

Table 1. Putative diagnostic features of *Plectroctena mandibularis* and *P. conjugata* (after Bolton 1974).

	<i>P. conjugata</i>	<i>P. mandibularis</i>
Worker head length	<3.0 mm	>3.0 mm
Worker eye length	0.32–0.38 mm	0.38–0.52 mm
Queen head length	<4.0 mm	>4.0 mm
Queen mandibular index	<83	>83
Queen scape length	<2.8 mm	>2.9 mm
Funicular segments 3–5	Annular, shorter than wide	As long or longer than wide
Striae on gula	Covering anterior half of gula	Covering whole gula
Male gaster	Black	Red-brown to orange

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Quantitative variation in males, workers and queens was determined phenetically using morphometric measurements of 180 workers, 18 queens and 40 males. The morphometric variables were primarily those suggested and defined by Bolton (1974). In the case of workers and queens the measurements were head length (HL), mandibular length (ML), scape length (SL), maximum ocular diameter (OD), petiole length (PL), dorsal petiole width (DPW), length of funicular segment 4 (FSL) and width of funicular segment 4 (FSW); in males they were head length, head width, mandible length, eye length, mandible width, clypeus width and mesonotum length. The pigmentation of gasters of males was scored as orange/yellow (1), brown (2), brown-tipped (3) or black (4). Bolton (1974) also proposed and defined several ratios, the most important of which are the mandibulo-cephalic index ($MI = ML/HL$), for separating queens, and the funicular index ($FI = FSL/FSW$), for discriminating between workers (Table 1).

Measurements were log-transformed to linearize allometric variation, and analysed using principal component analysis and regression. Geographic patterns in quantitative variation and pigmentation were examined by canonical correlation analysis, using latitude and longitude as measures of geographical location.

RESULTS AND DISCUSSION

Colony membership

As specimens from the same nest series can be assumed to belong to the same species, an

examination of intranidal variation was important in this study. Based on the distinguishing traits listed in Table 1, 13 (28 %) of the 47 nest series contained workers of both *P. mandibularis* and *P. conjugata*. Instances of this can be seen in Fig. 1, where the identity of specimens was decided on the basis of the mean funicular index of the colony series. Several worker specimens from *P. conjugata* colonies have funicular indices above 100, and even more specimens from *P. mandibularis* colonies have indices below 100. Revising the critical FI did not resolve the contradiction. Similar unresolvable contradictions arose from using head length or eye length to identify (presumably) related workers.

Regressing FI against head length as a measure of body size (Fig. 1) yielded a significant allometric relationship ($F = 394.6$; $P = 0.000$; $R^2 = 0.69$). The use of ratios such as funicular index to separate taxa is based on the implicit assumption that a ratio expressed shape independent of size. That this is not always true (Bookstein 1989) is evident in this case.

Four of the six queens associated with workers had morphological traits (mandibulo-cephalic indices, head length and/or scape length (Table 1)) that would place them in a different species from the workers. Similarly, five of the six males with black gasters (putative *P. conjugata*) were associated with *P. mandibularis* females. Colony membership therefore contradicted most putative distinguishing traits.

Morphometric variation: workers

Since other discriminatory traits could exist, it was also necessary to further test for the subdivision of the sample of ants using characters that have proved useful for other members of the genus (Bolton 1974).