



<http://dx.doi.org/10.11646/zootaxa.3911.4.2>

<http://zoobank.org/urn:lsid:zoobank.org:pub:EDF9E69E-7898-4CF8-B447-EFF646FE3B44>

Ants with Attitude: Australian Jack-jumpers of the *Myrmecia pilosula* species complex, with descriptions of four new species (Hymenoptera: Formicidae: Myrmeciinae)

ROBERT W. TAYLOR

Research School of Biology, Australian National University, Canberra, ACT 0200.

Honorary Fellow, Australian National Insect Collection, CSIRO Ecosystem Sciences, Canberra.

E-mail: bob.taylor@homemail.com.au

Abstract

The six known “Jack-jumper species *Myrmecia pilosula* Fr. Smith 1858, *M. croslandi* Taylor 1991, *M. banksi*, *M. haskinsorum*, *M. imaii* and *M. impaternalata* spp.n. are reviewed, illustrated and keyed. *Myrmecia imaii* is known only from southwest Western Australia, the others variously from southeastern Australia and Tasmania. These taxa were previously confused under the name *M. pilosula* (for which a lectotype is designated). Previous cytogenetical findings, which contributed importantly to current taxonomic understanding, are summarized for each species. Eastern and Western geographical races of the widespread *M. pilosula* are recognized. *Myrmecia croslandi* is one of only two eukaryote animals known to possess a single pair of chromosomes ($2n=2 \times 3$ or 4). *Myrmecia impaternalata* is evidentially an allodiploid ($n=5$ or 14 , $2n=19$) sperm-dependent gynogenetic hybrid between *M. banksi* and an element of the eastern race of *M. pilosula*, or their immediate ancestry. The sting-injected venom of these ants can induce sometimes fatal anaphylaxis in sensitive humans.

Key words: Ants, Formicidae, Myrmeciinae, *Myrmecia*, Jack-jumpers, Tasmania, Kangaroo Island, karyology, hybridization, thelytoky, allodiploidy

Introduction

The *Myrmecia pilosula* complex was defined by Ogata and Taylor (1991) as a section of the species group of *M. pilosula* Fr. Smith 1858. There are six component species, four of which are described here as new. In addition, *M. pilosula* comprises two newly recognized geographical races. These sometimes common ants are known to Australians variously as “Jack-jumpers”, “Jackie-Jumpers”, “Jumping Jacks”, “Jumper Ants”, “Black Jumpers” or “Hopper Ants. *Myrmecia imaii* is apparently endemic to southwest Western Australia (WA) and the other species are collectively distributed in a zone extending from extreme SE Queensland (QLD), south along the Great Dividing Range and its flanks in eastern New South Wales (NSW), the Australian Capital Territory (ACT), Victoria (VIC) and Tasmania (TAS), ranging from sea level to the high slopes of Mt Kosciuszko (2, 228m) and the Tasmanian mountains; thence from SE Victoria westwards to SE South Australia (SA) and Kangaroo Island. The nearest records of an eastern species to the distributional range of *M. imaii* are those for *M. pilosula* in SA east of Spencer Gulf, an overland distance of over 2, 000km.

Because of close interspecific similarity relevant museum specimens were previously often labeled or placed in collections as “*Myrmecia pilosula*”, as if representing a single biological species. Various authors (e.g. Wheeler, 1933; Clark, 1943, 1951; Haskins & Haskins, 1951; W. L. Brown, 1953; Taylor & D. R. Brown, 1985, Browning, 1987; Heterick, 2009) followed this portmanteau nomenclature, though sometimes aware that the action was not well supported (e.g. Browning, 1987). During this project specimens of all six species recognized here were found identified as *M. pilosula* in Australian public collections. Material in the Australian National Insect Collection (ANIC), Museum of Victoria (MVMA) and Queensland Museum (QMBA) labeled by Clark when compiling his revisions of *Myrmecia* and its erstwhile subgenus *Promyrmecia* (Clark, 1943, 1951), indicate that he identified as *M. pilosula* specimens assigned here to *M. haskinsorum*, *M. imaii* and both races of *M. pilosula*.

