SeagrassNet: Global Monitoring Network of Seagrass Resources

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www.SeagrassNet.org

Overview

SeagrassNet is a global monitoring program that makes quarterly assessments of seagrass habitat at 93 sites in 27 countries around the globe. After a pilot program in the Western Pacific starting in 2001, SeagrassNet has expanded to Asia, Australia, North, Central and South America, Africa and Europe. SeagrassNet focuses on both monitoring and education, to understand human impacts in the coastal zone and natural variation in seagrass habitats as well as the role of global climate change on seagrasses. At each site, a SeagrassNet team of local participants (typically scientists, managers, government and NGO personnel) is trained in the monitoring protocol; the program depends on these teams to conduct the monitoring field activities, submit the data to the online database. In some cases, local teams collaborate with the SeagrassNet management to secure funding to support field activities. Worldwide, SeagrassNet teams are now a veritable United Nations of coastal monitoring.
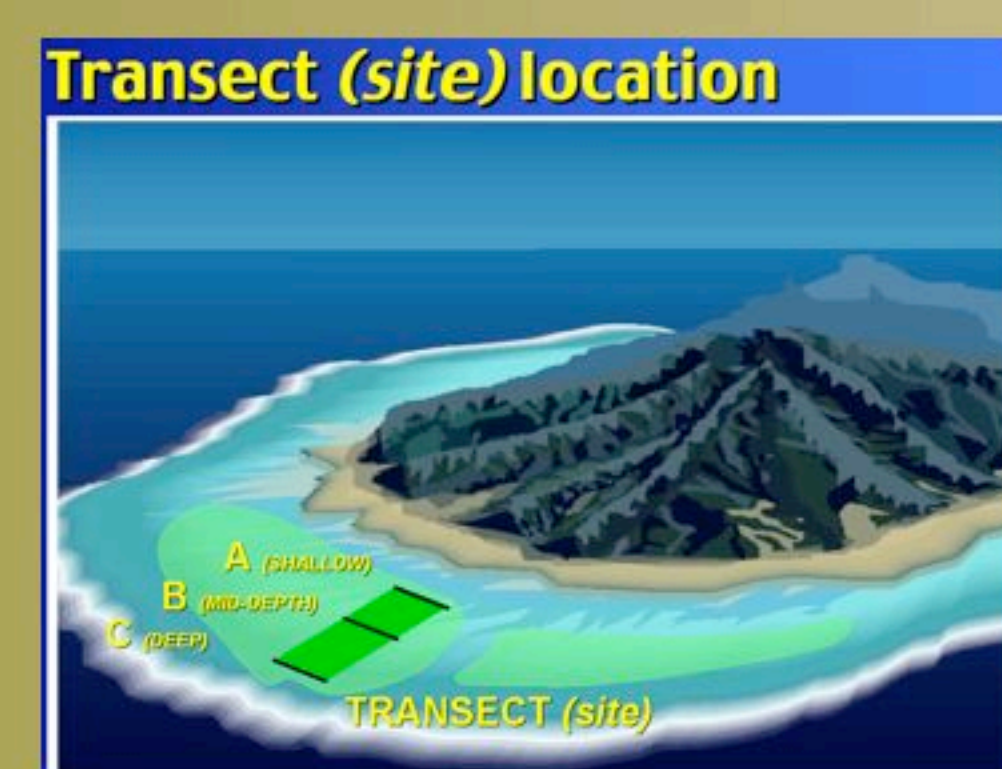
Goals of SeagrassNet

