

Cardiocondyla atalanta FOREL, 1915, a cryptic sister species of *Cardiocondyla nuda* (MAYR, 1866) (Hymenoptera: Formicidae)

Bernhard SEIFERT



Abstract

A numeric morphology-based alpha-taxonomy (NUMOBAT) analysis confirmed cryptic heterospecificity of *Cardiocondyla atalanta* FOREL, 1915 from *Cardiocondyla nuda* (MAYR, 1866). A discriminant analysis (DA) considering 14 morphological characters confirmed all *a-priori*-determinations of 48 *C. atalanta* and 84 *C. nuda* worker specimens and allocated the holotypes of *C. atalanta* and *C. nuda* to the corresponding cluster with $p = 0.999$ and $p = 1.000$, respectively. The Leave-One-Out Cross-Validation (LOOCV) test indicated an error rate of 0%. *Cardiocondyla atalanta* differs from *C. nuda* in the worker caste by having a shorter and less dense pubescence on first gaster tergite and a shorter scape. Simulations indicate that a single character, absolute pubescence length on first gaster tergite, should enable a safe species discrimination if nest samples containing three workers are available. The distribution of both species differs considerably. *Cardiocondyla nuda* is distributed in Polynesia east to 170° W, in New Guinea and along the coast of northern and eastern Australia. It avoids continental parts of Australia and is apparently best adapted to climate zones with annual rainfalls above 1000 mm. *Cardiocondyla atalanta* ranges all over the Australian continent, including its innermost parts, and is only exceptionally found on offshore islands of Australia. It is better adapted to a xerothermous climate with annual rainfall below 1000 mm. Both species are sympatric in the coastal areas of northern and eastern Australia. Syntopic occurrence was only once observed but is most certainly underrecorded because of low sample numbers.

Key words: Numeric morphology-based alpha-taxonomy, cryptic species, discriminant analysis, Australasian faunal region.

Myrmecol. News 11: 43-48

ISSN 1994-4136 (print), ISSN 1997-3500 (online)

Received 30 December 2007; revision received 15 February 2008; accepted 15 February 2008

Dr. Bernhard Seifert, State Museum of Natural History, Am Museum 1, D-02826 Görlitz, Germany.

E-mail: bernhard.seifert@smng.smwk.sachsen.de

Introduction

The *Cardiocondyla nuda* group in the definition of SEIFERT (2003) contains three major clades each of which has a very large geographic range: clade 1 with the cosmopolitan tramp species *Cardiocondyla mauritanica* FOREL, 1890; clade 2 with the different forms (possibly cryptic species) of the *C. kagutsuchi* TERAYAMA, 1999 complex, which largely replace *C. mauritanica* in the Oriental, Australasian and Japanese region; and clade 3 formed by *C. nuda* (MAYR, 1866) and *C. atalanta* FOREL, 1915, which are both known from the Australasian faunal region. The clear morphological separation of these three clades is unquestionable (SEIFERT 2003, see also below) and has also been confirmed by genetic data (HEINZE & al. 2005).

SEIFERT (2003) provisionally considered *C. atalanta* as a species separate from *C. nuda* but this statement was based on only two available worker specimens – the holotype and a second specimen from Australia. Since then, I had the opportunity to investigate much more material of *C. atalanta* and also further specimens of *C. nuda*. This enabled the separate species hypothesis to be checked by the objective test systems of NUMOBAT.

Methods

Fifteen numerically described continuous morphological characters were used. All measurements were made on mounted and dried specimens using a pin-holding stage,

permitting full rotations around X, Y and Z axes. A Wild M10 high-performance stereomicroscope equipped with a 1.6× planapochromatic objective was used at magnifications of 160 - 320×. A Schott KL 1500 cold-light source equipped with two flexible, focally mounted light-cables, providing 30°-inclined light from variable directions, allowed sufficient illumination over the full magnification range and a clear visualisation of silhouette lines. A Schott KL 2500 LCD cold-light source in combination with a Leica coaxial polarised-light illuminator provided optimum resolution of tiny structures and microsculpture at highest magnifications. Simultaneous or alternative use of the cold-light sources depending upon the required illumination regime was quickly provided by regulating the voltage up and down. A Leica cross-scaled ocular micrometer with 120 graduation marks ranging over 65 % of the visual field was used. To avoid parallax error, its measuring line was constantly kept vertical within the visual field. A mean measurement error of $\pm 0.6 \mu\text{m}$ was calculated for small and well-defined structures such as petiole width, but one of $\pm 1.0 \mu\text{m}$ for larger structures that are difficult to position such as cephalic length.

Definition of numeric characters

CL Maximum cephalic length in median line; the head must be carefully tilted to the position yielding the