



<http://dx.doi.org/10.11646/zootaxa.3753.4.9>

<http://zoobank.org/urn:lsid:zoobank.org:pub:6DAF0E77-298B-4A83-9F87-876C3EC5F403>

The status of the Australian genus *Caridinides* Calman, 1926 (Crustacea: Decapoda: Atyidae) with reference to recent phylogenetic studies

SAMMY DE GRAVE¹ & TIMOTHY J. PAGE²

¹Oxford University Museum of Natural History, Parks Road, Oxford, OX1 3PW, United Kingdom

E-mail: sammy.degrave@oum.ox.ac.uk

²Australian Rivers Institute, Faculty of Environmental Sciences, Griffith University, Nathan Campus, Qld 4111, Australia.

E-mail: penguintim@hotmail.com

Traditionally four subfamilies have been recognised within Atyidae (Holthuis 1986) based on an expanded version of Bouvier's (1925) "série" concept, namely Atyinae De Haan, 1849, Caridellinae Holthuis, 1986, Paratyinae Holthuis, 1986, and Typhlatyinae Holthuis, 1986. The distinction between these subfamilies and the assignment of genera to them was based on the relative development of exopods on the pereopods, the branchial formulae, pigment presence and reduction of eyes, the number of spines on the uropodal diarsis, as well as the shape and proportions of the chelipeds. In recent years, this subfamily division has not been consistently used in primary taxonomic literature (see Richard *et al.* 2012) and a growing body of phylogenetic studies have cast considerable doubt on their relevance to common ancestry. This phylogenetic work recently culminated in the comprehensive study of von Rintelen *et al.* (2012), who included 32 genera (out of the 42 then known) in analyses of one mitochondrial (16S) and two nuclear genes (28S, H3). They found no molecular support to continue to recognise subfamilies as phylogenetic realities, and suggested using informal group names for the five deep clades they recovered.

On a more inclusive level, the study of von Rintelen *et al.* (2012) also highlighted considerable levels of non-monophyly in *Caridina* as currently defined, which had been alluded to before (Page *et al.* 2007a). Most importantly, from a traditional systematic point of view, was the fact that 13 genera were recovered as embedded within their *Caridina* sensu lato clade (their "*Caridella*-group"), including *Atyella* Calman, 1906, *Caridinides* Calman, 1926, *Caridinopsis* Bouvier, 1912, *Caridella* Calman, 1906, *Edoneus* Holthuis, 1978, *Limnocaridina* Calman, 1899, *Marosina* Cai & Ng, 2005, *Neocaridina* Kubo, 1938, *Paracaridina* Liang, Guo & Tang, 1999, *Parisia* Holthuis, 1956, *Pycneus* Holthuis, 1986, *Pycnisia* Bruce, 1992 and *Sinodina* Liang & Cai, 1999. *Lancararis* Cai & Bahir, 2005 is also closely related to this clade, and falls within it in some analyses. All of these genera are morphologically close to *Caridina* sensu stricto, and are either troglobitic with considerable morphological adaptations (e.g., *Edoneus*, *Marosina*, *Pycneus*) or are considered different at generic level from *Caridina* on the basis of the same suite of characters used to delineate subfamilies (e.g., *Atyella*, *Caridinides*, *Paracaridina*). This raises important questions as to the delineation of the majority of genera in Atyidae, and suggests a revision of the morphological characters on which these taxa have been traditionally based.

The aim of the present contribution is to re-assess the unique, single morphological character that separates the monotypic, Australian genus *Caridinides* from *Caridina*.

Caridinides was erected by Calman (1926) for a single species, *C. wilkinsi* Calman, 1926, discovered in the Cape York Peninsula, Queensland, Australia. The generic diagnosis reads: "...resembling *Caridina*, but having a well-developed exopod on the first pair of chelipeds. No supra-orbital spine. Chelipeds of the *Caridina*-type, carpus of first pair slightly excavated. An arthrobranch at the base of first chelipeds (nine pairs of gills). A number of spines on exopod of uropods...". Calman himself already pointed out that, except for the presence of the exopod on the first pereopod, the species was a normal *Caridina*, which he thought to belong to the *Caridina nilotica* group. This is perhaps reflected in the etymology of the name he chose, which means "son of *Caridina*". He further states that he uses the generic name as a measure of practical convenience and not to indicate that the species may be phylogenetically more primitive than *Caridina*.

Johnson (1961) already raised some doubts whether the presence of an exopod on the first pereopod alone would be sufficient to maintain *Caridinides* as distinct, and suggested the species should perhaps be transferred to *Caridina*. Smith & Williams (1982) elegantly re-described and fully illustrated the species on the basis of extensive material from across

the species should now be referred to as *Caridina wilkinsi* (Calman, 1926) **comb. nov.** The presence of an exopod on the first pereopod amply serves to distinguish this species from all other known *Caridina*.

