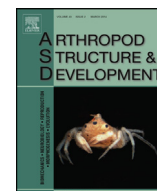




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The ovary structure and oogenesis in the basal crustaceans and hexapods. Possible phylogenetic significance[☆]

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ABSTRACT

Recent large-scale phylogenetic analyses of exclusively molecular or combined molecular and morphological characters support a close relationship between Crustacea and Hexapoda. The growing consensus on this phylogenetic link is reflected in uniting both taxa under the name Pancrustacea or Tetraconata. Several recent molecular phylogenies have also indicated that the monophyletic hexapods should be nested within paraphyletic crustaceans. However, it is still contentious exactly which crustacean taxon is the sister group to Hexapoda. Among the favored candidates are Branchiopoda, Malacostraca, Remipedia and Xenocarida (Remipedia + Cephalocarida). In this context, we review morphological and ultrastructural features of the ovary architecture and oogenesis in these crustacean groups in search of traits potentially suitable for phylogenetic considerations. We have identified a suite of morphological characters which may prove useful in further comparative studies.

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1. Introduction

Over the past two decades our understanding of the phylogenetic relationships between major groups of Arthropoda has changed tremendously. The analysis of the ever expanding molecular data sets has resulted in stimulating concepts offering a novel explanation of the evolutionary history of Arthropoda, not anticipated by classic studies relying on the morphological and developmental evidence alone. This applies in particular to the phylogenetic relationship between Crustacea and Hexapoda. The results of diverse molecular analyses as well as reinterpretation of various morphological traits have led to the formulation of the Pancrustacea/Tetraconata hypothesis which posits that Crustacea are paraphyletic with respect to monophyletic Hexapoda and that the latter group should be nested within Crustacea (Regier and Shultz, 1997; Zrzavy and Stys, 1997; Dohle, 1997, 2001; Richter, 2002; Cook et al., 2004; Regier et al., 2005, 2008, 2010). The

