HCMC UNIVERSITY OF NATURAL RESOURCES AND ENVIRONMENT
FACULTY OF MARINE RESOURCE MANAGEMENT

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MARINE RESOURCES AND ENVIRONMENT MANAGEMENT

Topic 2 - MARINE RESOURCES
2.3 Coastal ecosystems

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MATERIALS

1. Quản lý tài nguyên và môi trường biển, Nguyễn Kỳ Phùng, 2016

2. Quản lý biển, Lê Đức Tố, 2004

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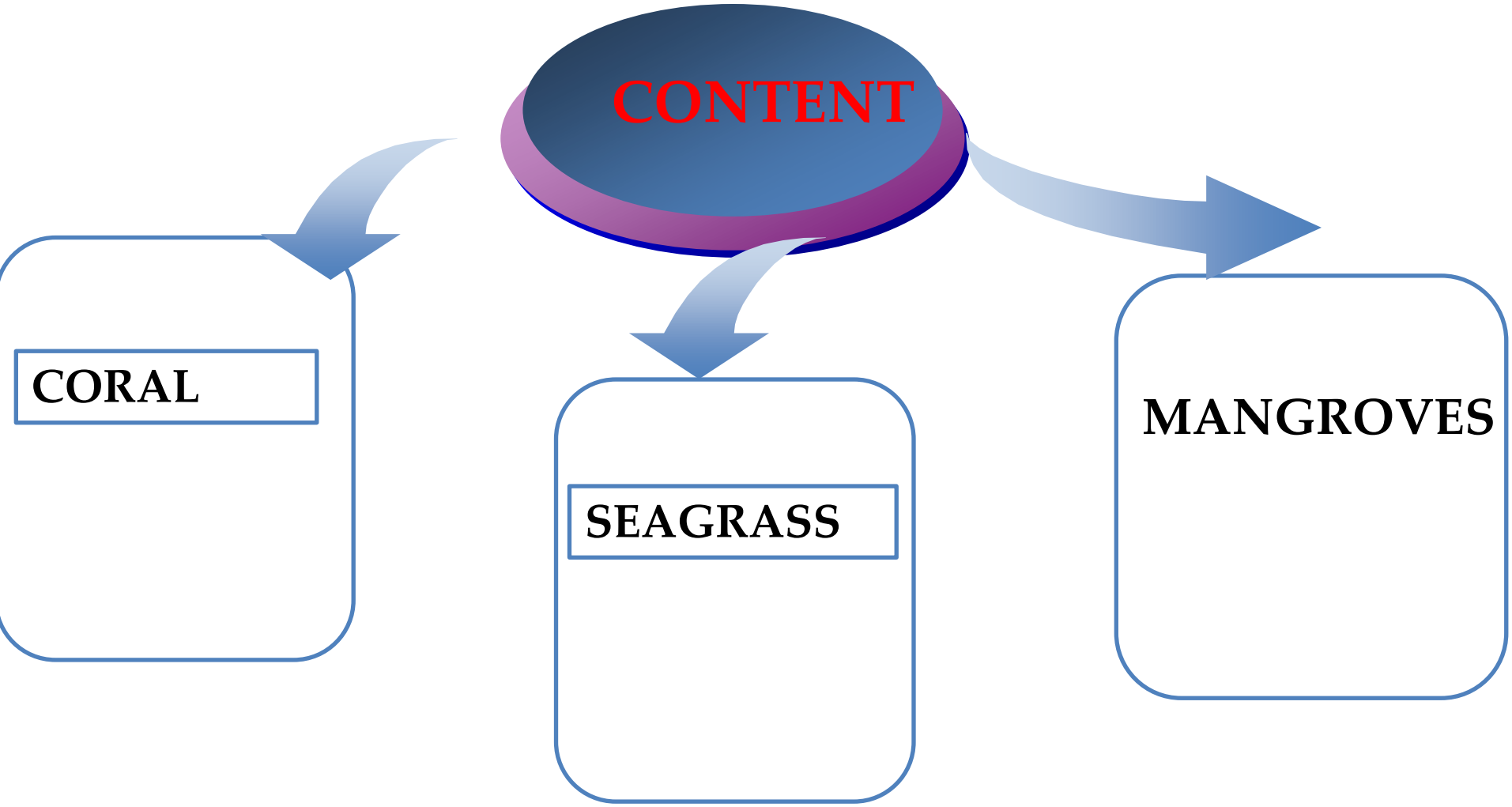

