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Original Article

First record of the formicine genus *Overbeckia* (Hymenoptera: Formicidae) from Australia

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Abstract

A collection of ants deeded to the Western Australian Museum by visiting amateur Raul Jordan included representatives of 10 subfamilies, 65 genera and 270 species. The ants were collected in 2002 in the Northern Territory, Queensland and Western Australia. Among the specimens were three workers of *Overbeckia* collected in Mossman, Queensland. This is an extremely rare arboreal genus known previously from only two collections in Singapore and the Philippines. The sole known species is *Overbeckia subclavata* Viehmeyer, 1916. The Australian material is hairier but otherwise agrees exactly with syntype workers illustrated on AntWeb. The implications of this find are discussed. The alternatives include (i) a new species of *Overbeckia* possibly endemic to Australia, (ii) the extension of the known range of *Overbeckia subclavata* and (iii) the introduction to Australia of a hairy morph of *O. subclavata* by human agency. At present, insufficient material is available to enable this author to choose between these alternatives. The Jordan Collection also includes the first Australian records of *Solenopsis papuana* Emery, 1900 and *Cardiocondyla minutior* Forel, 1899. These three new records are of considerable significance, and the value of amateur collections and the importance of good taxonomy are discussed in this paper.

Key words: *Overbeckia,* Formicinae, Australia, Raul Jordan Collection, relevance of museum collections.

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Introduction

The formicine genus *Overbeckia* has a medium-sized monomorphic worker and, for many years, was known only from a single series collected in Singapore. Because of its rarity, fresh material of *Overbeckia* was not available to Blaimer & al. (2015) and Ward & al. (2016) when they examined the evolutionary relationships within the Formicinae. However, the genus can be placed in the tribe Camponotini based on the diagnosis provided by Bolton (2003). The genus has generally been distinguished from other formicines by the incrassate appearance of the distal portion of the antennal funiculus – although this feature is subtle and not particularly accentuated – and the short sepals of the calyx of the proventriculus (this latter character requires the ant to be dissected). The metapleural gland in *Overbeckia* is vestigial and is indicated by a fine transverse ridge terminating in a very small thin, vertical slit overhung by three or four guard hairs, and is probably not functional. The *Overbeckia* worker also lacks a thin, median, longitudinal depression between the frontal carinae (B. Heterick, unpubl.). This separates it from the *Camponotus* worker and workers of most species in *Colobopsis* of similar appearance. The worker and the queen possess a five-toothed mandible. The above characters, combined, will identify a worker as *Overbeckia*. The genus currently contains a single species, *Overbeckia subclavata* Viehmeyer, 1916.

***Overbeckia* in Asia:** The type material for *Overbeckia* was collected by Hans Friedrich Overbeck from colonies in bamboo and a hollow branch of a mango tree, respectively, and described by Viehmeyer in 1916 as a monotypic genus and species, *Overbeckia subclavata*. For many years, this group of ants was known only from the types. However, a recent report (General & Alpert 2012) mentions the presence of a specimen of *O. subclavata* in the Museum of Comparative Zoology collected by an M. Ramos, and labelled "Bu of Sci, PI" – which is interpreted as "Bureau of Science, the Philippines" (Maximo Ramos collected botanical specimens for the Bureau of Science between 1904 and 1932).

***Overbeckia* in Australia:** In June 2018, the Western Australian Museum received a large donation of ants in alcohol from German amateur collector Raul Jordan.

