CHAPTER 67

INFRAORDER ASTACIDEA LATREILLE, 1802 P.P.: THE FRESHWATER CRAYFISH

BY

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INTRODUCTION

[F. Gherardi]

It is a matter of common information that a number of our streams and rivulets harbour small animals, rarely more than three or four inches long, which are very similar to little lobsters, except that they are usually of a dull, greenish or brownish colour, generally diversified with pale yellow on the under side of the body, and sometimes with red on the limbs. – T. H. Huxley, 1880.

1) Manuscript concluded June 2009.
Overview

Modern crayfish are an incredibly diverse group of organisms with over 600 described species worldwide (Crandall & Buhay, 2008; see also section Phylogeny and Biogeography) organized into two superfamilies, Astacoidea and Parastacoidea. Astacoidea consists of the Jurassic Cricoidoscelosidae and two extant families, both restricted to the Northern Hemisphere: Astacidae and Cambaridae (cf. Hobbs, 1989; Crandall & Buhay, 2008). Parastacoidea is composed of a single family, Parastacidae, and is distributed throughout Madagascar, southern South America, and Australasia (Crandall & Buhay, 2008). Crayfish are naturally absent from the Antarctic continent, continental Africa, the Indian subcontinent, and much of Asia. In recent times, however, their original distribution has been altered due to the massive human-mediated introduction of species outside their native range and the subsequent spread of some of the introduced crayfish across the introduced area (Gherardi & Holdich, 1999; Lodge et al., 2000).

Crayfish form a monophyletic group (Crandall et al., 2000; Scholtz, 2001; see Phylogeny, below). Their sister group seems to be the clawed lobsters, Nephropoidea Dana, 1852, as first suggested by Crandall et al. (2000) and recently supported by Porter et al. (2005) [but see the suggestion of Thalassinidea Latreille, 1831 as sister group by Scholtz & Richter, 1995]. Astacoidea, Parastacoidea, and Nephropoidea thus make up the infraorder Astacidea Latreille, 1802; in this chapter we treat the two freshwater superfamilies from that taxon. Fossil crayfish and their burrows (Hasiotis & Mitchell, 1993) support the hypothesis that crayfish are an extremely old group of organisms with the last common ancestor existing at least in the Triassic period with a Pangaean origin. The separation of Astacoidea and Parastacoidea seems to be originated around 185 mya, with the break-up of Pangaea into the northern supercontinent Laurasia and the southern supercontinent Gondwana (Crandall et al., 2000; section Phylogeny and Biogeography).

Although crayfish taxonomy is reasonably well resolved at the highest levels, the designation of the levels below remains still contentious (Starobogatov, 1995). Such an open debate is in great part due to the conservatism of some morphological characters in many species, the high intraspecific diversity in others, e.g., *Orconectes luteus* (Creaser, 1933), the recorded convergence with habitat diversity, e.g., in the case of cave species, and the various cryptic species that require an appropriate bioinformatic approach coupled with a set of molecular tools (AFLPs, microsatellites, and PCR primers for various gene regions) (Fetzner & Crandall, 2002) and/or refined morphometrical studies (Bertocchi et al., 2008) to be identified.

Two centers of crayfish diversity have been described, the first in the southern Appalachian Mountains of the southeastern United States (Northern Hemisphere center) and the second in southeastern Australia (Southern Hemisphere center) (Crandall & Buhay, 2008); hot spots of diversity have been also identified for single families or genera, e.g., Fratini et al. (2005). Yet, crayfish diversity is in serious decline due to growing habitat loss and degradation often acting in synergy with the detrimental effects of invasions by alien species, over-harvesting, and chemical pollution (section Conservation). Over 50% of the U.S. species, for example, are imperiled to some degree (Taylor et al., 1996): 20