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Marine algae of the South China Sea bordered by Indonesia, Malaysia, Philippines, Singapore, Thailand and Vietnam

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Abstract. Although the South China Sea (SCS) is one of the most productive marine ecoregions in the world, there is no report of marine algae covering this wide area. We here provide the first checklist of marine algae from the SCS, bordered by Indonesia, Malaysia, Philippines, Singapore, Thailand, and Vietnam. A total of 1,442 species including subspecies and varieties in 96 families were compiled in this checklist; 119 species in 12 families for Cyanophyta, 305 species in 22 families for Chlorophyta, 258 species in 14 families for Ochrophyta and 730 species in 48 families for Rhodophyta. Marine algal flora, compared using the Sorensen's Similarity Index, is very similar between Malaysia, Singapore and Thailand. This preliminary checklist will provide a baseline for future taxonomic and biogeographical studies of marine algae in the region. Further international collaboration among phycologists will improve our knowledge of marine algae in the SCS.

INTRODUCTION

The South China Sea (SCS) encompasses a tropical region stretching from Singapore in the southwest to the Strait of Taiwan in the northeast, across 22° of latitude bounded by the coastlines of Malaysia, Thailand, Cambodia, Vietnam, China, the Philippines, Brunei and Indonesia. On the west, the SCS is separated by a shallow sill from the Gulf of Thailand. The sea surface area is about 3.6 million km^2, with an average depth of over 1,200 m and a maximum depth of 5,000 m. The SCS contains 7.04% of the world's coral reefs and 0.93% of the world's seamounts, with 0.31% of the sea surface being protected (Heileman, 2008). The SCS is a highly productive (150–300 g C.m^{-2} yr^{-1}) region based on global primary productivity estimates. It has a diverse range of habitats including mangroves, seagrass meadows, coral reefs and soft bottom communities, representing the world's most diverse shallow marine ecosystem (Morton & Blackmore, 2001). The 50 m depth contour largely follows the coast, with the widest shelves occurring along the eastern edge of the large marine ecosystem. Rivers like the Pearl River in Guangdong, China, Red River in northern Vietnam, and Mekong River in southern Vietnam, drain into the SCS, which also harbours islands like Hainan in the northwest, Pahlawan in the southeast as well as numerous small islands, atolls and reefs, including the Spratleys (Morton & Blackmore, 2001). The SCS is influenced by the Southwest Monsoon in the summer and the Northeast Monsoon in the winter. The monsoonal winds and resulting currents greatly influence the distribution of coastal and marine species. The countries at the rim of the SCS are amongst the most densely populated in the world, where coastal and maritime communities depend greatly on marine resources for their livelihoods. The SCS forms part of a megadiversity region in Southeast Asia that extends into the Coral Triangle, where seaweed farming contributes significantly to the enhancement of livelihoods of the coastal and maritime populations. The Coral Triangle produces more than 70% of the global carrageenan (Phang et al., 2010).

The marine algae in this paper refer to the marine macroalgae, commonly called the seaweeds. They are simplistically categorised into green seaweeds (Chlorophyta), brown seaweeds (Ochrophyta) and red seaweeds (Rhodophyta). The filamentous marine blue-green algae (Cyanophyta) are included in the list of marine algal flora of the SCS region, but the marine microalgae and phytoplankton are beyond the scope of this paper and are excluded from the list.

A number of reports and checklists of the marine algal flora of the SCS region have been published, although flora of most of the Southeast Asian countries are still lacking. In recent

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