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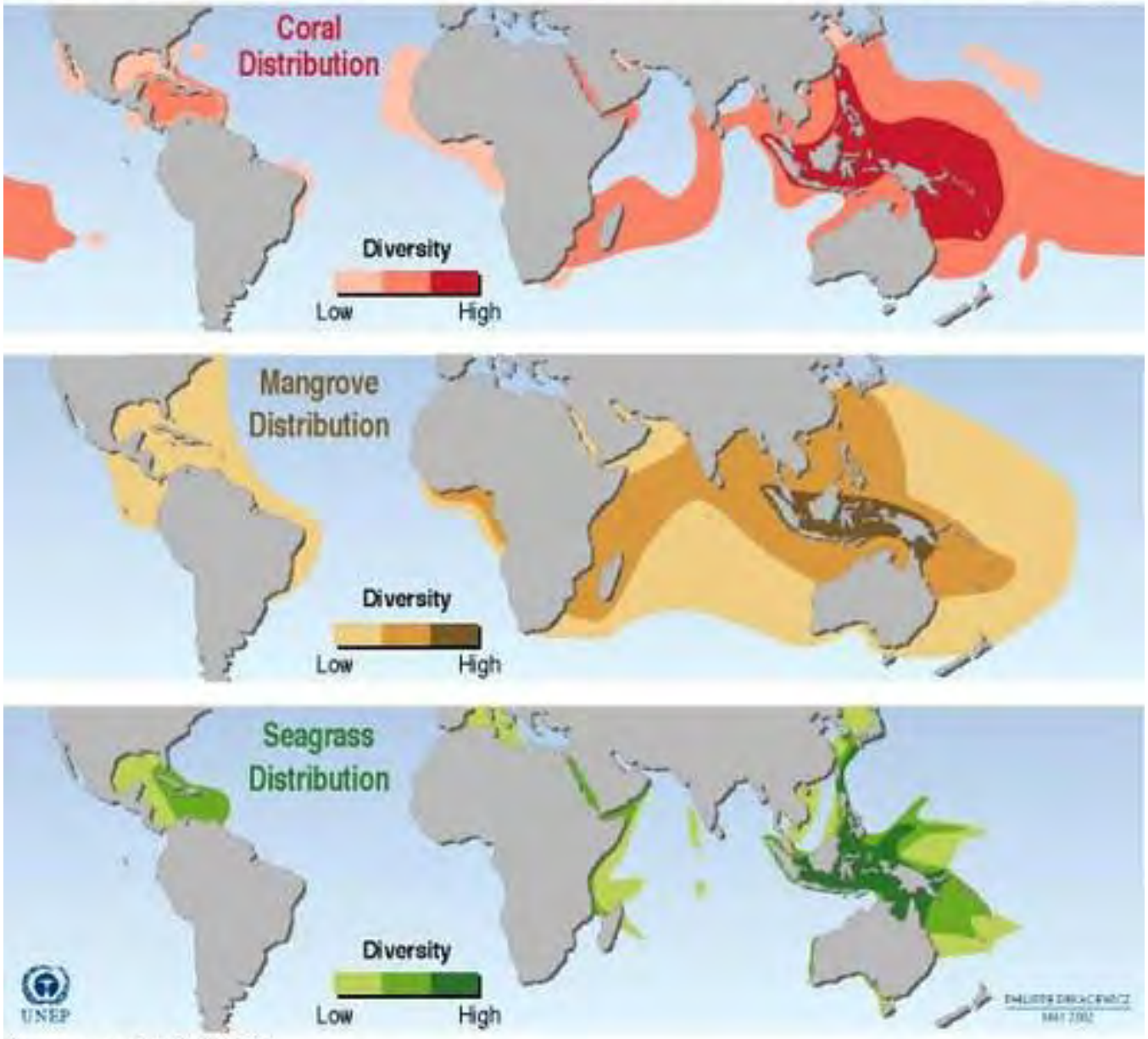
Global Distribution of Coral, Mangrove and Seagrass Diversity



Source : UNEP-WCMC, 2001.