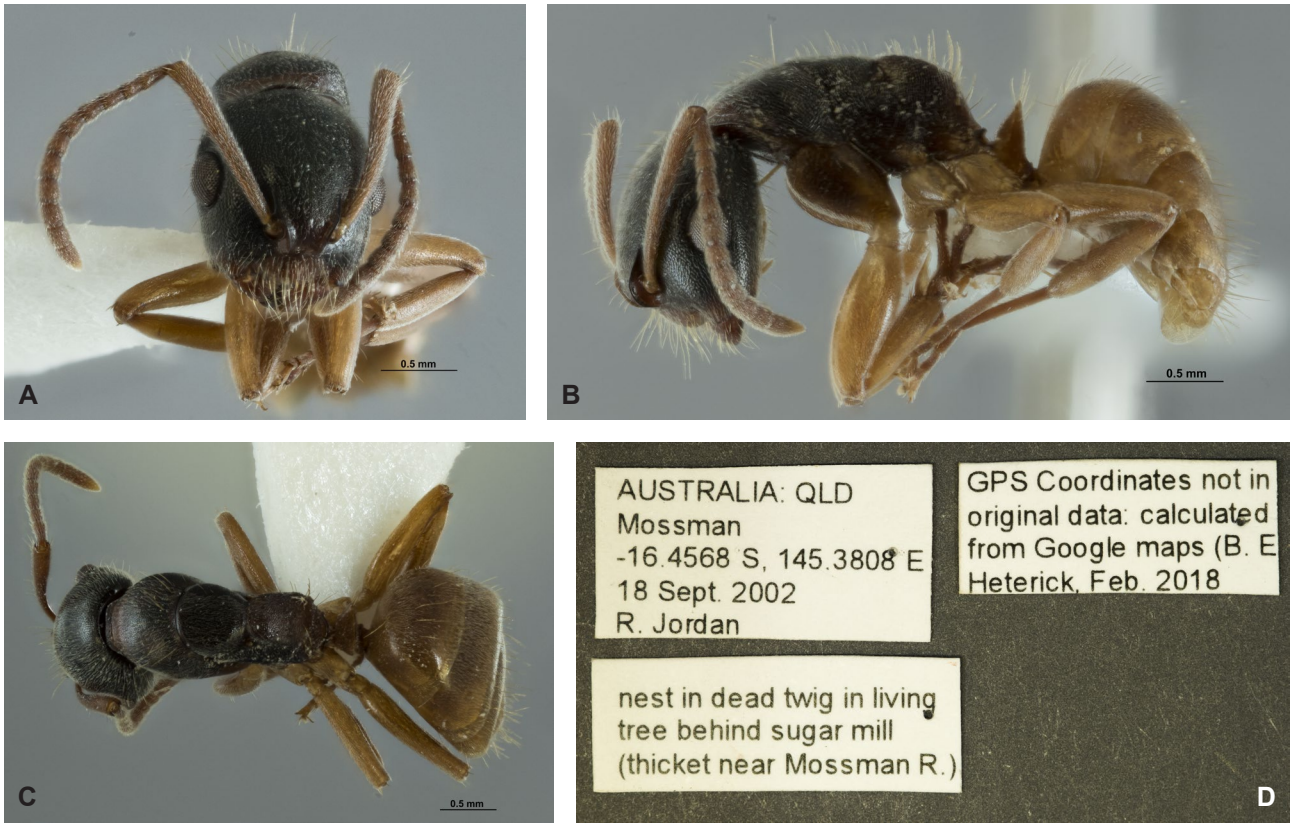

Fig. 1: *Overbeckia* cf. *subclavata* Viehmeyer, 1916, collected from a twig in Mossman, Queensland (top specimen of three pinned workers). (A) Head, (B) profile, (C) dorsal view, (D) labels.

These comprised mainly worker specimens from 10 subfamilies, 67 genera and 270 species. All of these ants were collected in 2002 from the Northern Territory, Queensland and Western Australia.

Materials and methods

All ants in the Jordan Collection were received in vials. I mounted one or more representative specimens from each vial on cardboard points for the purpose of closer examination and identification. Where there were more than one species in a vial, at least one specimen of each species was mounted. Nearly all mounted specimens were workers. During this process, I noticed that three worker ants from a vial labelled "*Camponotus*" differed markedly from the majority of the workers that were clearly associated with male and female reproductives and brood. These strange formicines appeared to belong not only to a different species, but to a different genus that was not immediately recognizable as an Australian form. The three new workers were pointed on the one pin. All the specimens in the vial were collected on the edge of the town of Mossman, Queensland, by Jordan on 18 September 2002. Additional label data indicated the nest material was extracted from a dead twig in a living tree in a thicket behind the sugar mill. Subsequent correspondence from Jordan indicated the specimens were obtained at head height, and the tree was just beside the river (i.e., the Mossman River). This was sufficient to enable me to assess the coordinates as -16.4568° S and 145.3808° E. The nest material was identified as *Colobopsis macrocephala* (Erichson, 1842). I investigated the second genus, and was able to find an almost exact match with images of *Overbeckia subclavata* on AntWiki (<https://www.antwiki.org/wiki/Overbeckia>, retrieved 25 September 2019). The Australian workers have a more developed pilosity than the workers described from Singapore, with many erect setae on the mesosoma compared with only a few in the original material. However, the general morphology, the macro- and microsculpture of the cuticle and the colour pattern of both the Australian and the material from Singapore agree.

