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Recovery of mitochondrial DNA for systematic studies of Pentatomoidea (Hemiptera: Heteroptera): successful PCR on early 20th century dry museum specimens

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Abstract

First molecular studies on museum specimens of five families of pentatomoid bugs, namely Cydnidae, Dinidoridae, Parastrachiidae, Tessaratomidae, and Thyreocoridae (Hemiptera: Heteroptera: Pentatomoidea), are presented, as a preliminary approach to molecular phylogenetic analyses of these families. Forty-eight pin-mounted museum specimens representing 46 pentatomoid species collected in the late 19th and the 20th century (more than 15 years old, the oldest specimen collected in 1894) were analyzed; and the acquisition of PCR amplifiable mitochondrial DNA (16S and/or 12S rDNA fragments) was successful from 10 specimens, i.e., 2 specimens (2 species) of Cydnidae, 4 specimens (4 species) of Dinidoridae, 1 specimen (1 species) of Parastrachiidae, 1 specimen (1 species) of Tessaratomidae, and 2 specimens (2 species) of Thyreocoridae. The oldest PCR amplifiable mtDNA sample was extracted from *Strombosoma impictum* (Stål) (Thyreocoridae) collected in 1932 in Zaire.

Key words: Hemiptera, Heteroptera, Cydnidae, Dinidoridae, Parastrachiidae, Tessaratomidae, Thyreocoridae, ancient DNA, museum specimens, mitochondrial DNA, molecular phylogeny

Introduction

Molecular techniques have recently considerably expanded our abilities for research in Heteroptera, particularly with regards to biogeographic, phylogenetic, and taxonomic studies (e.g., Wheeler *et al.* 1993; Hypša *et al.* 2002; Damgaard and Zettel 2003; Dai and Zheng 2004; Hebsgaard *et al.* 2004; Damgaard and Cognato 2005; Li *et al.* 2005; Xie *et al.* 2005, 2008; Dai 2004; Damgaard 2006; Li 2006; Li, Deng and Wang 2006; Li, Wang and Liu 2006; Li, Sites and Song 2007; Liu *et al.* 2007, 2009; Paula *et al.* 2007; Grazia *et al.* 2008; Hua *et al.* 2008; Tian *et al.* 2008; Schuh *et al.* 2009; Weirauch and Munro 2009).

Nevertheless, most of those molecular studies were based on freshly collected or alcohol-preserved specimens. Since freshly preserved samples are often not available for such analyses, it is very important to know whether it is possible to recover amplifiable mtDNA from heteropterous dried museum specimens in different age of preservation (natural history collections are potentially the most valuable source of samples for phylogenetics, conservation biology, forensic studies, and population genetics – see, e.g., Roy *et al.* 1994; Cooper and Wayne 1998; Austin and Melville 2006; Wandeler *et al.* 2007; Anderung *et al.* 2008; Ellis 2008).

Studies on recovery of mitochondrial DNA from museum specimens in Heteroptera were conducted sporadically (Li *et al.* 2005; Li, Deng and Wang 2006; Damgaard and Zettel 2003; Hebsgaard *et al.* 2004; Li, Sites and Song 2007); only in first two were several species of Pentatomoidea included, whereas the others related to non-pentatomoid families of Heteroptera. Unfortunately, the authors of those two papers (Li *et al.* 2005; Li, Deng, and Wang 2006) did not mention the names and age of utilized museum specimens of Pentatomoidea.

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