IOCTX 2025 Conference

The 1st International Online Conference on Taxonomy

03–04 December 2025 | Online

MDPI

Taxonomy of sponges (Porifera) from Indo-Pacific shallow waters

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INTRODUCTION

Sponges (phylum Porifera) are benthic, sessile, filter-feeding animals found in freshwater ecosystems and oceans worldwide. This phylum is very diverse, with over 9,600 living species described[1]. Sponges provide important ecosystem services, such as serving as habitat for numerous species and contributing to nutrient cycling[2]. In addition, they are being researched for their potential medicinal properties, such as anti-cancer and anti-inflammatory effects.

Six specimens with possible medicinal compounds were collected by the National Institute of Health (NIH) in shallow waters of the Indo-Pacific ocean, specifically in Thailand and Papua New Guinea. The goal of this project is to identify, describe and classify these specimens, whether they are a new species or not.

MATERIAL & METHODS

The anatomy of all six specimens were observed, including cross-sections of skeletal structures. Spicules were dissociated (Fig. 1) and spicule types were identified under a compound microscope. Thirty spicules per type were measured using Image J.

Identification keys from peer-reviewed literature and the World Porifera Database[3] were used to classify each specimen to the lowest taxonomic level possible.

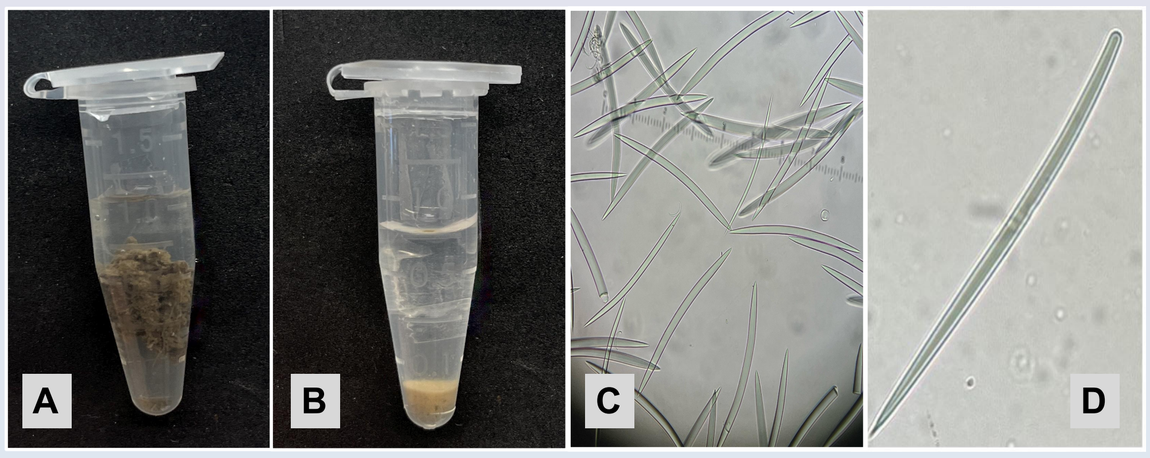

Figure 1: Spicule dissociation process. (A) Piece of specimen submerged in household bleach to dissolved tissue; (B) spicules at bottom of tube after tissue dissolution; (C) specimen's spicules prepared on slide; (D) single spicule viewed under microscope.

Table 1: Classification of the four investigated specimens, which include class, order, lowest unit of identification and specific spicule types found for each sample.

Class	Order	Current Classification	Spicule types
Demospongiae	Axinellida	Raspaillidae (Family) Nardo	Oxeas Styles Subtylostyles
Demospongiae	Axinellida	Axinellidae (Family) Carter	Oxeas Raphidiform Oxeas Styles (rare)
Demospongiae	Axinellida	Axinellidae (Family) Carter	Worm-like Strongyles Styles
Demospongiae	Poecilosclerida	*Wigginsia* sp. (Genus) de Laubenfels	Chromosomal Tylotes Acanthostrongyles
Demospongiae	Haplosclerida	?	Sigmas Oxeas
Demospongiae	Dendroceratida	Dictyodendrillidae (Family) Bergquist	No spicules, only fibers

RESULTS & DISCUSSION

All six specimens belong to the class Demospongiae. Six of the specimens were classified to lower taxonomic groups as follows:

(1) Family Dictyodendrillidae (Fig. 2A): This specimen presents no spicules, only branching fibers. The specimen is purple on the outside, when cut is is a pale orange/beige. The body has a massive to repent shape with a conulose surface.

