

SEAGRASS in Hainan, China

Seagrasses are flowering plants that can live under water, but still require sunlight. Only 72 species are known worldwide. They play an important role for the environment by protecting the coast and providing habitat and food for many marine organisms. However, seagrasses are disappearing worldwide due to pollution and environmental changes. The rate of their loss is comparable to that of tropical rainforests, yet it receives less attention.



Photos: L. Herbeck, E. Thomsen

FACTS

What are seagrasses?

Even though seagrasses may look like terrestrial grass, they are more related to lilies and orchids. They can have many different shapes and sizes. Seagrasses, who belong to the angiosperms, can exist either as a few plants or in dense meadows. Using their strong roots and the extensive underground system, called rhizomes, they anchor in the sandy and muddy sediments.

Examples of species



C. serrulata



H. ovalis



T. hemprichii



Z. capricorni

Why is seagrass important?

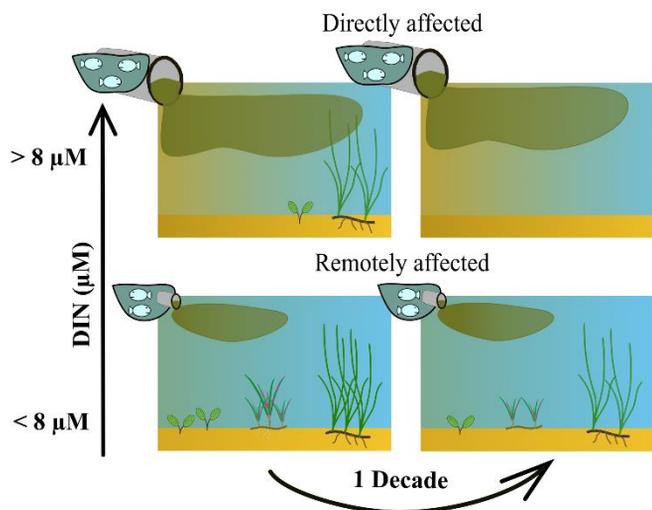
Seagrasses provide habitats as well as nursery areas and serve as a food source for many marine organisms. They can be hotspots of coastal biodiversity. As primary producers, seagrasses oxygenate the water and trap carbon dioxide through photosynthesis. By filtering nutrients and pollutants from the water body, seagrasses improve water quality. In addition, they can protect the coast by stabilizing marine sediments through rhizomes and by dissipating wave energy. For thousands of years, seagrasses have been used by humans to insulate houses, for thatch roof, as flour or fertilizer etc.

What are the threats?

Seagrasses are disappearing worldwide due to:

- reduced water clarity caused by excess nutrients from sewage, agricultural and urban runoff, aquaculture effluents (e.g. fish and shrimp ponds);
- discharge of pollutants (e.g. pesticides, herbicides, oil spills and other wastes);
- physical damage by dredging, boat propellers, anchors, chains, moorings, trawling and shellfish digging;
- net fishing and blast fishing,
- natural processes such as storm, flood and tsunami;
- environmental changes, e.g. in water temperature or salinity.

Case study in Hainan Island, China



Long-term effect of pond aquaculture effluents on seagrass performance

This figure was published in Thomsen et al., 2020. Copyright Elsevier.

Off Hainan, coastal eutrophication from aquaculture effluents has led to an 87% decrease in seagrass biomass and a reduction in species within one decade. **!**



Globally, seagrass meadows of the size of a soccer field are lost every 30 minutes. The rate of loss is comparable to that of tropical rainforests.

Interesting links

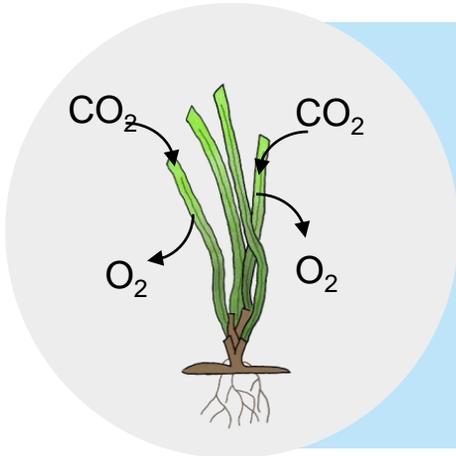
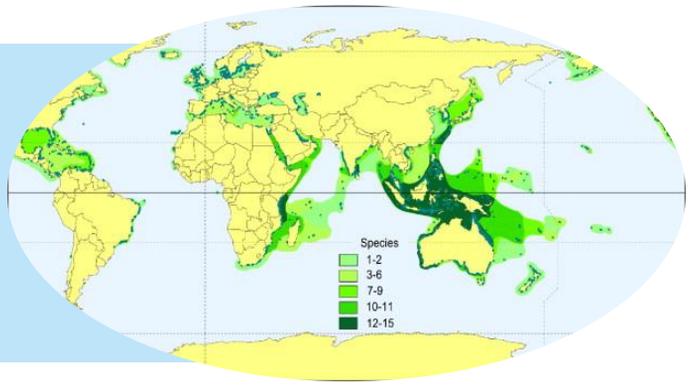
<http://www.seagrassnet.org>
<http://www.seagrasswatch.org/seagrass.html>
<http://www.oceanhealthindex.org/methodology/components/seagrass-area>
<http://ocean.si.edu/seagrass-and-seagrass-beds>

References

Thomsen et al. 2020. The end of resilience: Surpassed nitrogen thresholds in coastal waters led to severe seagrass loss after decades of exposure to aquaculture effluents. *Mar. Environ. Res* 160: 0141-1136.
Short et al. 2007. Global seagrass distribution and diversity: A bioregional model. *J Exp Mar Biol Ecol* 350: 3-20.

Seagrass by numbers

Seagrass meadows **cover less than 0.2%** of the area of oceans, but are responsible for up to **15%** of the total **carbon storage** in marine ecosystems.

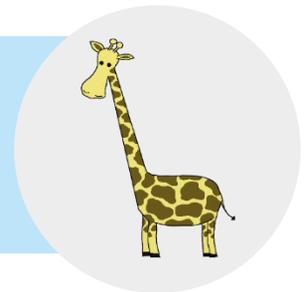


ONE HECTARE of pristine seagrass...

- ...can absorb **1.2 kg of nutrients** per year, that equals the treated effluent from **200 people**.
- ...can produce **100,000 litres of oxygen** per day.
- ...can absorb up to **1.33 tons of carbon** per year.
- ...can support **80,000 fish** and **100 million invertebrates** (animals without a backbone).
- ...is worth more than **19,000 \$** per year.

Fun fact

The seagrass *Zostera caulescens* can grow to **7 m length** in the water column, which is taller than a giraffe.



Take home messages

- Seagrasses play an important role for the environment and are hotspots of coastal biodiversity
- They are threatened by several factors like man induced pollution and environmental changes
- Worldwide, seagrass meadows are disappearing at an alarmingly fast rate
- A threshold for seagrass survival was identified from our study in Hainan: seagrasses will disappear upon long-term exposure to concentrations $>8 \mu\text{M DIN}$

Imprint

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