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Review

Testicular and spermatogenic characteristics of *Lagria villosa* (Tenebrionidae: Lagriinae) with taxonomic inferences

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ABSTRACT

In the present study testicular and spermatogenetic aspects were described for *Lagria villosa* using light and scanning electron microscopy. In this species, spermiogenesis results in the formation of sperm bundles with spermatozoa arranged in an antiparallel manner, a characteristic observed only in Tenebrionidae. *L. villosa*, however, has about 60 follicles per testis and up to 1200 spermatozoa per cyst, in contrast to other tenebrionids that exhibit only six follicles in each testis and up to 512 spermatozoa per cyst. Therefore, the antiparallel arrangement of the spermatozoa in the bundle give support to previous works classifying the lagriids in a subfamily (Lagriinae) of Tenebrionidae. Just as the number of spermatozoa per cyst and follicles per testis suggest that they constitute, in fact, a distinct branch of this family.

Contents

1. Introduction

Tenebrionidae is one of the most speciose families of beetles, which has made it difficult to establish a consensual hypothesis about its systematics (Booth et al., 1990). Although works have been published using molecular, morphological and behavioral data, the taxonomic classification at the levels of genus, and especially subfamily, remains in doubt (Doyen and Tschinkel, 1982; Levkaničová, 2009). Some works have divided the tenebrionids into two branches: Tenebrionoide and Lagrioide. The latter contains the lagriids, a controversial group with regard to taxonomic status. Initially they were considered a family, Lagriidae, but later works placed them within Tenebrionidae as the subfamily Lagriinae (Watt, 1974; Doyen and Tschinkel, 1982; Bouchard et al., 2005).

Morphological characteristics of the reproductive system, of the spermatogenesis and of the spermatozoa have been used to help establish phylogenetic relations between insects (Jamieson et al., 1999; Lino-Neto et al., 2000; Zama et al., 2001). In the tenebrionids, *Tenebrio molitor* (Fig. 12.1b, Chapman, 1998), *Palembus dermestoides* (Almeida and Cruz-Landim, 2000), *Tribolium castaneum* and *Zophobas confusa* (personal observation), each testis is formed by six follicles (or lobes) connected to the vas deferens by six short efferent ducts. Each follicle is filled by groups of germ cells, called cysts, in different phases of spermatogenesis. In these beetles, spermatogenesis follows the usual sequence for insects. Each spermatogonium passes through successive mitotic divisions, resulting in a group of primary spermatocytes. These spermatocytes then undergo two successive meiotic divisions, resulting in spermatids, which, after dramatic morphological change (spermiogenesis), result in spermatozoa (see Dumser, 1980). During spermiogenesis, the spermatids become elongated and the nuclei positioned in a peripheral region of the cyst. In

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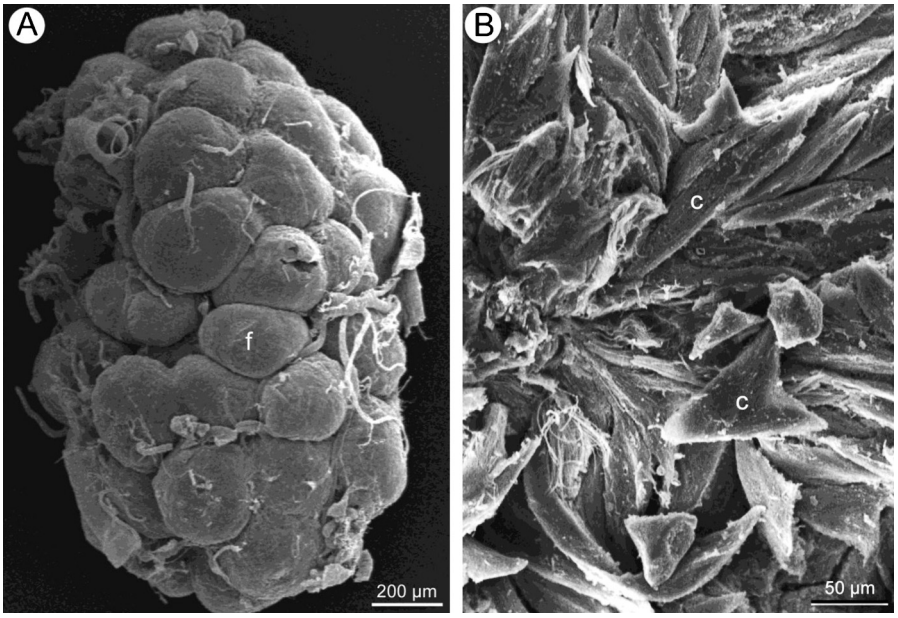