(2) Family Axinellidae (Fig. 2B): This specimen shows styles and worm-like strongyles. The specimen originally had an orange color with a clathrate body. The surface can be described as a mix of conulose and corrugated.

(3) Order Haplosclerida (Fig. 2C): This specimen shows oxeas and sigmas. The specimen is white with a massive shape, along with a rugose/honeycombed surface.

(4) Family Raspaillidae (Fig. 2D): This specimen has oxeas, styles and subtylostyles. The specimen is black with an encrusting body shape, with a smooth, paper-like surface.

(5) Family Axinellidae (Fig. 2E): This specimen contains oxeas, raphidiform oxeas, and occasional styles. The specimen was black with a branching body and smooth surface.

(6) Genus *Wigginsia* (family Acarnidae; Fig. 2F): This specimen contained tylotes and acanthostrongyles. The specimen was black with an encrusting/massive shape with occasional large osculum, along with a rugose surface.

The next step of this research is to obtain scanning electron microscopy (SEM) images of spicules, refine the identification of all specimens and determine which species are new to science. New species will be named and all six specimens will be described.

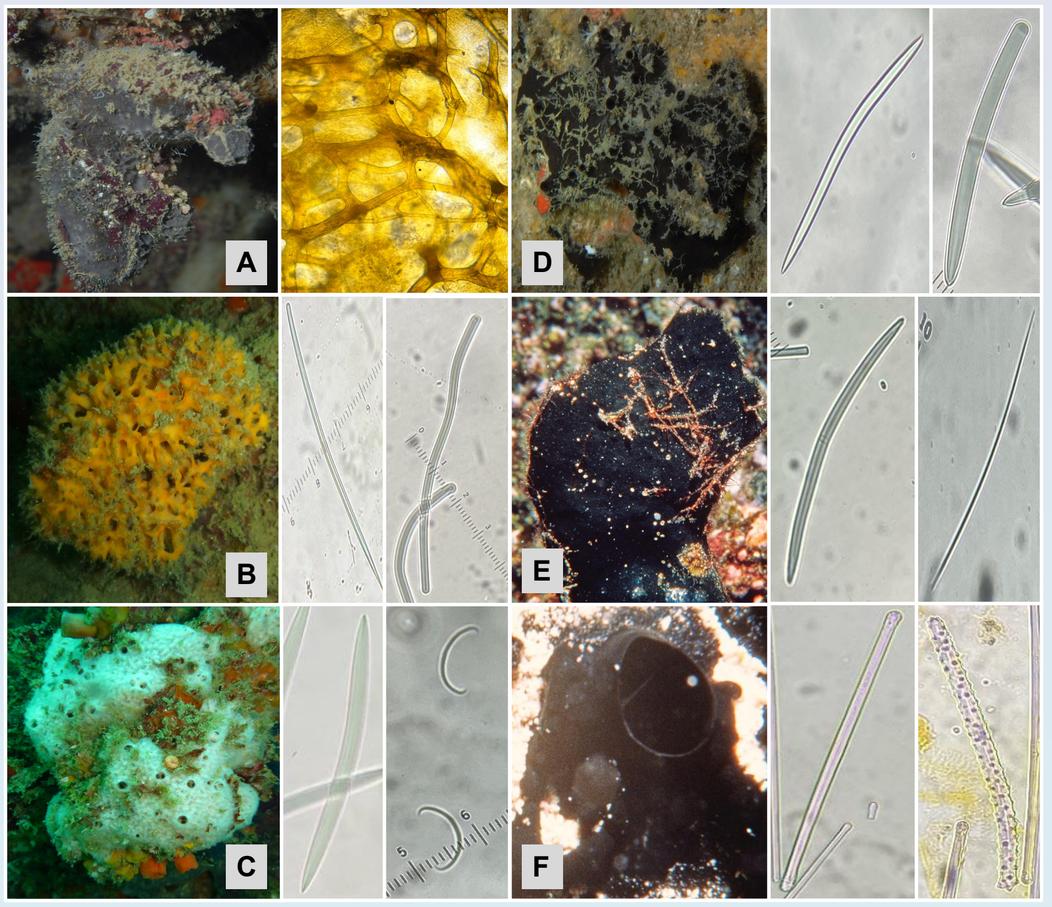

Figure 2: In-situ photos of sponge specimens along with their associated spicules/fibers in the following order: (A) Family Dictyodendrillidae; (B) Family Axinellidae; (C) Order Haplosclerida; (D) Family Raspaillidae; (E) Family Axinellidae; (F) Genus *Wigginsia* (family Acarnidae)

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