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1) Coral Ecosystem

Taxonomy Coral

Class Coral (Anthozoa) is a class of invertebrates aquatic including sea anemones, rock corals and soft corals, belonging to the phylum Anthozoa

- There are 3 main groups: hard corals, soft corals and horn corals

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Structures of coral reefs

1. Atoll reef
2. Fringing reef.
3. Platform reef
4. Barrier reef

According to Veron, 2000

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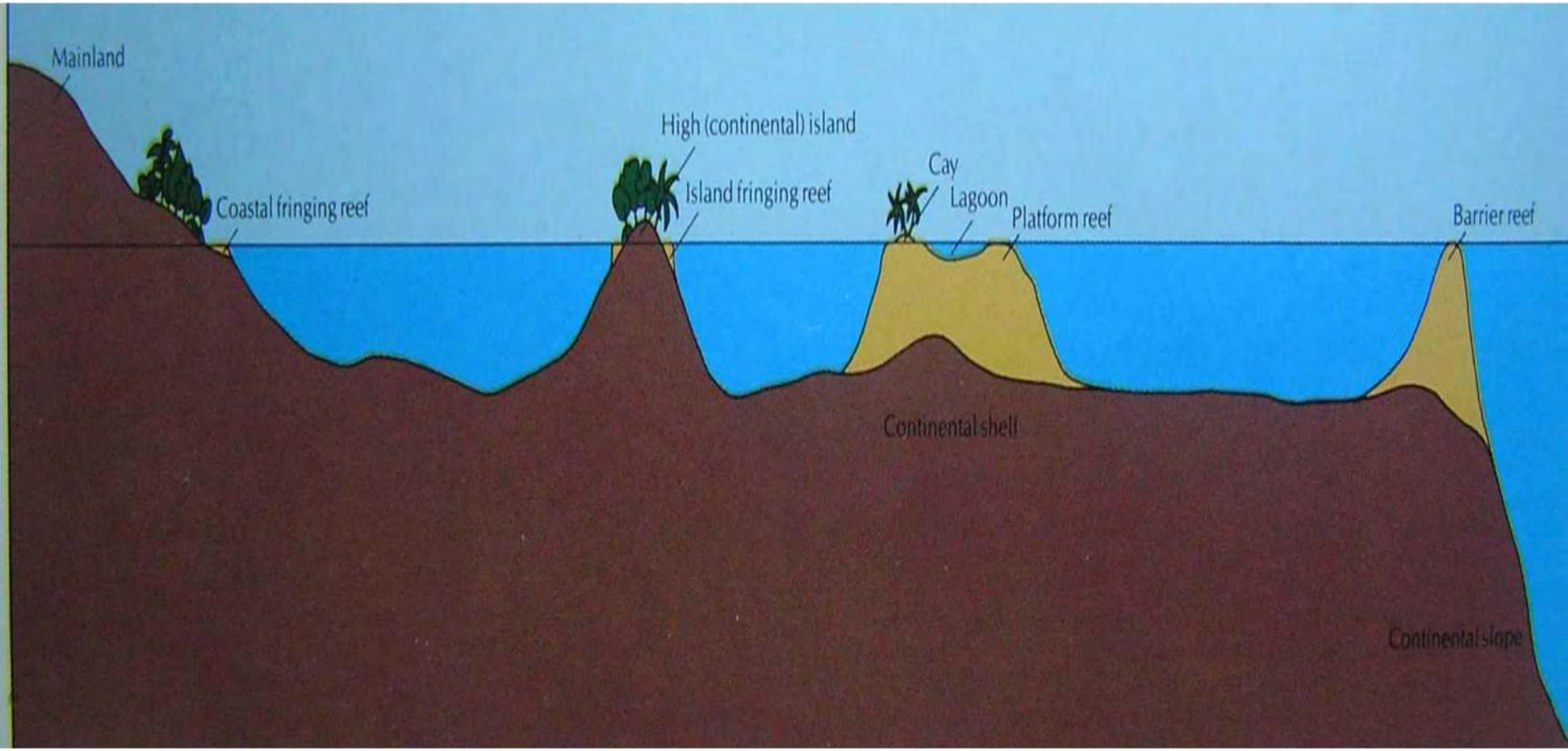
RESISTANCE STRUCTURE RESISTANCES



