



Rediscovery of the rare ant genus *Bannapone* (Hymenoptera: Formicidae: Amblyoponinae) and description of the worker caste

BENOIT GUÉNARD^{1,3}, BENJAMIN BLANCHARD¹, CONG LIU^{1,2}, DA-RONG YANG² & EVAN ECONOMO¹

¹Okinawa Institute of Science and Technology Graduate University, Okinawa, 904-0495, Japan

²Key Laboratory of Tropical Forest Ecology, Xishuangbanna Tropical Botanical Garden, Chinese Academy of Sciences, Kunming, China

³Corresponding author. E-mail: zeroben@gmail.com

Abstract

The genus *Bannapone* was described in 2000 on the basis of a single dealate queen specimen. Since its original collection in Yunnan, China, no other specimen has been reported, making it one of the rarest ant genera in the world. Here we report the collection of two workers of *Bannapone* also from Yunnan province. The description of the worker caste is presented. Furthermore, we found significant differences with the described *B. mulanae* Xu, 2000 which leads us to describe the workers as a new species, *B. scrobiceps* n. sp.. Finally, we briefly discuss the importance of leaf-litter collection methods to collect taxa considered as “rare”.

Key words: Formicidae, Amblyoponinae

Introduction

The subfamily Amblyoponinae includes 116 species spread over 13 genera. Most of the Amblyoponine genera exhibit a pan-tropical distribution (Guénard *et al.* 2011), although a few species are also known to be adapted to cooler habitats of temperate regions. A few fossils have also been described, found in deposits located in more northern regions of Europe and Asia and now outside the distribution range of the subfamily (Figure 1). Many species of this subfamily are known to exhibit a subterranean life and are occasionally collected through leaf litter extraction (Brown 1949, 1960). Amblyoponine colonies are typically small, consisting of only a dozen to a few hundred workers (Gotwald & Levieux 1972, Traniello 1982, Hölldobler & Wilson 1990, Ito 1991, Yoshimura & Fisher 2012). The typical mandibular shape of several genera encountered in this subfamily is an adaptation for their specialized predatory diet of centipedes and insect larvae found in rotten wood or leaf litter (Brown 1960, Gotwald & Levieux 1972, Masuko 1993, Ito 1993). Another unusual feeding characteristic of some Amblyoponinae species is the feeding from larval hemolymph though non-destructive parental cannibalism (Masuko 1986, Ito 2010). This behavior, considered as “primitive” in ants and linked to some of the morphologically primitive characters (e.g. broad attachment of the petiole to the gaster, see Ward 1994) of this subfamily have supported the hypothesis that Amblyoponinae is a basal lineage in ants. Recent molecular phylogenetic work has confirmed this conclusion (Moreau & Bell 2013).

Among the genera that constitute the Amblyoponinae, the genus *Bannapone* is one of the rarest. *Bannapone* was described from a single dealate queen specimen from Mengla county, Yunnan province, China (Xu 2000). This is the only known record for this genus, making it one of the rarest ants in the world. Many species are known from single specimens, but it is unusual for a genus or higher taxon to be so poorly represented (e.g., the subfamily Martialinae, known from a single worker; Rabeling *et al.* 2012). Rareness in ants can be factual or artificial due to incomplete or inadequate sampling (Espadaler & López-Soria 1991). Specifically, ant species that live in microhabitats that are difficult to sample or ants with highly specialized life histories (e.g., social parasites) may be abundant but can be perceived as rare due to inadequate sampling methods. Several subterranean ants that were

Acknowledgments

We warmly thank Jiajia Liu for his assistance and advices on collecting sites. We also thank Masashi Yoshimura and Eli Sarnat for their valuable comments on a previous version of the manuscript. BG, EPE, CL, BDB, were supported by OIST. EPE acknowledges the support of a grant from NSF (DEB-1145989).

