



## Morphological description and DNA barcodes of shallow-water *Tetractinellida* (Porifera: Demospongiae) from Bocas del Toro, Panama, with description of a new species

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## Abstract

*Tetractinellida* Marshall 1876 [Borchiellini *et al.* 2004] comprises the Orders Spirophorida and Astrophorida. A survey of their diversity in the Bocas del Toro archipelago (Panama) was conducted. A total of ten species of *Tetractinellida* were encountered: *Cinachyrella alloclada*, *Cinachyrella apion*, *Cinachyrella kuekenthali*, *Ecionemia megastylifera*, *Stelletta fibrosa*, *Stelletta* sp., *Stryphnus raratriaenus* **sp. nov.**, *Erylus formosus*, *Geodia gibberosa* and *Geodia papyracea*. Five of these species are new to the Atlantic sponge fauna of Panama, one of which is new to science. *Stryphnus raratriaenus* sp. nov. is very similar to Caribbean *Asteropus* species but it possesses triaenes. It is the first species of this genus in the Caribbean. The description of *Ecionemia megastylifera* Wintermann–Kilian & Kilian, 1984 is here revised and the species fully redescribed. A cytochrome *c* oxidase subunit I (COI) gene partial fragment and/or a 28S ribosomal gene partial fragment (C1–D2 domains) were sequenced for some of the species collected.

**Key words:** Taxonomy, barcoding, COI, 28S, Spirophorida, Astrophorida, *Geodia*, *Erylus*, *Ecionemia*, *Stryphnus*, *Stelletta*, *Cinachyrella*.

## Abstract [Spanish]

*Tetractinellida* Marshall 1876 [Borchiellini *et al.* 2004] incluye los Ordenes Spirophorida y Astrophorida. Se realizó un inventario de su diversidad en el archipiélago de Bocas del Toro (Panamá), encontrándose diez especies de *Tetractinellida*: *Cinachyrella alloclada*, *Cinachyrella apion*, *Cinachyrella kuekenthali*, *Ecionemia megastylifera*, *Stelletta fibrosa*, *Stelletta* sp., *Stryphnus raratriaenus* **sp. nov.**, *Erylus formosus*, *Geodia gibberosa* y *Geodia papyracea*. Cinco de estas especies son nuevos reportes para la fauna atlántica de esponjas de Panamá y una de ellas es nueva para la ciencia. *Stryphnus raratriaenus* sp. nov. es muy parecida a las especies de *Asteropus* del Caribe, pero posee triaenes. Es la primera especie de este género en el Caribe. La descripción de *Ecionemia megastylifera* Wintermann–Kilian & Kilian, 1984 ha sido revisada y la especie ha sido redescrita en este artículo. Estudios moleculares que incluyeron una secuencia parcial del gen citocromo *c* oxidase subunidad I (COI) y/o una secuencia parcial del gen ribosómico 28S (dominios C1–D2) fueron realizados en algunas de las especies encontradas.

## Introduction

On the western Caribbean shore of Panama, the Bocas del Toro region includes two large water bodies, Almirante Bay and Chiriquí Lagoon; it is a shallow coastal zone (maximum depths of 20–50 m). More than 68 islands and mangrove keys form the Bocas del Toro archipelago (Fig. 1). This archipelago offers a wide range of marine habitats such as reefs, mangroves and seagrass beds. As in other Caribbean sites the sponge fauna represents one of the most diverse benthic animal group with 123 shallow-water sponges identified (Collin *et al.* 2005; Díaz 2005; Díaz *et al.* 2007; Valderrama *et al.* 2009).

*Tetractinellida* Marshall 1876 [Borchiellini *et al.* 2004] is a worldwide monophyletic group comprising the sister-orders Spirophorida Bergquist & Hogg, 1969 and Astrophorida Sollas, 1888 (Borchiellini *et al.* 2004; Nichols 2005). *Tetractinellida* share four-rayed megascleres with usually one unequal ray longer than the other three. These ‘triaenes’ are, up to now, the single morphological synapomorphy of the group (Chombard *et al.* 1998) although they can sometimes be secondarily reduced or lost (Uriz 2002a;b).

The first sponge survey in the Bocas del Toro region, focusing on reefs, encountered two tetractinellids (Guzman & Guevara 1999; Guzman & Guevara 2001): *Cinachyrella alloclada* (Uliczka, 1929) and *Cinachyrella* sp.. Later, a more comprehensive study listed four tetractinellid species (Díaz 2005): *Geodia papyracea* Hechtel, 1965, *Erylus formosus* Sollas, 1886, *Cinachyrella alloclada* and *Cinachyrella apion* (Uliczka, 1929). This is a relatively low number of species compared to neighboring regions with similar habitats and where sponge surveys are more comprehensive. For example, along the Caribbean Colombian coast there has been a total of 11 tetractinellid species identified (Wintermann-Kilian & Kilian 1984; Díaz 2007; van Soest 2009) while Cuba has 26 (Alcolado 2002). If we consider only shallow-water tetractinellids, Belize has about 10 species (Rützler *et al.* 2000; Erpenbeck *et al.* 2007), Curacao has 11 (van Soest 1981)