• To assess the impacts of human activities on seagrass ecosystems

• To assess the impact of climate change on seagrass ecosystem

• To increase seagrass awareness worldwide

Monitoring Protocol

To monitor and assess the status and trends of the seagrass ecosystem worldwide, SeagrassNet developed a standardized protocol (Burdick and Kendrick, 2001) for scientific monitoring successfully implemented by trained teams of in-country scientists and managers. The project adopts a statistical approach to test the data and identify local and global trends. Data are sent via the Internet to an online database and archive at www.SeagrassNet.org.
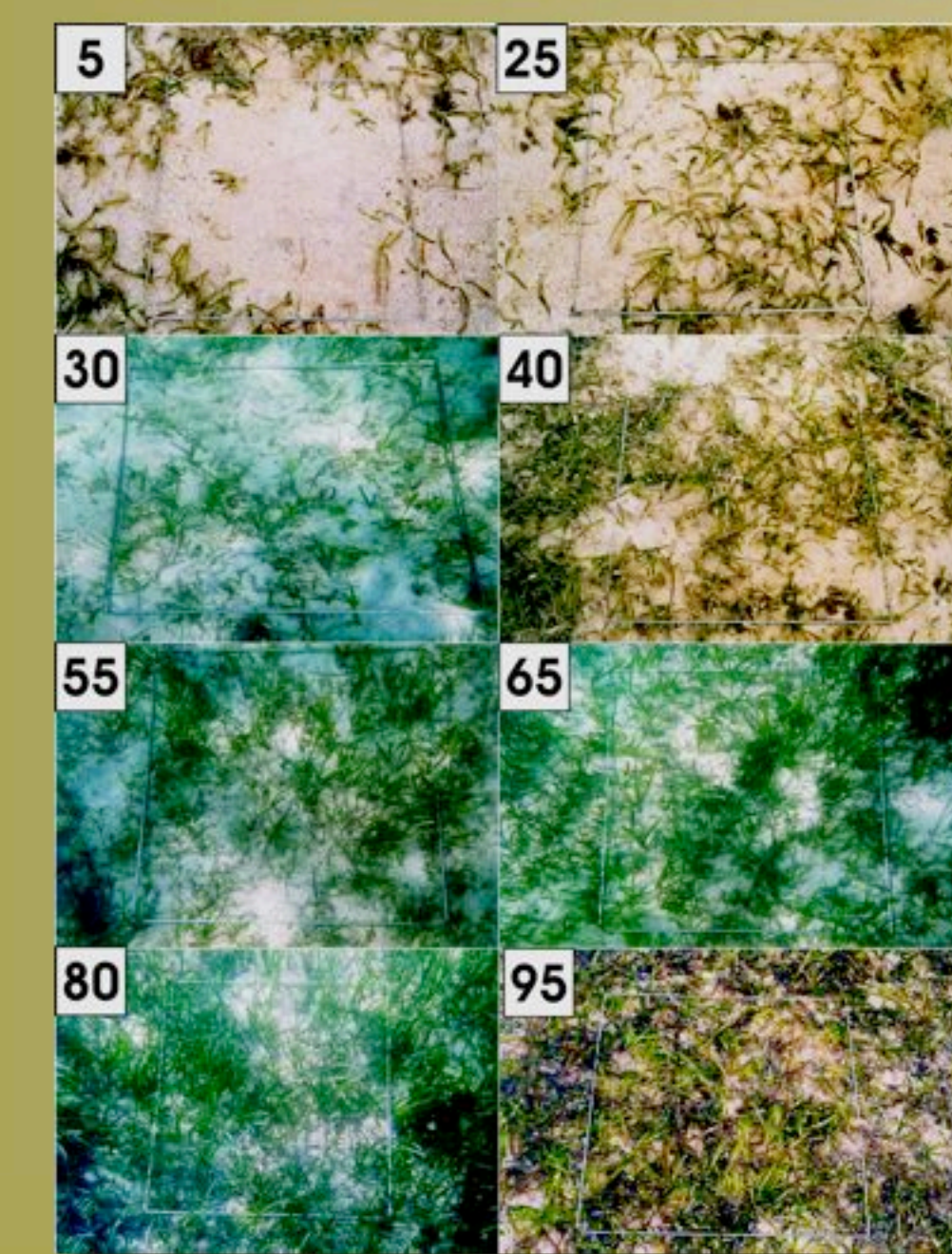
Sampling design