Fig. 1. Scanning electron micrographs of testis. (A) Testis formed by approximately 60 follicles (f). (B) Fractured testis showing cysts (c) in different phases of spermatogenesis.

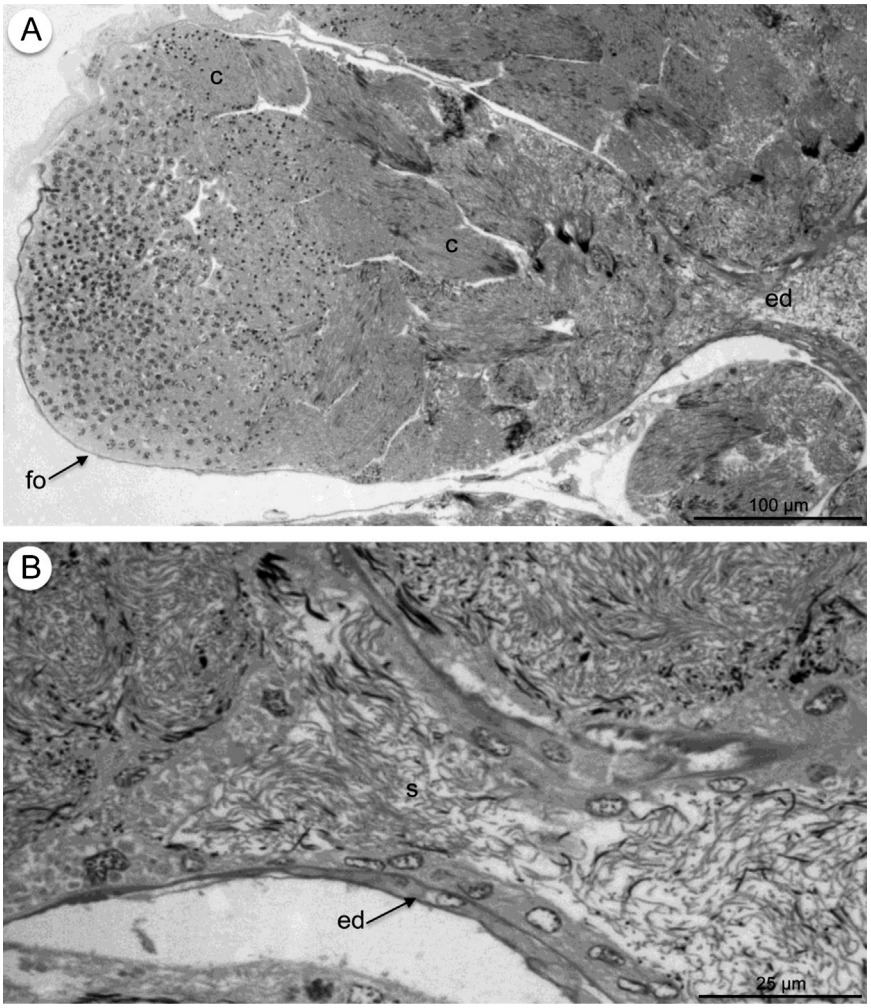

Fig. 2. (A) Longitudinal section of a follicle (fo) showing cysts at different stages of spermatogenesis. (B) An efferent duct region (ed) showing that the sperm (s) are not organized in bundles.