Literature cited

- Bouvier, E.L. (1925) Recherches sur la morphologie, les variations et la distribution systématique des crevettes d'eau douce de la famille des Atyidés. *Encyclopédie Entomologique*, 4, 1–365.
- Calman, W.T. (1926) On freshwater prawns of the family Atyidae from Queensland. *The Annals and Magazine of Natural History*, series 9, 17, 241–246.
<http://dx.doi.org/10.1080/00222932608633399>
- Choy, S.C. & Horwitz, P. (1995) Preliminary key to the species of Australian shrimps (Atyidae) found in inland waters. In: Horwitz, P. (Ed.), *Preliminary Key to the Species of Decapoda (Crustacea, Malacostraca) found in Australian Inland Waters. Co-operative Research Centre for Freshwater Ecology, Albury, Identification Guide*, 5, 51–59.
- Cook, B.D., Page, T.J. & Hughes, J.M. (2011) Molecular and conservation biogeography of freshwater caridean shrimps in north-western Australia. In: Held, C., Koenemann, S. & Schubart, C.D. (Eds), *Phylogeography and Population Genetics in Crustacea. Crustacean Issues*. CRC Press, Boca Raton, 19, 273–289.
- De Grave, S. & Fransen, C.H.J.M. (2011) Carideorum Catalogus: The recent species of the dendrobranchiate, stenopodidean, procarididean and caridean shrimps (Crustacea: Decapoda). *Zoologische Mededelingen*, 85, 195–589.
- Holthuis, L.B. (1986) A new genus and species of subterranean shrimp from Western Australia (Crustacea: Decapoda: Atyidae). *Zoologische Mededelingen*, 60, 103–111.
- Jalihah, D.R., Shenoy, S. & Sankolli, K.N. (1988) Freshwater prawns of the genus *Macrobrachium* Bate, 1868 (Crustacea, Decapoda, Palaemonidae) from Karnataka, India. *Records of the Zoological Survey of India. Miscellaneous Publication, Occasional Paper*, 112, 1–74.
- Johnson, D.S. (1961) Notes on freshwater Crustacea of Malaysia. I. The Atyidae. *Bulletin of the Raffles Museum*, 26, 120–153.
- Page, T.J., Choy, S.C. & Hughes, J.M. (2005) The taxonomic feedback loop: symbiosis of morphology and molecules. *Biology Letters*, 1, 139–142.
<http://dx.doi.org/10.1098/rsbl.2005.0298>
- Page, T.J., von Rintelen, K. & Hughes, J.M. (2007a) Phylogenetic and biogeographic relationships of subterranean and surface genera of Australian Atyidae (Crustacea: Decapoda: Caridea) inferred with mitochondrial DNA. *Invertebrate Systematics*, 21, 137–145.
<http://dx.doi.org/10.1071/is06023>
- Page, T.J., von Rintelen, K. & Hughes, J.M. (2007b) An island in the stream: Australia's place in the cosmopolitan world of Indo-West Pacific freshwater shrimp (Decapoda: Atyidae: *Caridina*). *Molecular Phylogenetics and Evolution*, 43, 645–659.
<http://dx.doi.org/10.1016/j.ympev.2006.08.007>
- Page, T.J. & Hughes, J.M. (2011) Neither molecular nor morphological data have all the answers; with an example from *Macrobrachium* (Decapoda: Palaemonidae) from Australia. *Zootaxa*, 2874, 65–68.
- Richard, J., De Grave, S. & Clark, P.F. (2012) A new atyid genus and species from Madagascar (Crustacea: Decapoda: Caridea). *Zootaxa*, 3162, 31–38.
- Riek, E.F. (1953) The Australian freshwater prawns of the family Atyidae. *Records of the Australian Museum*, 23, 111–121.
<http://dx.doi.org/10.3853/j.0067-1975.23.1953.625>
- Smith, M.J. & Williams, W.D. (1982) Taxonomic revision of the Australian genus *Caridinides* Calman (Crustacea: Decapoda: Atyidae). *Australian Journal of Marine and Freshwater Research*, 33, 575–587.
<http://dx.doi.org/10.1071/mf9820575>
- von Rintelen, K., Page, T.J., Cai, Y., Roe, K., Stelbrink, B., Kuhajda, B.R., Iliffe, T.M., Hughes, J.M. & von Rintelen, T. (2012) Drawn to the dark side: A molecular phylogeny of freshwater shrimps (Crustacea: Decapoda: Caridea: Atyidae) reveals frequent cave invasions and challenges current taxonomic hypotheses. *Molecular Phylogenetics and Evolution*, 63, 82–96.
<http://dx.doi.org/10.1016/j.ympev.2011.12.015>