The view that “*M. pilosula*” was composite was eventually confirmed by the author’s discovery of two distinct

Research prospects. Sociobiological and genetical investigation of this long-time geographically-isolated species, *versus* its eastern relatives, is desirable.

Acknowledgments

The collegiality of JACP and AAVAS researchers listed above is commended, as are Steve Shattuck, Phil Ward, Robyn Meier, †Renate Saddler, Beth Mantle, David Yeates, Joachim Ziel, Ajay Narendra, Piyankarie Jayatilaka, Chloe Radershall, Sam Reid, Hugh and Marina Tyndale-Biscoe and Colin Beaton, John Longino and an appreciated anonymous referee. Wendy Taylor, Jan Robertson and David Somerfield participated in a 2010 Jack-jumper-focused collecting expedition covering much of Victoria. Masao Kubota mounted scores of JACP voucher specimens for the ANIC. Taxonomic work was partly funded by The Australian Biological Resources Study Participatory Program; AAVAS participation by the Australian National Health and Medical Research Council. JACP participation was funded by the Japanese Ministry of Education through Hirokami Imai's grant support, and facilitated by †Division of Entomology, CSIRO, and its former Chiefs †Douglas Waterhouse and Max Whitten. Special thanks to the South Australian mother of a dangerously *pilosula*-venom-sensitive child, who provided the title words "Ants with Attitude" when discussing the ants banefully common in her garden.

References

- Brown, S.G.A., van Eeden, P., Wiese, M.D., Mullins, R.J., Solley, G.O., Puy, R., Bleasel, K., Taylor, R.W. & Heddle, R.J. (2011) Ant sting anaphylaxis in Australia – The Australian Ant Venom Allergy Study. *Medical Journal of Australia*, 195, 69–73.
- Brown, W.L. Jr. (1953) Revisionary notes on the ant genus *Myrmecia* of Australia. *Bulletin of the Museum of Comparative Zoology Harvard University*, 111, 1–35.
- Browning, G.P. (1987) *Taxonomy of Myrmecia Fabricius (Hymenoptera: Formicidae)*. Ph.D. thesis, University of Adelaide, Adelaide, 431 pp.
- Clark, J. (1943) A revision of the genus *Promyrmecia* Emery (Formicidae). *Memoirs of the National Museum of Victoria*, 13, 83–149.
- Clark, J. (1951) *The Formicidae of Australia. Vol. I. Subfamily Myrmeciinae*. CSIRO, Melbourne, 230 pp.
- Cole, C.J. (1985) Taxonomy of parthenogenetic species of hybrid origin. *Systematic Zoology*, 34, 359–363.
<http://dx.doi.org/10.2307/2413153>
- Cook, L.G. (2000) Extraordinary and extensive karyotypic variation: A 48-fold range in chromosome number in the gall-inducing scale insect *Apiomorpha* (Hemiptera: Coccoidea: Eriococcidae). *Genome*, 43, 255–263.
<http://dx.doi.org/10.1139/gen-43-2-255>
- Crosland, M.W.J. & Crozier, R.H. (1986) *Myrmecia pilosula*, an ant with only one pair of chromosomes. *Science*, 231, 1278.
<http://dx.doi.org/10.1126/science.231.4743.1278>
- Crosland, M.W.J., Crozier, R.H. & Imai, H.T. (1988) Evidence for several sibling biological species centered on *Myrmecia pilosula* (F. Smith) (Hymenoptera: Formicidae). *Journal of the Australian Entomological Society*, 27, 13–14.
- Crozier, R.H., Dobric, N., Imai, H.T., Graur, D., Cornuet, J.M. & Taylor, R.W. (1995) Mitochondrial DNA sequence evidence on the phylogeny of Australian jack-jumper ants of the *Myrmecia pilosula* complex. *Molecular Phylogenetics and Evolution*, 4, 20–30.
<http://dx.doi.org/10.1006/mpev.1995.1003>
- Forel, A. (1910) Formicides australiens reçus de MM. Froggatt et Rowland Turner. *Revue suisse de Zoologie*, 18, 1–94.
- Frakes, L.A. (1999) Evolution of Australian environments. *Flora of Australia*, 1, 163–203.
- Hasegawa, E. & Crozier, R.H. (2006) Phylogenetic relationships among species groups of the ant genus *Myrmecia*. *Molecular Phylogenetics and Evolution*, 38, 575–582.
<http://dx.doi.org/10.1016/j.ympev.2005.09.021>
- Haskins, C.P. & Haskins, E.F. (1951) Notes on the biology and social behavior of the archaic ponerine ants of the genera *Myrmecia* and *Promyrmecia*. *Annals of the Entomological Society of America*, 43, 461–491.
- Hechler, H.C. (1968) Postembryonic development and reproduction in *Diploscapter coronata* Nematoda: Rhabditidae. *Proceedings of the Helminthological Society of Washington*, 35, 24–30.
- Heterick, B.E. (2009) A guide to the ants of south-western Western Australia. *Records of the Western Australian Museum*, No 26 (Supplement), 1–207.
- Hirai, H., Yamamoto, M.T., Ogura, K., Satta, Y., Yamada, M., Taylor, R.W. & Imai, H.T. (1994) Multiplication of 28S rDNA and NOR activity in chromosome evolution among ants of the *Myrmecia pilosula* species complex (Hymenoptera: Formicidae: Myrmeciinae). *Chromosoma*, 103, 171–178. [Berlin]
<http://dx.doi.org/10.1007/BF00368009>
- Hopper, S.D. & Gioia, P. (2004) The southwest Australian floristic region: evolution and conservation of a global hot spot of