According to Veron, 2000

DISTRIBUTION OF CORAL IN THE WORLD

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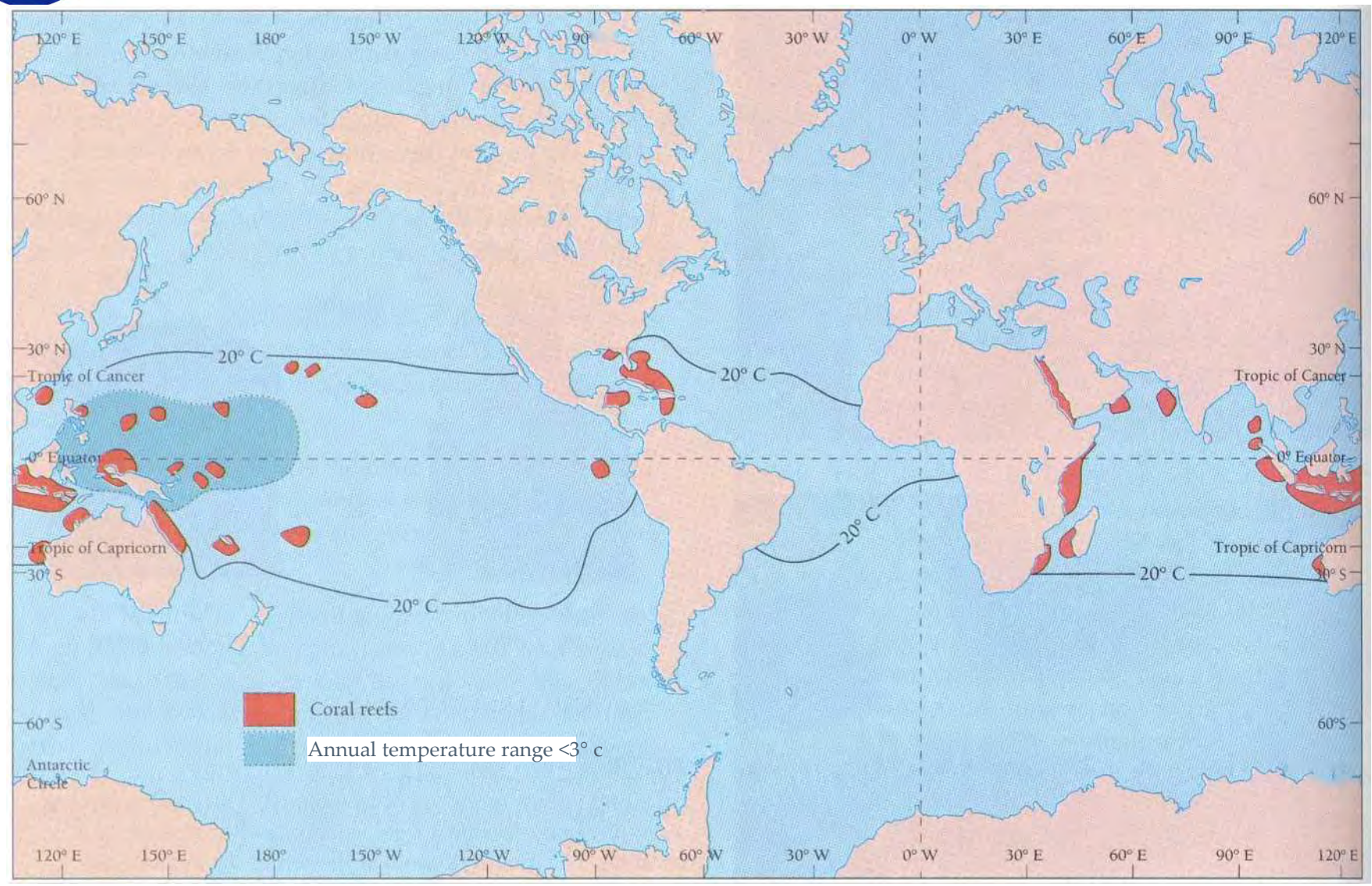

- *World: 6 x 10 ^{5} kilometer ^{2}*

winter male ASIAN: 100,000 km








The importance of coral reefs

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- High diversity
- Fisheries: direct and indirect(10%): 10.5 -31 tons/km2
- High biological productivity
- Tourism: high diversity
- Coastal protection
- Gene reserves
- Supply of pharmaceutical productsrare
- Other: research, education,...