• Quarterly sampling to identify seasonal trends

• Synchronous sampling provides global/regional spatial and temporal patterns of change in seagrass

• Pre-selected random quadrats

• Fixed transects + repeated measures, allowing robust detention of temporal variation

Transect (site) location

Random quadrat positions

Seagrass Percent Cover Photo Guide

Monitoring Parameters

Seagrass voucher specimen
Seagrass species composition
Seagrass % cover
Seagrass canopy height
Seagrass shoot density
Seagrass biomass
Presence of flowers & fruits
Evidence of grazing
Photograph of each quadrat
Salinity
Sediment grain size
Light, using loggers
Temperature, using loggers

Maryland, USA — Cape Cod, USA — New Hampshire, USA — Calvi, Corsica, France — Sabah, Malaysia - 2 sites — Ha Long Bay, Viet Nam — Philippines - 2 sites — Manado, Indonesia — Palau - 2 sites — Kavieng, PNG - 3 sites — Oregon, USA — Pohnpei, FSM - 3 sites — San Quintin, Mexico — Kosrae, FSM - 2 sites — Belize Network - 8 sites — Queensland, Australia — Neguanje Bay, Colombia — Fiji — Recife, Brazil — Komodo, Indonesia - 2 sites — Riung, Indonesia — Abrolhos, Brazil — Cabo Frio, Brazil — Eliat, Israel — Wadi Gemal, Egypt — Nyali Beach, Kenya — Tanzania - 2 sites — Inhaca Island, Mozambique — Ifaty, Madagascar — Andaman Islands, India — Trang, Thailand - 2 sites — Peninsular Malaysia