The three *Overbeckia* workers were imaged. The worker illustrated in Figure 1A - D was captured with the Visionary Digital Passport II Imaging System using a Canon 5D Mark II 21 MP camera attached to a PC workstation laptop on which was loaded Photoshop, Lightroom and stacking software. A Macro Photo 65 mm lens was used with the EOS 7D Mark II application, with an F-stop of f / 5.6 and horizontal and vertical resolution both 300 dpi. The magnification was 3. The images were forwarded to AntWeb for incorporation in their database, and the specimen in Figure 1 has been given the unique identifier CASENT0872753.

Results and discussion

Examination of the specimens and the images produced has not resulted in an unequivocal identification of the

sample collected by R. Jordan as either *Overbeckia subclavata* or a distinct species. Increased hairiness in itself is not automatically a case for erecting a novel species, as this author has seen many instances in which workers of a given species, particularly those from a wetter environment, have a smoother cuticle and more prominent standing setae than what is seen in specimens from a dry environment. However, if the range is large, a clinal pattern is often encountered with the very hairy and the more glabrous individuals occupying extreme ends of the spectrum. In the case of *Overbeckia*, there are only three sets of specimens available for comparison. The Philippines worker is damaged and is not illustrated in General & Alpert's (2012) paper, but, significantly, their key to the Philippine Formicinae mentions the genus is characterized by having a mesosoma and head without coarse, erect hairs (setae). These, however, are present in the Australian workers. Thus, the Australian samples differ from both sets of overseas *Overbeckia* samples.

Since *Overbeckia* was found in Queensland, a check was undertaken for possible additional accessional material in the Queensland Museum, but the Museum appears not to hold any specimens of this species (C. Burwell, pers. comm.). Additional material is also unlikely to be present in the ANIC Ant Collection in Canberra as the CSIRO staff until quite recently has included specialist myrmecologists such as R.W. Taylor and S.O. Shattuck, and the presence of such an unusual ant would most likely have been noted by them.

***Overbeckia* an introduction?** There appear to be three possibilities: either (i) the local samples of *Overbeckia* represent the first record of an endemic Australian species within the genus or (ii) the local workers represent a morphological variant of *O. subclavata* which may also be found overseas, and the species occurs naturally in Australia, or, finally, (iii) the local workers represent a population of *O. subclavata*, represented by a relatively hairy phenotype, that has been introduced into Australia at some time in the past.

If (i) is correct, and the local *Overbeckia* represents a distinct species, it is rather odd that it has remained unknown for nearly 200 years. The Queensland tropics have long been the target of collections because of the allure of the rainforest, and one of the most prolific of the early amateur insect collectors, F.P. Dodd, was stationed at Townsville and Kuranda for a number of years in the late 1800's and the early 1900's. There has also been a rich history of entomological research in Queensland, and a department of Entomology was set up in the University of Queensland in 1952 (Veitch 1962). An analogous case to *Overbeckia* is that of *Peronomyrmex*, another cryptic, arboreal genus. This ant is an Australian endemic that was known for many years from a single specimen collected by Hans Friedrich Overbeck, the same collector who brought *Overbeckia* to the world's attention. *Peronomyrmex* is undoubtedly very rare and appears to be nocturnal as well as arboreal (Shattuck 2006). However, the fact remains that even this enigmatic, vanishingly rare genus was known as early as 1922, and since then two additional species have come to light. The present sample of *Overbeckia* was obtained not from the heart of a remote rainforest, but within disturbed remnant vegetation on the outskirts of a reasonably large town (Mossman's population was 1937 inhabitants at the 2016 census [<https://en.wikipedia.org/wiki/Mossman,_Queensland>, retrieved 2 October 2019]), and despite its undoubtedly cryptic habits, its complete absence from the Queensland Museum Ant Collection is difficult to explain if it is an Australian endemic. It is also worth noting that other ant genera (e.g., *Philidris* and *Romblonella*), which are similarly arboreal, and whose occurrence in Australia is also limited to north-east Queensland, are confined to rainforest.

Explanation (ii), namely, that the Australian *Overbeckia* represents an extension of the known range of the currently recognized species, is subject to the same objections as (i). Ants from Australia's Top End and the northeast Queensland coast, which represent the vast bulk of the Raul Jordan Collection, are generally very well known; of the 270 species collected by Jordan, only 28 (10.3%) could definitely not be placed in a described species, and one of these is a dealated queen.

