



Cnidocysts of Caryophylliidae and Dendrophylliidae (Cnidaria: Scleractinia): Taxonomic Distribution and Phylogenetic Implications

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Abstract

Caryophylliidae Dana, 1846 and Dendrophylliidae Gray, 1847 are families of widespread hard corals (order Scleractinia) composed mainly of azooxanthellate corals. A growing body of molecular data has provided new insights on hard-coral evolution, suggesting that many of the traditionally recognized families are not monophyletic. The morphology of the skeletal parts has been the only source of evidence for the taxonomy of the group for many years. Soft anatomy has been less explored, and recently, with the increased use of molecular evidence, anatomical studies have decreased in importance. As a result, for many taxa, we know little or nothing about variation in soft tissue morphology and their use for systematics has never been explored. In this study we examined the cnidocysts of two species of caryophylliids and of four dendrophylliids, and synthesized previous studies on the subject. We performed a morphological phylogenetic analysis, based on eight informative characters, which includes eight species of dendrophylliids and 11 caryophylliid taxa. Five taxa belonging to the families Poritidae, Flabellidae, and Fungiacyathidae were also scored for these morphological characters. The aims were to investigate the diversity of cnidocysts in members of the two families and test the monophyly of Dendrophylliidae. The data support a dendrophylliid clade and indicate the presence of b-rhabdoids (1) in mesenterial filaments as a synapomorphy of the family. The taxonomic distribution of two other characters contradicts the clade (Dendrophylliidae + Poritidae) suggested by molecular analyses. Our results reinforce the relevance of soft tissue studies in hard-corals to reconstructing their phylogeny.

Key words: deep-sea corals, morphology, nematocysts, phylogeny, systematics

Introduction

Caryophylliidae Dana, 1846 and Dendrophylliidae Gray, 1847 are families of widespread hard corals (order Scleractinia) that represent nearly 65% of the azooxanthellate coral species (Cairns *et al.* 1999; Cairns 2007). Some of their members are the main builders of deep water reefs, and they comprise almost 300 and 170 extant species, respectively (Cairns *et al.* 1999; Cairns 2001). Wells' (1956) evolutionary arrangement suggested that these families are each other closest relatives, and moreover, that the lineage of dendrophylliids is directly descendent from caryophylliid ancestors.

Recent molecular analyses of the order Scleractinia suggest, however, that Caryophylliidae is a polyphyletic group, with members spread along both “complex” and “robust” clades previously proposed (Romano & Cairns 2000; Daly *et al.* 2003; Le Goff-Vitry *et al.* 2004; Barbeitos *et al.* 2010). Other phylogenetic studies recover caryophylliids spread throughout the cladogram (Kitahara *et al.* 2010) or distantly related in the “robust” clade (Cuif *et al.* 2003). On the other hand, several molecular studies have strongly supported the monophyly of Dendrophylliidae, and also have indicated a sister group relationship with Poritidae (Chen *et al.* 1995; Romano & Palumbi 1996; Veron *et al.* 1996; Le Goff-Vitry *et al.* 2004; Fukami *et al.* 2008; Kitahara *et al.* 2010). Some analyses retrieve dendrophylliids as a paraphyletic (Romano & Cairns 2000; Barbeitos *et al.* 2010) or even a polyphyletic group (Daly *et al.* 2003).