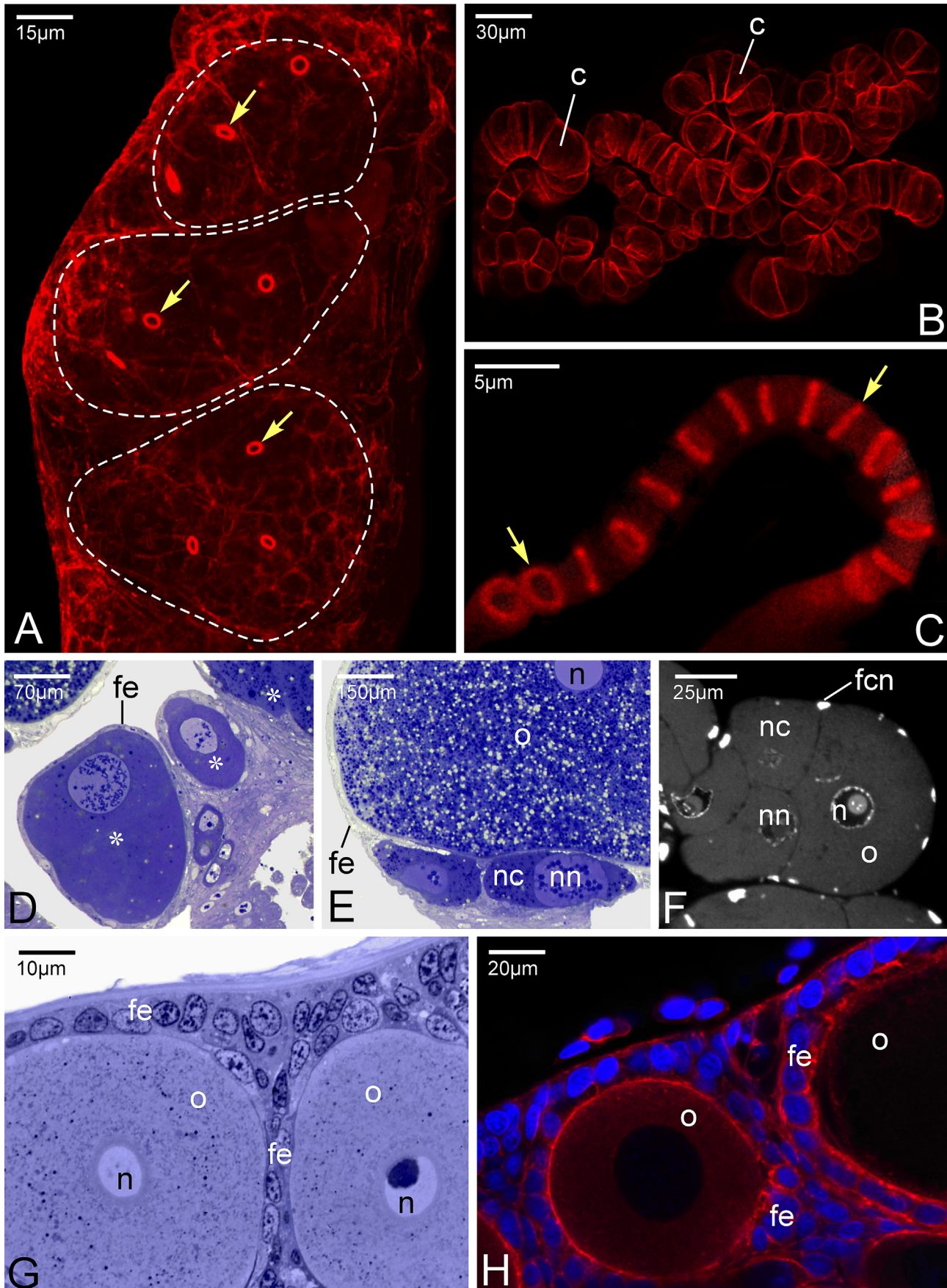
grouping of insects with crustaceans is well supported by molecular data sets based on both mitochondrial and nuclear genes coding for rRNA and proteins (Cook et al., 2001; Mallatt et al., 2004; Hassanin, 2006; Mallatt and Giribet, 2006; Regier et al., 2005, 2008, 2010; von Reumont et al., 2009) as well as Expressed Sequence Tags (Dunn et al., 2008; Meusemann et al., 2010). Although there is a growing support for the Pancrustacea/Tetraconata concept, the controversy exists on the internal relationships within Pancrustacea and which extant crustacean taxon is a sister group of Hexapoda (Regier et al., 2008; von Reumont et al., 2009; Jenner, 2010; Andrew, 2011). Some molecular and morphological studies have indicated either Branchiopoda or Malacostraca as possible candidates (Sinakevitch et al., 2003; Babbett and Patel, 2005; Regier et al., 2005; Lim and Hwang, 2006; Mallatt and Giribet, 2006; Dunn et al., 2008; Timmermans et al., 2008; Jenner, 2010; Strausfeld and Andrew, 2011). Recent large scale phylogenetic analyses, focusing either on molecular data alone or their combination with morphological characters of both fossil and extant taxa, have retrieved Remipedia or Remipedia and Cephalocarida (united in a taxon termed Xenocarida) as the Hexapoda sister group (Giribet et al., 2001; Fanenbruck et al., 2004; Regier et al., 2008, 2010; Ertas et al., 2009; Koenemann et al., 2010; von Reumont et al., 2012; Legg et al., 2013).

In this review, we strive to identify ovarian characters of a potential value for phylogenetic analyses. We focus on selected

[☆] Sadly, during realization of this project our good colleague and reliable friend Dr. Janusz Kubrakiewicz, Professor of the University of Wrocław, unexpectedly and prematurely passed away. He was not only a dedicated and recognized student of arthropod gametogenesis, but also frequently contributed to ASD as an author and a reviewer.

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