References

- Antweb (2002–2013) AntWeb v5.1.24. Available from: <http://www.antweb.org> (Accessed 10 July 2013)
- Brady, S.G., Schultz, T.R., Fisher, B.L. & Ward, P.S. (2006) Evaluating alternative hypotheses for the early evolution and diversification of ants. *Proceedings of the National Academy of Sciences of the United States of America*, 103, 18172–18177.
<http://dx.doi.org/10.1073/pnas.0605858103>
- Brandão, C.R.F., Feitosa, R.M., Schmidt, F.A. & De Castro Solar, R.R. (2008) Rediscovery of the putatively extinct ant species *Simopelta minima* (Brandão) (Hymenoptera: Formicidae), with a discussion on rarity and conservation status of ant species. *Revista Brasileira de Entomologia*, 52, 480–483.
<http://dx.doi.org/10.1590/s0085-56262008000300026>
- Brown, W.L. Jr. (1949) A new American *Amblyopone*, with notes on the genus (Hymenoptera: Formicidae). *Psyche*, 56, 81–88.
<http://dx.doi.org/10.1155/1949/67378>
- Brown, W.L. Jr. (1960) Contribution toward a reclassification of the Formicidae, III: Tribe Amblyoponini (Hymenoptera). *Bulletin of the Museum of Comparative Zoology Harvard*, 122, 144–230.
- Brown, W.L. Jr. (1974) *Concoctio* genus nov. *Pilot Register of Zoology Card*, 29, 1.
- Espadaler, X. & López-Soria, L. (1991) Rareness of certain Mediterranean ant species: fact or artifact? *Insectes Sociaux*, 38, 365–377.
<http://dx.doi.org/10.1007/bf01241872>
- Francoeur, A. (1973) Révision taxonomique des espèces néarctiques du groupe *fusca*, genre *Formica* (Formicidae, Hymenoptera). *Mémoires de la Société Entomologique du Québec*, 3, 1–316.
- Gotwald, W.H. Jr. & Levieux, J. (1972) Taxonomy and biology of a new West African ant belonging to the genus *Amblyopone* (Hymenoptera: Formicidae). *Annals of the Entomological Society of America*, 65, 383–396.
- Guénard, B., Weiser, M.D. & Dunn, R.R. (2011) Ant Genera of the World. Available from: http://www.antmacroecology.org/ant_genera/index.html (Accessed 2 July 2013)
- Guénard, B. & Dunn, R.R. (2012) A checklist of the ants of China. *Zootaxa*, 3358, 1–77.
- Harris, R.A. (1979) A glossary of surface sculpturing. *California Department of Food and Agriculture. Laboratory Services, Entomology. Occasional Papers*, 28, 1–31.
- Hölldobler, B. & Wilson, E.O. (1990) The ants. Belknap Press of Harvard University Press, Cambridge, MA, 732 pp.
- Ito, F. (1991) Preliminary report on queenless reproduction in a primitive ponerine ant *Amblyopone* sp. (*reclinata* group) in West Java, Indonesia. *Psyche*, 98, 319–322.
<http://dx.doi.org/10.1155/1991/81216>
- Ito, F. (1993) Observation of group recruitment to prey in a primitive ponerine ant, *Amblyopone* sp. (*reclinata* group) (Hymenoptera: Formicidae). *Insectes Sociaux*, 40, 163–167.
<http://dx.doi.org/10.1007/bf01240704>
- Ito, F. (2010) Notes on the biology of the Oriental amblyoponine ant *Myopopone castanea*: queen-worker dimorphism, worker polymorphism and larval hemolymph feeding by workers (Hymenoptera: Formicidae). *Entomological Science*, 13, 199–204.
<http://dx.doi.org/10.1111/j.1479-8298.2010.00384.x>
- Kikuchi, T., Miuazaki, S., Ohnishi, S., Takahashi, J., Nakajima, Y. & Tsuji, K. (2008) Small queens and big headed workers in a monomorphic ponerine ant. *Naturwissenschaften*, 95, 963–968.
<http://dx.doi.org/10.1007/s00114-008-0414-8>
- Masuko, K. (1986) Larval hemolymph feeding: a nondestructive parental cannibalism in the primitive ant *Amblyopone silvestrii* Wheeler (Hymenoptera: Formicidae). *Behavioral Ecology and Sociobiology*, 19, 249–255.
<http://dx.doi.org/10.1007/bf00300639>
- Masuko, K. (1993) Predation of centipedes by the primitive ant *Amblyopone silvestrii*. *Bulletin of the Association for Natural Sciences, Senshu University*, 24, 35–43.
- Meng, L.Z. & Gao, X.X. (2007) Species diversity of rat and ant at different habitats and sites in Xishuangbanna. *Chinese Journal of Ecology*, 26, 802–809.
- Molet M., Peeters, C. & Fisher, B. (2007) Winged queens replaced by reproductives smaller than workers in *Myrmium* ants. *Naturwissenschaften*, 94, 280–287.
<http://dx.doi.org/10.1007/s00114-006-0190-2>

