authors have contributed to the study of wax scales in the Afrotropical region: Linnaeus (1758, 1767); Signoret (1872); Cockerell (1899, 1902a,b); Newstead (1898, 1906, 1910a,b, 1911a,b, 1913, 1917); Green (1899); Marchal (1909a, 1909b); Leonardi (1913); Brain (1920a,b); Balachowsky (1927, 1929, 1934); Hall (1931); Bellio (1939); De Lotto (1961, 1965, 1966, 1969a,b, 1970); Almeida (1969), and Hodgson (1969a,b). De Lotto in particular made important contributions, especially with redescriptions and keys to species from southern Africa. More recently, Matile-Ferrero and Le Ruyet (1985) and Ben-Dov *et al.* (2000) have described further species and Hodgson *et al.* (2009) produced a key to all species known from South Africa. In terms of the number of species in the subfamily Ceroplastinae, the Afrotropical region is the second largest zoogeographic region, with only the Neotropical Region having more. ScaleNet (Ben-Dov *et al.*, 2011) lists 63 species for this region: 42 in *Ceroplastes* Gray, 19 in *Waxiella* De Lotto, 1 in *Gascardia* Targioni Tozzetti and 1 in *Vinsonia* Signoret (note that ScaleNet did not list *C. lamborni* Newstead and so the actual number in *Ceroplastes* should be 43).

The identity of many of the wax scale insects from the Afrotropical region has been very uncertain, and thus all species within the subfamily Ceroplastinae recorded from the region (as defined here) are revised based on the morphology of the adult female. Peronti *et al.* (2008), as part of their revision of the wax scales of São Paulo State, Brazil, found that *Ceroplastes* species could be divided into fairly discrete species-groups depending on the structure, frequency and distribution of the dorsal pores (the *Ceroplastes*-type pores of Hodgson (1994) but here