Neptune's Cup Sponge (*Cliona patera)*
Order Clionaida. Family Clionaidae
Belongs to the phylum porifera (meaning 'pore bearing' in Latin, arising from many pores present on its body).

Sponges (Porifera)
Sponges are sessile, aquatic organisms. Most primitive group of animals, asymmetric with only a cellular level of organisation, and lack any complex organ systems. Sponges have spicules making up its skeleton, which may be made of calcium carbonate or silica. Various cells, such as choanocytes help with filter feeding and pumping water through the sponge. Sponges are filter feeders, where water is drawn or pumped into the sponge via the inhalant aquiferous system, small particles including plankton and other micro organisms are filtered out, before the water is pumped out of the sponge through the exhalant aquiferous system and osculum. This pumping of water through the sponge also functions for gas exchange, waste disposal and release of sperm and larvae.

Sponges can undergo both sexual (vivapary and vivipary) and asexual (budding and fragmentation) reproduction. Ovipary occurs where eggs develop in the female sponge, and is then broadcast into the water for external fertilisation. Larvae will settle on a suitable substrate. In vivipary, sperm is taken into a female sponge. Eggs will be fertilised and larvae brooded within the sponge. After development, the larvae leave through the exhalant canals and oscules.

Ecosystem functions/human uses: Filter feeding nature helps with improving water quality. Sponges contain various bioactive compounds that are of interest to science. This includes possible cytotoxic, antifouling, antibiotic, antiviral, antitumoral, cytoprotective, anti-inflammatory, enzyme inhibitory, anti-Alzheimers compounds. They may also be useful for stem cell-based tissue engineering applications.

Neptune's Cup Sponge (*Cliona patera)* was the first sponge to be described from Singapore in 1822. It was the first animal named from Singapore, Thomas Hardwicke named it *Spongia patera*, the goblet sponge.

Reportedly once common in Singapore, this species was thought to be extinct. It was not seen in Singapore waters for over a hundred years since 1908, until it was rediscovered by Dr Lim Swee Cheng in 2011. Currently, 7 living individuals were discovered in 2011 in Singapore.

According to the second British Resident of Singapore John Crawfurd, it was abundant in Singapore waters when he was holding office in 1823 to 1826. It was popular, with almost every major natural history museum in Europe having at least one specimen of the sponge. They were also collected by collectors for their private collections. Additionally, these sponges were used as a bathtub for babies or children, with a photograph available of a child bathing in a dried Neptune's cup sponge specimen in Indonesia.

The causes for the disappearance are unknown. Reclamations of Telok Ayer Bay in 1887 and Telok Ayer Basin in the early 1900s likely contributed to their demise due to their sessile and filter feeding nature, causing them to be adversely affected by increased sediment load in the environment. The rediscovery of this sponge in Singapore is significant considering the extensive modification of its shoreline and transformation, which includes land reclamation and developments.

Description: “Sponge in gamma stage and free-living, comprising an oval, shallow, concave disk supported by a stalk with a height of 26 cm (Fig. 5A). The stalk extends some 20 cm into substrate after which it branches into 4-6 rooting processes that extend a further 20 cm in depth into the substratum”

Body typically whitish to yellow.It is the largest sponge species in Singapore waters, growing over 1 m in diameter and height for mature individuals. Anchors to the seafloor with sandy and coral rubble substrate via the stalk. Bowl/wine glass shaped upper body supported by the stalk.

Distribution: Found in the waters of Singapore, Thailand, Cambodia, Australia. Marine habitat, found at depths of 10 to 30 m in Singapore waters, where there is good water flow. Individuals were found at depths of 5.5 to 19.5 m in the Gulf of Thailand.

Historical records showed occurrences in Malacca Strait (off Sumatra), South China Sea (Gulf of Thailand, Singapore Strait, Java Sea off Java) and Gulf of Carpenteria, off Australia.

Threats: Listed as Critically Endangered (CR) in the Singapore Red Data Book. History of overharvesting and population declines. Threats the sponge faces include habitat loss and modification, sedimentation and predation by turtles. Low genetic diversity threatens their existence in Singapore waters as well, with six of the seven living individuals being very genetically similar. Low genetic diversity results in low resilience of the species, affecting their recovery and response to environmental stress and human impacts. Poor population connectivity.

In other parts of the world, such as the Gulf of Thailand, these sponges are threatened by entanglement, damage or uprooting from marine debris, and fishing activities. This includes active and passive fishing (including from trawling, discarded fishing gear).

Conservation: In Singapore, some individuals have been moved to Sisters’ Island Marine Park for protection under maritime and conservation regulations. These individuals are monitored regularly.

Potential human use:
Sponges are known to host complex microbial consortiums, which are an important source of therapeutic agents. The Neptune’s cup sponge hosts various marine bacteria, some of which showed promising candidates as sources of novel quorum sensing inhibitory molecules.