- biodiversity. *Annual Review of Ecology and Systematics*, 35, 623–650.
<http://dx.doi.org/10.1146/annurev.ecolsys.35.112202.130201>
- Hopper, S.D., Harvey, M.S., Chappill, J.A., Main, A.R. & Main, B.Y. (1996) The western Australian biota as Gondwanan heritage – a review. In: Hopper, S.D., Chappill, J.A., Harvey, M.S. & George, A.S. (Eds.), *Gondwanan Heritage: past, present, and future of the western Australian biota*. Surrey Beatty & Sons, Chipping Norton, pp. 1–46. [Australia]
- Imai, H.T. (2010) A productive friendship – my work in ant cytogenetics with Ross H. Crozier. *Myrmecological News*, 15, 1–5.
- Imai, H.T., Crozier, R.H. & Taylor, R.W. (1977) Karyotype evolution in Australian ants. *Chromosoma*, 59, 341–393. [Berlin]
<http://dx.doi.org/10.1007/BF00327974>
- Imai, H.T., Hirai, H., Satta, Y., Shiroishi, T., Yamada, M. & Taylor, R.W. (1992) Phase specific Ag-staining of nucleolar organizer regions (NORs) and kinetochores in the Australian Ant *Myrmecia croslandi*. *Japanese Journal of Genetics*, 67, 437–447.
<http://dx.doi.org/10.1266/jjg.67.437>
- Imai, H.T. & Taylor, R.W. (1989) Chromosomal polymorphisms involving telomere fusion, centromeric inactivation and centromere shift in the ant *Myrmecia (pilosula) n=1*. *Chromosoma*, 98, 456–460. [Berlin]
<http://dx.doi.org/10.1007/BF00292792>
- Imai, H.T., Taylor, R.W., Crosland, M.W.J. & Crozier, R.H. (1988) Modes of spontaneous chromosomal mutation and karyotype evolution in ants with reference to the minimum interaction hypothesis. *Japanese Journal of Genetics*, 63, 159–185.
<http://dx.doi.org/10.1266/jjg.63.159>
- Imai, H.T., Taylor, R.W., Crozier, R.H., Crosland, M.W.L. & Browning, G.P. (1988) Chromosomal polymorphism in the ant *Myrmecia (pilosula) n=1*. *Annual Report of the National Institute of Genetics*, 38, 82–84. [Japan]
- Imai, H.T., Taylor, R.W., Kubota, M., Ogata, K. & Wada, M.Y. (1990) Notes on the remarkable karyology of the primitive ant *Nothomyrmecia macrops* Clark, and on the related genus *Myrmecia* Fabricius (Hymenoptera: Formicidae). *Psyche, Cambridge*, 97, 133–140.
<http://dx.doi.org/10.1155/1990/91237>
- Imai, H.T. Taylor, R.W. & Crozier, R.H. (1994) Experimental bases for the minimum interaction hypothesis: 1. chromosome evolution in ants of the *Myrmecia pilosula* species complex (Hymenoptera: Formicidae: Myrmeciinae). *Japanese journal of Genetics*, 69, 137–182.
<http://dx.doi.org/10.1266/jjg.69.137>
- Imai, H.T., Taylor, R.W., Ogata K. & Crozier, R.H. (1992) Karyotypic divergence and speciation in the Australian *Myrmecia (pilosula)* species complex (Hymenoptera: Formicidae), with reference to modern cytological techniques. *Proceedings of the 19th International Congress of Entomology*, Abstracts, 7.