SeagrassNet sites across the world - SeagrassNet has now reached 5 continents

Seagrass local trends from Sabah, Malaysia

Pulau Gaya is the largest of 5 islands that make up the Tunku Abdul Rahman National Park and the closest to the city of Kota Kinabalu. Although largely protected, Pulau Gaya is in the midst of change and vulnerable to a number of human influences. The capital of Sabah, Kota Kinabalu, counts 3.4 million people, 343,765 live in Kota Kinabalu and the city is growing at an alarming rate. A large and growing stilt village has been illegally developed on the shore of Pulau Gaya closest to Kota Kinabalu. Dynamite fishing was practiced on the north of the island until 2002. Two SeagrassNet sites were established on Pulau Gaya in 2001. Beginning in 2004, there was a decline in seagrasses at both monitoring sites, leading us to conclude that a large scale, persistent disturbance has damaged the seagrasses in this region. Based on reduced light in seagrass beds and satellite images during this time we believe terrestrial inputs of sediments may explain these seagrass declines.
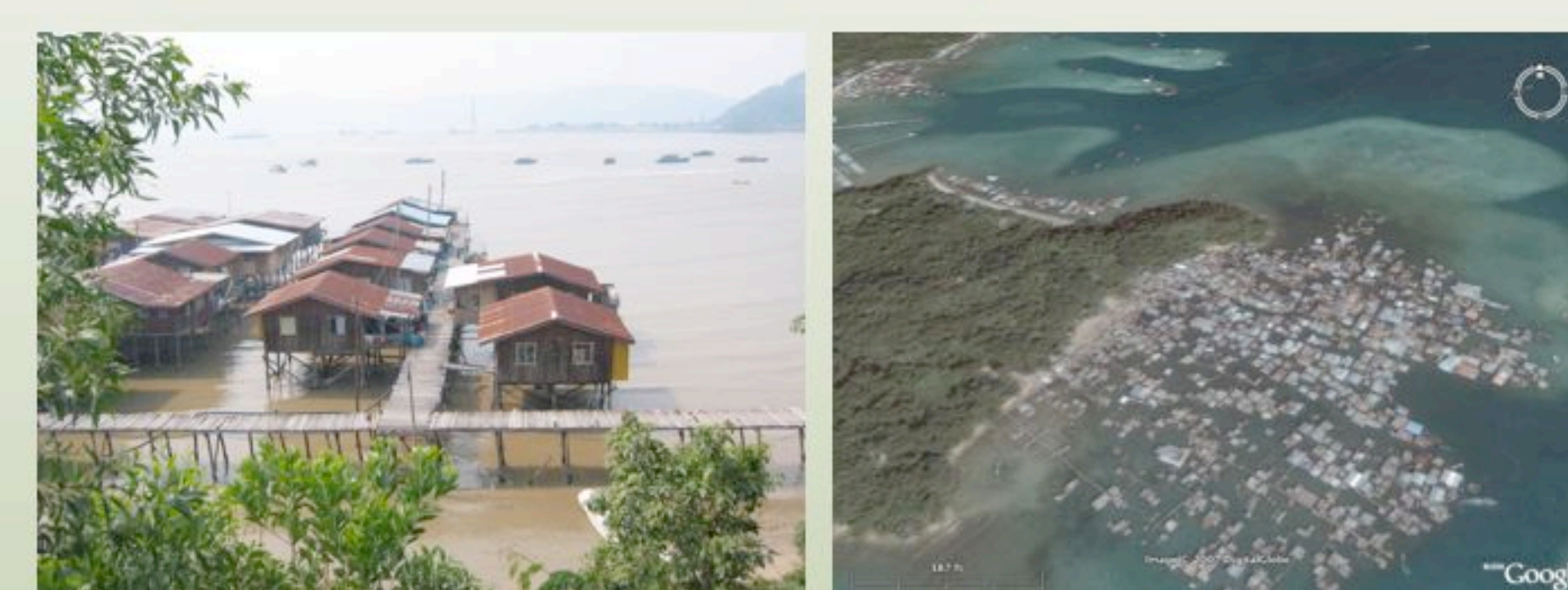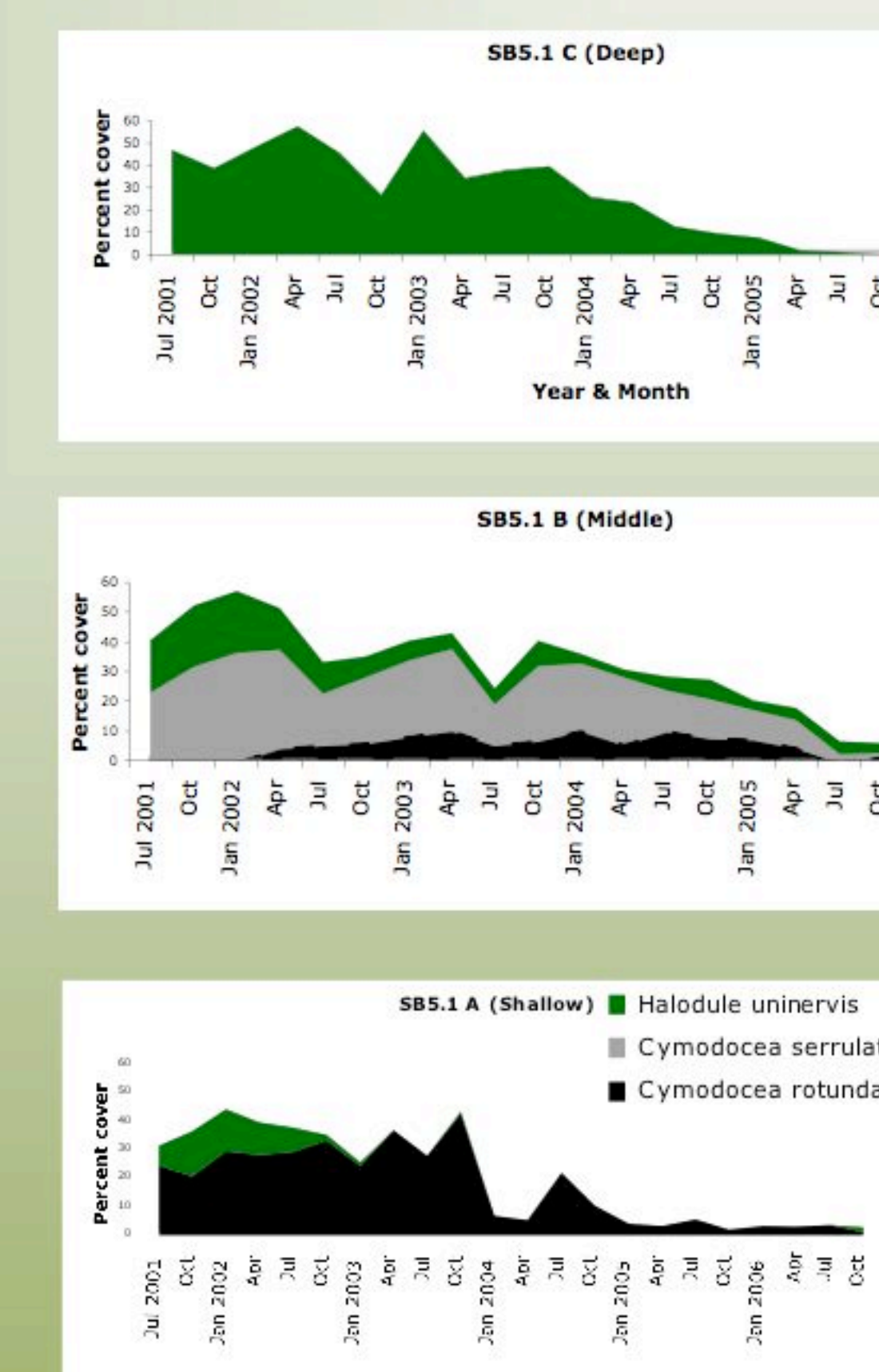
Sabah's economy has traditionally largely been based on timber harvest, but as the native forests have been depleted, efforts have shifted to palm (oil) plantations as a sustainable agricultural product. Ironically, although re-vegetation with palm plantations is the primary justification for clearing forests, recently cleared land is converted to plantations only 60% of the time. While there is some evidence that seagrasses are recovering at Kuari Bay, sustained recovery may rely on mitigating the aggregate effects of these human disturbances.

