Zootaxa 3765 (3): 201–248
www.mapress.com/zootaxa/

Article

ISSN 1175-5326 (print edition)
ZOOTAXA
ISSN 1175-5334 (online edition)

http://dx.doi.org/10.11646/zootaxa.3765.3.1
http://zoobank.org/urn:lsid:zoobank.org:pub:770E2D24-AC00-4F71-BB34-49A785C385C9

Systematic review of the firefly genus *Amydetes* Illiger, 1807 (Coleoptera: Lampyridae), with description of 13 new species

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Abstract

A systematic review of *Amydetes* Illiger, 1807, based on examination of the type-material. We fix *A. fastigiata* Illiger, 1807 as the type-species of the genus; redescribe the genus and six out of eight species; describe 13 new species; and provide illustrations and a key to species. We place *A. vigorsi* Westwood, 1830 **syn. n.** and *A. gorhami* Kuntzen, 1912 **syn. n.** in synonymy with *A. fastigiata*; *A. suturalis* Pic, 1925 **syn. n.** and *A. brasiliensis* Pic, 1925 in synonymy with *A. apicalis*; and *A. flavicollis* Olivier, 1888 **syn. n.** in synonymy with *A. lucioloides* Olivier, 1888. We report the first record of *Amydetes* from Venezuela and Argentina, and establish more precise distributions of the studied species. We describe the circadian period of *A. apicalis* (diurnal), *A. fastigiata* and *Amydetes bellorum* **sp. nov.** (nocturnal) and discuss the circadian

Accepted by C. Majka: 6 Dec. 2013; published: 18 Feb. 2014

diversity of the genus. Fronto-clypeus, antenna, labrum, maxillary palpomere, prothorax, mesosternum, lanterns, abdominal segment VIII and terminalia were structures that provided important characters for delimitation and diagnosis of the species.

Key words: Amydetinae, Fireflies, Neotropical Region, Key

Introduction

The Lampyridae Rafinesque, 1815 comprise about 2000 species represented by approximately 80 genera (Branham, 2010), usually placed in eight (Crowson 1972; Lawrence and Newton 1995) or seven (Janisova & Bocakova 2012) subfamilies. Bouchard *et al.* (2011) inaccurately cited all but five by arbitrarily placing Ototretinae, Ototretadrillinae and Pterotinae under Cantharidae Imhof, 1856 (Bouchard, pers. comm.). There is no phylogenetic support for the majority of the subfamilies, except for Luciolinae and Photurinae (Branham & Wenzel 2003; Stanger-Hall *et al.* 2004, Jeng 2008, unpublished), and Ototretinae (Bocakova *et al.* 2007). The family has cosmopolitan distribution, with most of its known diversity found in the Neotropics and Asian Southeast (Lawrence & Newton 1995).

Fireflies have great cultural appeal. They feature in poems, songs, paintings and other forms of art (Harvey 1957; Lenko & Papavero 1996) and this appeal also extends to science. Lampyrids have been studied for four main aspects: 1) Biotechnology, for its molecules that affect bioluminescence (luciferin and luciferase), largely used on biomedical research as pools for reagents in ATP and biomass analysis, and as bioluminescent markers for gene expression (Viviani 2007); 2) Agricultural, as fireflies are predators of snails and slugs which are of economic relevance (Bess 1956; Peterson 1957); 3) Medical, as tthey prey on snails which are intermediary hosts for human water-bourne diseases (Viviani 1989); and 4) as environmental bioindicators, since the limitations of their distribution can reflect the intensity of light pollution (Viviani *et al.* 2010). Lampyrids have also been used in various approaches that facilitate formal and environmental education, as well as nature conservancy (Faust 2004; Lloyd 1997). Despite all this relevance, much of its diversity and ecology remains unnamed and unstudied.

The Neotropical lampyrid fauna needs massive nomenclatural and curatorial work in order to be in a position conducive to a modern taxonomic revision. Most of the original descriptions go back to the nineteenth century and present very superficial descriptions in comparison to contemporary ones. For the majority of the genera, this has resulted in extreme ambiguity when trying to identify specimens to the species level. This is of utter importance as perhaps more than half of the Lampyrid diversity is found in the Neotropics (Lloyd 1978).

Following McDermott (1966), Amydetinae Olivier 1907 comprises a single tribe (Amydetini, 193 spp.). The subtribes are: Vestina McDermott 1966 (six genera, 91 spp.); Psilocladina McDermott 1966 (five genera, 76 spp.); and Amydetina Olivier 1907 with two genera: *Amydetes* Illiger, 1807 (type-genus), with hitherto 13 species and *Magnoculus* McDermott, 1964, with 29 species, five of which were recently described from French Guiana by Constantin (2011). The only Amydetinae (*sensu* McDermott 1966) genus to be revised recently is *Cyphonocerus* Kiesenwetter, 1879 (Psilocladina) from Asia (Jeng *et al.* 2006b). However, Crowson (1972) transferred *Cyphonocerus* with Neartic *Pollaclasis* Kiesenwetter, 1979, to the newly established subfamily Cyphonocerinae Crowson, 1972. This placement was followed by subsequent authors (Jeng *et al.* 2006b) and confirmed by phylogenetic analysis (Jeng 2008, unpublished). This phylogenetic analysis rejected Amydetinae monophyly, but proposed its placement in Cyphonocerinae instead (Jeng 2008, unpublished). None of the published lampyrid phylogenies (Branham & Wenzel 2003; Stanger-Hall *et al.* 2004) recovered monophyly of the Amydetinae, and the type-genus, *Amydetes*, has never been included.

Amydetes, noted in the historical lampyrid works to be the second lampyrid genus to be described, was proposed by Illiger (1807) based on specimens in Hoffmannsegg's entomological collection. Part of this collection was donated directly to the Zoological Museum in Berlin, Germany; or indirectly, having been previously deposited in Hellwig's collection (Kuntzen 1912). In subsequent works (*e.g.,* Olivier 1907; McDermott 1966), several authors ascribed *Amydetes* to Hoffmannseg, which was a misinterpretation (*cf*., Kuntzen 1912).

Amydetes was described as having:

> "*Fühler mit mehr als vierzig Gliedern, deren jedes vom dritten an, an der Innenseite einen langen schmalblättrigen Fortsatz hat, wodurch sie dicht kammformig werden. Uebrigens mit* Lampyris *übereinstimmend*".

Acknowledgements

We thank all the Laboratório de Entomologia (UFRJ) colleagues, for their invaluable assistance with the fieldwork and comments on the manuscript; Laboratório de Ecologia de Insetos (UFRJ), especially Dr. Ricardo Monteiro and Dr. Margarete Macedo, for allowing the use of the photographic equipment acquired by INCT Hympar Sudeste; all the curators of the Institutions quoted in this paper, but specially A. Mantilleri (MNHN); Dr. Joe Cicero, Ms. Joana Cristóvão, Dr. Christopher Majka and two anonymous reviewers for reading and reviewing the manuscript, giving signitficant contributions. We thank the *Instituto Chico Mendes* and *Fundação Instituto Estadual de Florestas e do Ambiente* (INEA) for the authorizations for scientific research and colleting permits (respectively, proc. 10710– 1; 10663, 22156–1, 26861–1 and INEA002/2008). This study was supported by FAPERJ (process 101.476/2010, 100.927/2011) and CNPq (process 470980/2011–7) and CAPES.

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