- Japanese Ant Database Group (2003) *Ants of Japan*, Gakken Press, Tokyo, 221 pp. [English Language Edition, Book and CD]
- Key, K.H.L. (1974) Speciation in Australian morabine grasshoppers – taxonomy and ecology. In: White, M.J.D. (Ed.), *Genetic Mechanisms of Speciation in Insects*. Australia and New Zealand Book Company, Sydney, pp. 43–56.
- Kokko, H., Heubel, K.U. & Rankin, D.J. (2008) How populations persist when asexuality requires sex: the spatial dynamics of coping with sperm parasites. *Philosophical Transactions of the Royal Society B*, 275, 817–825.
<http://dx.doi.org/10.1098/rspb.2007.1199>
- Lambeck, K. & Chappell, J. (2001) Sea level changes in the last glacial epoch. *Science*, 292, 679–686.
<http://dx.doi.org/10.1126/science.1059549>
- Maslin, T.P. (1968) Taxonomic problems in parthenogenetic vertebrates. *Systematic Zoology*, 17, 219–231.
<http://dx.doi.org/10.2307/2412001>
- Meyne, J., Hirai, H. & Imai, H.T. (1995) FISH analysis of the telomere sequences of bulldog ants (*Myrmecia*: Formicidae). *Chromosoma*, 104, 14–18. [Berlin]
- Nelson, E.C. (1981) Phytogeography of Southern Australia. In: Keast, A. (Ed.), *Ecological Biogeography of Australia*. W. Jung, the Hague, pp. 733–759.
- Ogata, K. & Taylor, R.W. (1991) Ants of the genus *Myrmecia* Fabricius: a preliminary review and key to the named species. (Hymenoptera: Formicidae: Myrmeciinae). *Journal of Natural History*, 25, 1623–1673.
<http://dx.doi.org/10.1080/00222939100771021>
- Smith, F. (1858) *Catalogue of hymenopterous insects in the collection of the British Museum. Part VI. Formicidae*. British Museum, London, 216 pp.
- Taylor, R.W. (1991) *Myrmecia croslandi* sp.n., A karyologically remarkable new Australian jack-jumper ant (Hymenoptera: Formicidae: Myrmeciinae). *Journal of the Australian Entomological Society*, 30, 288.
<http://dx.doi.org/10.1111/j.1440-6055.1991.tb00438.x>
- Taylor, R.W. & Brown, D.R. (1985) Hymenoptera: Formicoidea. *Zoological Catalogue of Australia*, 2, 1–149, 306–348.
- Wheeler, W.M. (1922) Observations on *Gigantiops destructor* Fabricius and other leaping ants. *Biological Bulletin (Woods Hole)*, 42, 185–201.
<http://dx.doi.org/10.2307/1536521>
- Wheeler, W.M. (1933) *Colony-founding among Ants with an account of some primitive Australian species*. Cambridge, Massachusetts, Harvard University Press, 179 pp.
- White, M.J.D. (1974) Speciation in the Australian morabine grasshoppers – the cytogenetic evidence. In: White, M.J.D. (Ed.), *Genetic Mechanisms of Speciation in Insects*. Australia and New Zealand Book Company, Sydney, pp 57–70.
<http://dx.doi.org/10.1007/978-94-010-2248-4>