Figures: Cumulative % cover of seagrass species at Kuari Bay (left) and Police Beach (right)
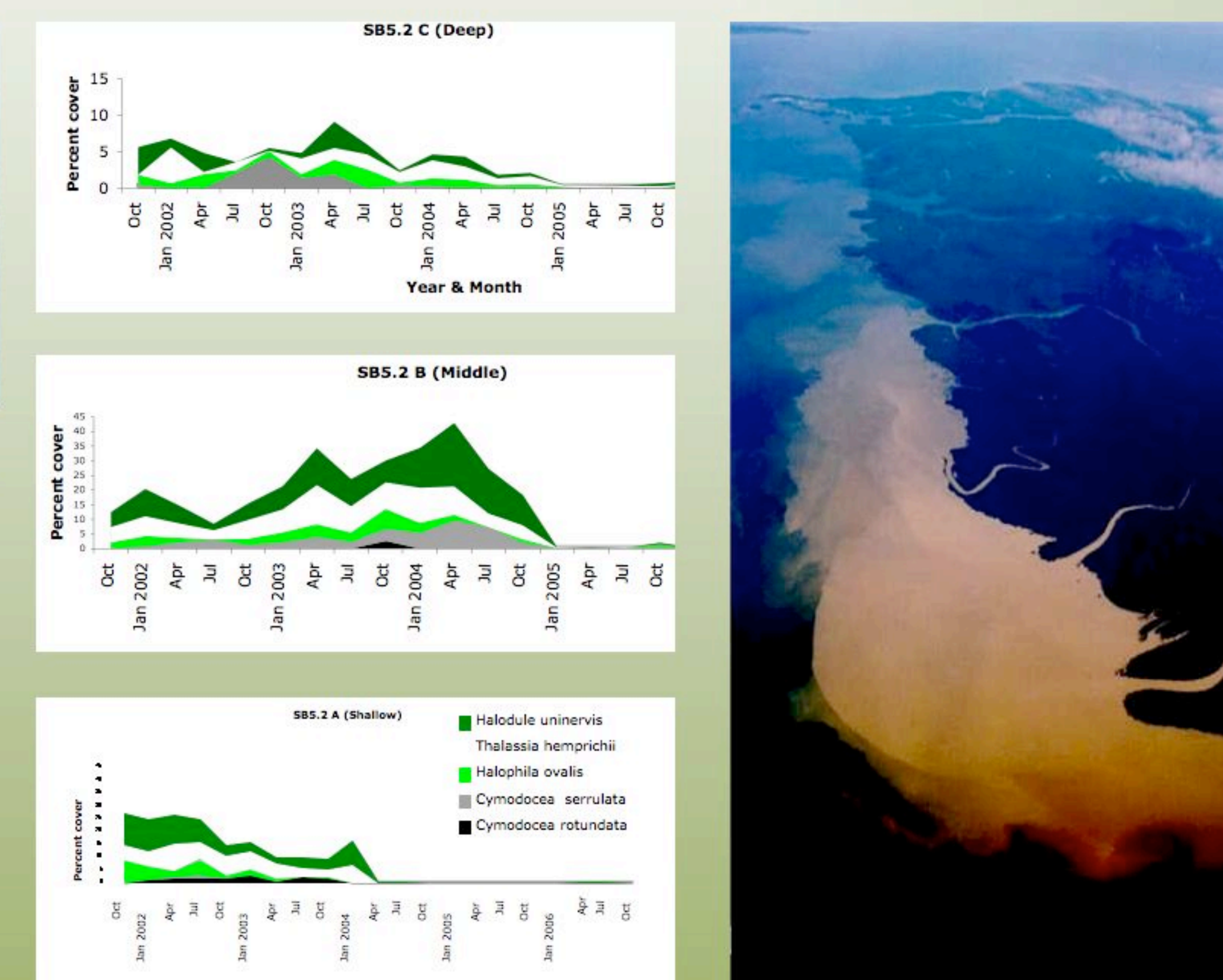
Global Report Card