Explanation (iii) posits an extralimital provenance for the Australian population of *Overbeckia subclavata*. In this case, due to the founder effect, the Australian morph is a worker in which the pilosity is well-developed although the original population may be predominantly glabrous (the case with the Singapore and Philippines workers). This is worth examining in the light of historical human activity in north-east Queensland. Possibly, *Overbeckia* was introduced to Queensland in supplies ferried or flown in during World War II. During this period, numerous installations were built in and around Cairns, less than 60 km south of Mossman. The nearest of these to Mossman was a civil defence facility just east of Barron Falls, only 48 km from Mossman. Within Cairns itself were a plethora of defence-related structures constructed – airfields, fortifications, naval and port facilities, supply facilities and ammunition facilities, to name just a few of these constructions (<https://www.ww2places.qld.gov.au/search/map?region=cairns>, retrieved 2 October 2019). Cairns was a major centre for the construction of landing craft, as the most northerly centre for the manufacture and ferrying of boats to theatres of war in New Guinea. Plywood landing barges were constructed from Queensland timber for use by infantry and light vehicles. While this activity was outgoing, there would also be incoming marine traffic from various places to the north of Australia, and ant colonies could have been transported to Cairns in lumber and other vegetal materials during this time. Another possibility is that this ant was transported to Australia after the war, in which case it may have been brought in bamboo. Both Singapore and the Philippines are among the main exporters of the product and Australia is a significant importer (Inbar 2012). Note: while bamboo appears to be favoured as a host tree by *Overbeckia*, as reported by Viehmeyer, the ant is not specialized to colonize

only this plant genus, and its advent in Australia may have been via some other species of timber.

At present, the evidence for possibilities (i), (ii), and (iii) is equivocal, although perhaps (iii) has most to commend it: More material, both from Australia and from overseas, is needed.

The value of amateur collections: The Raul Jordan Collection is not only important for the number of native ant species it contains, but also because it represents the first records in this country of two other unquestionably exotic species; namely *Cardiocondyla minutior* Forel, 1899 and *Solenopsis papuana* Emery, 1900. *Cardiocondyla minutior* was identified using the taxonomic keys to species-group and then to species in Seifert (2003). (Note: Seifert's species level key bases the differentiation between *C. minutior* and its sister species *C. tjibodana* Karavaiev, 1935 on minute morphometric differences and colour-tone, which, in practical terms, is rather unsatisfactory. *Cardiocondyla minutior* has a greater dispersal capacity and is a pantropical tramp species whereas *C. tjibodana* is mainly found on Indo-Malay and Pacific islands. The worker in the Jordan Collection came from within the urban quarter of Darwin and is a dull yellowish-brown, so the former name is preferred. Seifert regarded the separation of the two taxa as tentative and conceded future investigations might reveal the two ants are conspecific. In such a case, *C. minutior* would be the senior name.) *Solenopsis papuana* was identified using a combination of Emery's original description (Emery 1900) and AntWeb images. Images of both sets of species and their accompanying labels are available on AntWeb (CASENT0872755 for the *Cardiocondyla*, CASENT0872757 for a *Solenopsis papuana* queen and CASENT087757 for a *Solenopsis papuana* worker). The Queensland *Solenopsis* specimens, collected in Centenary Lakes in Cairns, have paraclypeal teeth in addition to the normal clypeal teeth. This feature is lacking from most workers imaged on AntWeb (including syntypes) but can clearly be seen in an identical worker collected on Oahu, Hawaii and identified by P. Krushelnycky as *Solenopsis papuana*. Another, similar worker identified by Krushelnycky as *S. papuana* and also collected on Oahu appears to lack paraclypeal teeth. Apparently, this feature is variable, as is the colour in this species (Wilson & Taylor 1967). Both *Cardiocondyla minutior* and *Solenopsis papuana* have been imaged and the images sent to AntWeb.

While these two species are unlikely to represent a substantial threat to Australian flora and fauna and Australian agriculture or be a domestic nuisance, their discovery highlights the value of amateur collections in picking up exotic organisms that might otherwise evade detection. In order to make the best use of such collections, however, there is the need for more professional taxonomists. The ideal situation is where both the enthusiasm of amateur collectors and the professional skills of trained taxonomists work in synergy; the field naturalist often has irreplaceable knowledge of the habits and distribution of his target organisms, whereas the professional taxonomist working in institutional collections and in the office can make use of the most up-to-date tools that include specialist technical equipment, morphological expertise and familiarity with molecular data. Taxonomy, in fact, is an essential starting-off point since, for any organism to be understood, it must first be given a reliable name and a proper description. On the basis of this foundation, workers in other fields, for example, animal physiology, environmental management, evolutionary theoretics, and pest management, to name just a few areas, can then ply their craft.

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