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Biodiversity Record: Sea lettuce (*Ulva* sp.) bloom on beach at Lazarus Island

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Subjects: Sea lettuce, unidentified *Ulva* species (Chlorophyta: Ulvophyceae: Ulvales: Ulvaceae).

Subjects identified by: Pavarne Shantti and Tasya Vadya Sarira.

Location, date and time: Singapore Strait, beach at Pulau Sekijang Pelepah (Lazarus Island), 01°22′53.92″N, 103°85′44.88″E; 18 June 2022; around 0800 hrs.

Habitat: Marine. Intertidal sandy beach with seagrass meadow. Between tidal height of -0.1 to 0 m.

Observers: Pavarne Shantti and Tasya Vadya Sarira.

Observation: 100% *Ulva* cover was observed in the north and south of the beach (Figs. 1 & 2). Large mats of *Ulva* were collected on the intertidal zone where seagrasses *Halophila ovalis*, *Thalassia hemprichii* and *Enhalus acoroides*, *Halodule uninervis, Syringodium isoetifolium*, *Cymodocea serrulata* and *Cymodocea rotundata* persist (Figs. 1 & 2).

Fig. 1. *Ulva* species collected on seagrass meadow at low tide at 1°13.545′ N 103°51.250′ E. Large species of seagrass such as *Cymodocea rotundata* can be seen outside the quadrate. Smaller species of seagrass such as *Halophila ovalis* and *Halodule uninervis* would have been buried. Quadrat 50 × 50 cm. (Photograph by: Pavarne Shantti).

Remarks: The genus *Ulva*, a free-floating macroalgae, typically undergoes a bloom where its biomass increases significantly over a short period of time. This phenomenon occurs due to high levels of nitrate in the seawater that stimulate the growth of species of *Ulva* (Gao et al., 2017). In Singapore, *Ulva* blooms has been sighted in the northern coasts such as Chek Jawa and Changi beach (Tan, 2013; Kwan et al., 2022). While *Ulva* species occur in the southern coast (Noiraksar et al., 2012), there has apparently been no records of *Ulva* blooms there prior to the observation herein featured.

Fig. 2. Beach at Pulau Sekijang Pelepah, with views of the northern part (A) and the southern part (B). Dark green patches are seagrass, while the fluorescent green stretches are *Ulva*. (Photographs by: Pavarne Shantti)

Pulau Sekijang Pelepah beach has the largest diversity of seagrasses in the Saint John's Island Complex which includes St John's Island and Seringat-Kias Island. Up to seven of the 12 known species of seagrass in Singapore can be found at this beach. Seagrasses are increasingly recognized as important providers of a wide range of ecosystem services, including habitat for biodiversity, coastal protection, erosion control, and carbon storage and sequestration (Nordlund et al., 2016). During an *Ulva* bloom, large amounts of macroalgae accumulate in the intertidal zone. If not removed, the macroalgae would decompose, causing an anoxic and hypoxic environment which has been reported to threaten sediment biota (Norkko & Bonsdorff, 1996). At Pulau Sekijang Pelepah beach, the mat of *Ulva* that accumulated on the seagrass meadow can result in light reduction, anoxic and eutrophic conditions that reduces seagrass growth and its survivability (Han & Liu, 2014), putting our prized ecosystem at risk.

Pulau Sekijang Pelepah saw an increased number of visitors as the island was a popular choice among locals for a quick getaway when international borders were closed due to the COVID-19 pandemic (Toh, 2020). Moreover, fish farms are also being set up between Lazarus and Saint John's Island (Ang, 2022). These activities can hasten the input of nutrients in the water. Without scrupulous management and monitoring, the coastal waters of the Saint John's Island Complex are vulnerable to further eutrophication and macroalgae blooms.

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