SeagrassNet results show seagrass declines due to direct anthropogenic impacts and indirect effects from climate change. Monitoring has documented significant trends of seagrass loss due to sediment loading from deforestation in Malaysia (Freeman et al., in press), resuspended sediments from tourism boating (Vietnam), and nutrient pollution (Koror, Palau; Maryland, USA).

We have documented seagrass losses from climate change impacts through increased storm activity in Tamandare', Brazil and excess grazing from altered goose migration patterns in New Hampshire, USA (Short et al. 2006).
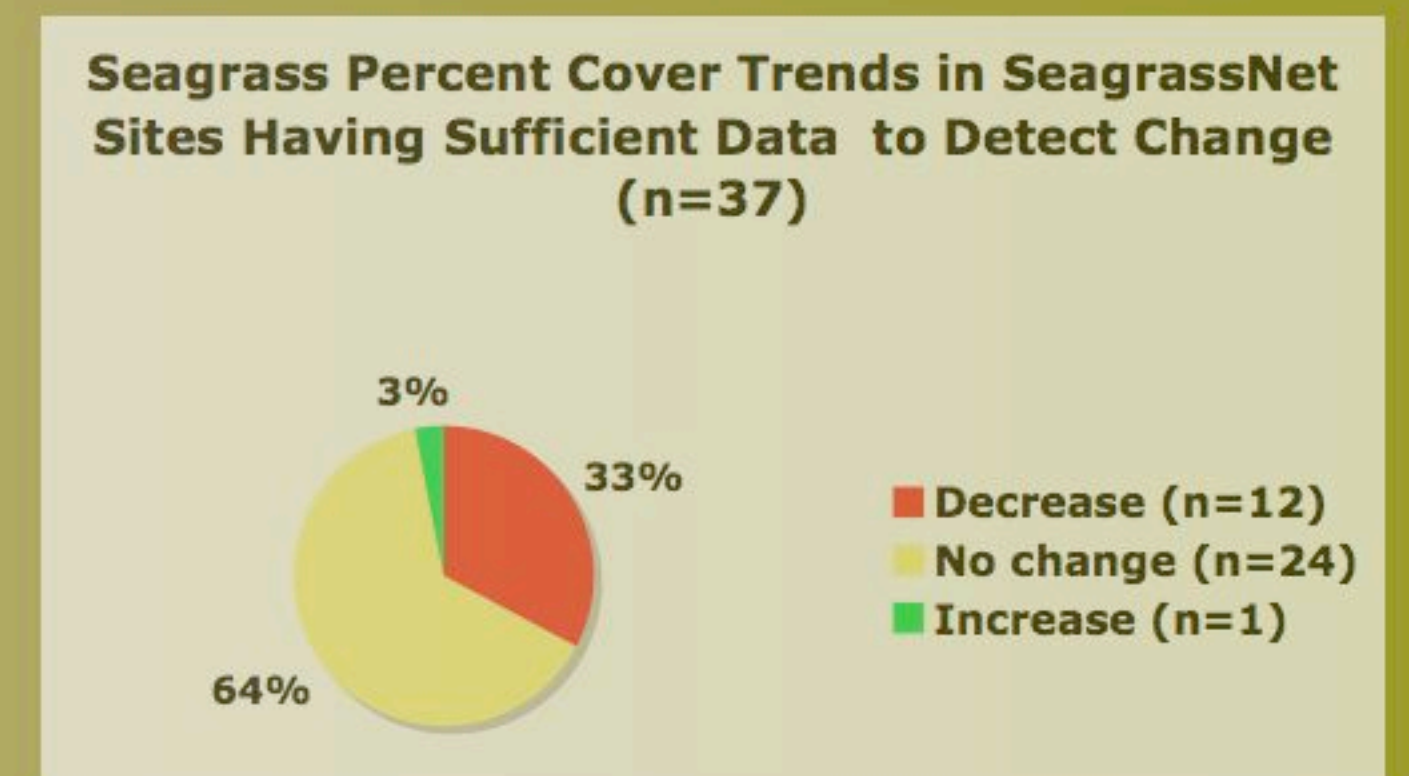
Concomitantly, several remote or protected SeagrassNet sites are stable and healthy, e.g., Pohnpei and Kosrae (Micronesia), Puerta Galera (Philippines), and the Great Barrier Reef (Australia).
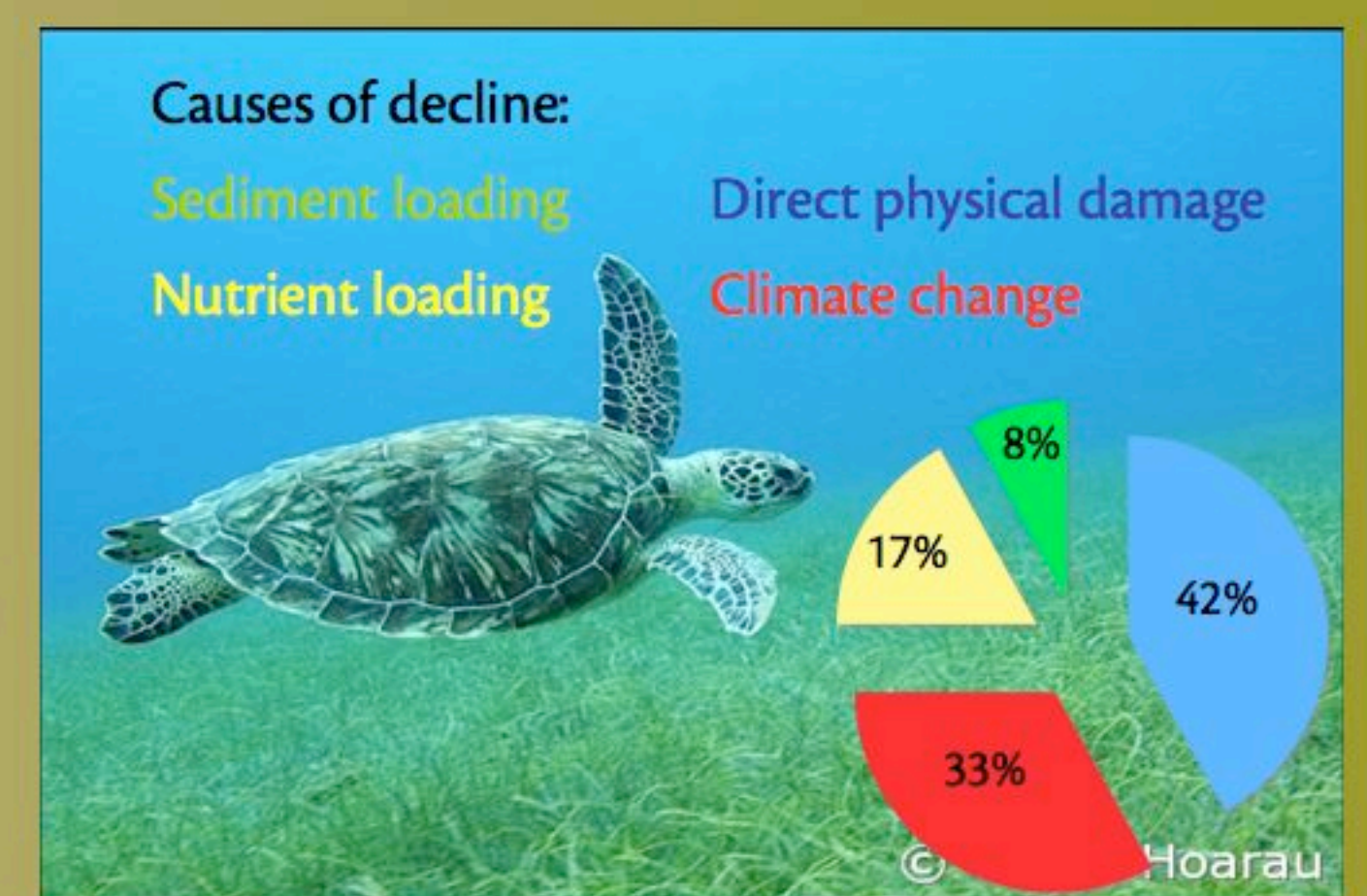
The overall trend shown by SeagrassNet is one of seagrass loss in sites impacted by human activity and stable seagrasses in remote or protected areas.

