



<http://dx.doi.org/10.11646/zootaxa.3652.2.1>

<http://zoobank.org/urn:lsid:zoobank.org:pub:2A51BCDC-77D6-4D3F-8F4D-830EEC5B3EEB>

## A cladistic analysis and classification of the subfamily Bembicinae (Hymenoptera: Crabronidae), with a key to the genera

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### Abstract

A cladistic analysis of the digger wasp subfamily Bembicinae based on morphological characters is presented. The underlying data matrix comprises 83 terminal taxa (coded on genus-level) and 64 morphological characters. The resulting strict consensus tree was used as the basis for a revised tribal and subtribal classification of the Bembicinae. Based on a previously published classification, we herewith propose a change: the tribe Heliocausini Handlirsch 1925, **stat. resurr.** (composed of *Acanthocausus* Fritz & Toro 1977, *Heliocausus* Kohl 1892, and *Tiguipa* Fritz & Toro 1976) is separated from Bembicini Latreille 1802. Four tribes are recognized within the subfamily Bembicinae and seven subtribes within the tribe Gorytini and two subtribes in the tribe Nyssonini, based on the present cladistic analysis. The subtribe Nurseina Nemkov & Lelej, **subtrib. nov.** (comprising of *Nippononysson* Yasumatsu & Maidl 1936 and *Nursea* Cameron 1902) is separated from other genera in the tribe Nyssonini Latreille 1804. An new identification key to the genera of the Bembicinae is provided.

**Key words:** Heliocausini, Nurseina, digger wasps, sand wasps, phylogeny

### Introduction

The subfamily Bembicinae comprise 1697 recognized species, which are divided into 81 genera and three tribes (Pulawski 2013). Besides those there are one fossil genus *Biamogorytes* Nemkov 1990 (Upper Oligocene) and three fossil species: *Biamogorytes handlirschi* Nemkov 1990 (Upper Oligocene), *Gorytes archoryctes* (Cockerell 1922) (Eocene) and *Psammaecius sepultus* (Cockerell 1906) (Lower Oligocene). Bembicinae is the second (after Crabroninae) most numerous subfamily within Crabronidae with regard to the number of species (19 % of total) and genera (31 % of total). They are distributed worldwide: 21 genera and 434 species occur in the Palearctic region, 36 and 275, respectively, in the Nearctic region, 19 and 292 in the Afrotropical region, 19 and 161 in the Oriental region, 53 and 353 in the Neotropic region, and 10 and 176 in the Australian region. Six species of *Nysson*, *Stizus*, and *Bembix* are of doubtful origin, without known type locality. The majority of Bembicinae are ground-burrowing wasps. Their burrows contain from one to several cells per nest (Evans 1966, Evans & O'Neill 2007, Nemkov 2012). The prey of Bembicinae are various insect, mainly Orthoptera, Hemiptera-Auchenorrhyncha, and Diptera. Some genera of Bembicinae (*Stizoides* and all Nyssonini genera with known natural history) are cleptoparasitic on other digger wasps (Sphecidae and Crabronidae).

This paper is the final one in the series on phylogeny and classification of the subfamily Bembicinae. The previous papers (Nemkov & Lelej 1996, Nemkov & Pulawski 2009, Nemkov & Ohl 2011) have been devoted to the most complicated and diverse tribe, namely Bembicini. In those papers the detailed historical review has been presented. In the current paper, we present a phylogenetic analysis of the genus-level relationships in the whole subfamily based on morphological characters of adults with strict cladistic methods. Larval characters are not included because data are available only for a small part of the ingroup taxa. Based on the resulting hypothesis, a new classification of the Bembicinae is suggested.