- Moreau, C., Bell, C.D., Vila, R., Archibald, S.B. & Pierce, N.E. (2006) Phylogeny of the ants: diversification in the age of Angiosperms. *Science*, 312, 101–104.
<http://dx.doi.org/10.1126/science.1124891>
- Moreau, C.S. & Bell, C.D. (2013) Testing the museum versus cradle tropical biological diversity hypothesis: phylogeny, diversification, and ancestral biogeographic range evolution of the ants. *Evolution*. [in press]
<http://dx.doi.org/10.1111/evo.12105>
- Rabeling, C., Brown, J.M. & Verhaagh, M. (2008) Newly discovered sister lineage sheds light on early ant evolution. *Proceedings of the National Academy of Sciences of the United States of America*, 105, 14913–14917.
<http://dx.doi.org/10.1073/pnas.0806187105>
- Saux, C., Fisher, B.L. & Spicer, G.S. (2004) Dracula ant phylogeny as inferred by nuclear 28S rDNA sequences and implications for ant systematics (Hymenoptera: Formicidae: Amblyoponinae). *Molecular Phylogenetics and Evolution*, 33, 457–468.
<http://dx.doi.org/10.1016/j.ympev.2004.06.017>
- Schmidt, F.A., Feitosa, R.M., de Moraes Rezende, F. & Silva de Jesus, R. (2013) News on the enigmatic ant genus *Anillidris* (Hymenoptera: Formicidae: Dolichoderinae: Leptomyrmecini). *Myrmecological News*, 19, 25–30.
- Traniello, J.F.A. (1982) Population structure and social organization in the primitive ant *Amblyopone pallipes* (Hymenoptera: Formicidae). *Psyche*, 89, 65–80.
<http://dx.doi.org/10.1155/1982/79349>
- Ward, P.S. (1994) *Adetomyrma*, an enigmatic new ant genus from Madagascar (Hymenoptera: Formicidae), and its implications for ant phylogeny. *Systematic Entomology*, 19, 159–175.
<http://dx.doi.org/10.1111/j.1365-3113.1994.tb00585.x>
- Xu, Z. (1998) A report of forty-one ant species newly recorded in China from Xishuangbanna District of Yunnan Province (Hymenoptera: Formicidae). *Abstract of Chinese Academic Periodicals*, 4, 1119–1121.
- Xu, Z. (1999) An analysis on the ant fauna of the tropical rain forest in Xishuangbanna of China. *Zoological Research*, 20, 379–384.
- Xu, Z.-H. (2000) Two new genera of ant subfamilies Dorylinae and Ponerinae (Hymenoptera: Formicidae) from Yunnan, China. *Zoological Research*, 21, 297–302.
- Xu, Z.-H. (2002) *A study on the biodiversity of Formicidae ants of Xishuangbanna Nature Reserve*. Yunnan Science and Technology Press, 181 pp.
- Xu, Z., Liu, T.Y., He, Y.F. & Zeng, G. (1998) A comparative study on the ant communities in primeval and secondary forests of four vegetation subtypes in Xishuangbanna of China. *Zoological Research*, 20, 360–364.
- Xu, Z., Zeng, G., Liu, T.Y. & He, Y.F. (1999) A study on communities of Formicidae ants in different subtypes of vegetation in Xishuangbanna District of China. *Zoological Research*, 20, 118–125.
- Yang, X.D., She, Y.P., Zhang, Z.H., Cao, M. & Deng, X.B. (2001) Studies on structure and diversity of ant groups in the fragmentary tropical rainforests of Holy Hills of Dai nationality in Xishuangbanna, China. *Acta Ecologica Sinica*, 21, 1321–1328.
- Yoshimura, M. & Fisher, B.L. (2012) A revision of the Malagasy endemic genus *Adetomyrma* (Hymenoptera: Formicidae: Amblyoponinae). *Zootaxa*, 3341, 1–31.
- Zhang, Z.Y., Cao, M., Yang, X.D., Deng, X.B. & She, Y.P. (2000) A study on species diversity of ant in fragments of seasonal rain forest of Xishuangbanna, China. *Zoological Research*, 21, 70–75.