Seagrass Percent Cover Trends in SeagrassNet Sites Having Sufficient Data to Detect Change (n=37)

- Decrease (n=12) — 33%
- No change (n=24) — 64%
- Increase (n=1) — 3%

Causes of decline: Sediment loading, Direct physical damage, Nutrient loading, Climate change — 8%, 42%, 17%, 33%

Summary

• SeagrassNet provides a standard monitoring protocol for any seagrass species anywhere in the world, allowing data to be compared globally.

• 93 sites are operating in 27 countries on 6 continents, making SeagrassNet the largest and longest-running seagrass monitoring program.

• SeagrassNet provides a connection to a database and a web site presence for each of the monitoring sites with online data access.

• SeagrassNet provides a global assessment of the status and dynamic change of seagrass meadows.

• Monitoring results document change due to anthropogenic impacts and/or global climate change.

• SeagrassNet welcomes inclusion of new sites and regional networks.

• SeagrassNet increases public and governmental awareness of seagrasses and the threats to these important ecosystems worldwide.

SeagrassNet publications

Burdick, D.M., Kendrick, G.A. 2001. Standards for seagrass collection, identification and sample design. In: Short, F.T. and R.G. Coles (eds.). Global Seagrass Research Methods. Elsevier Science B.V. Amsterdam. pp. 79-100.

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