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Annual income from 1 square kilometer of coral reef

Forms of coral reef exploitation	Annual production capacity	Annual Income (USD)
Fisheries for domestic consumption	10 -30 tons	15,000 -45,000
Export fisheries (live fish)	0.5 -1 tons	5,000 - 10,000
Tourism	600 - 2,000 people	4,500 - 25,000
Coastal protection		5,000 - 25,000
Entertainment and variety born learn	600 - 2,000 people	2,400 -8,000
Total		*31,900 - 113,000*

Zoning of the coral system creating Vietnam's sea reefs

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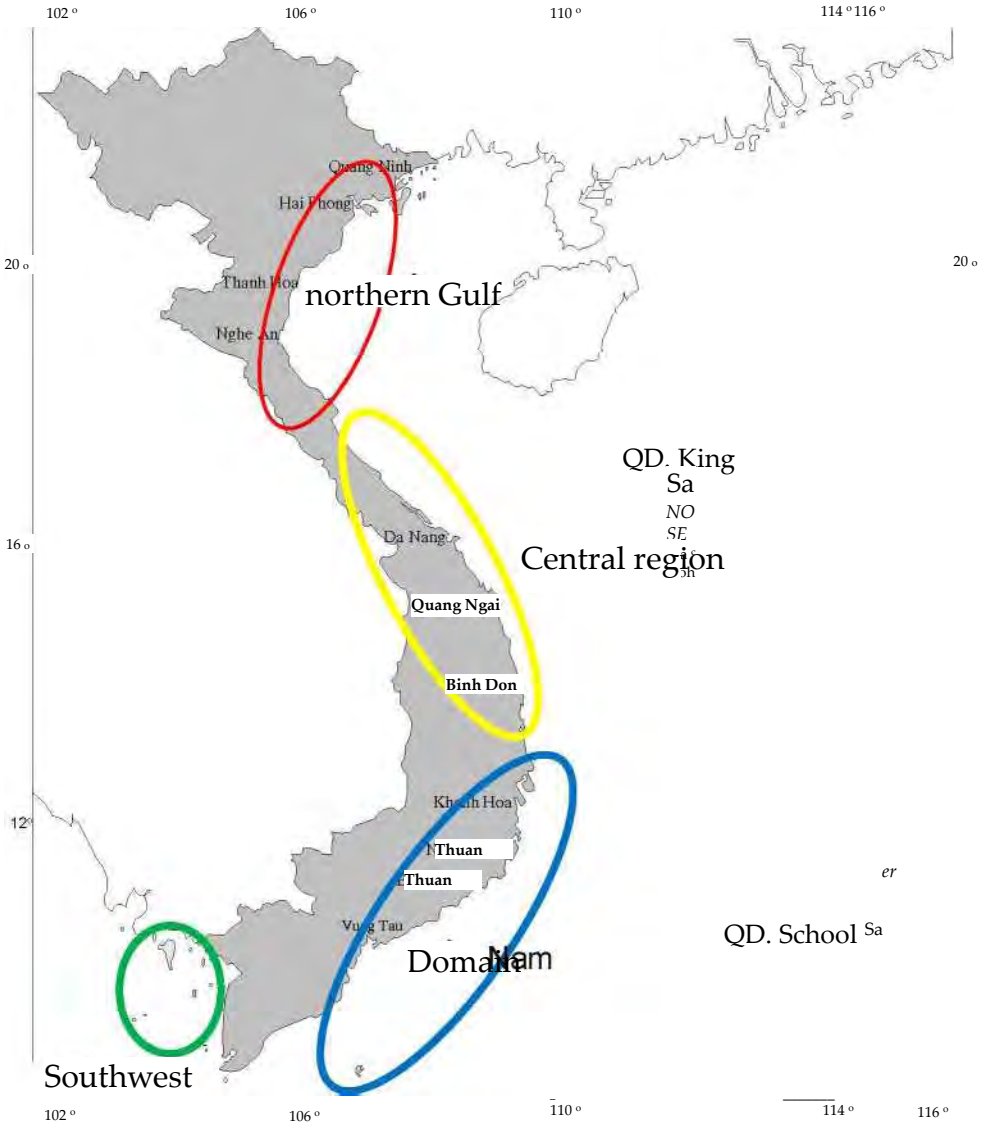

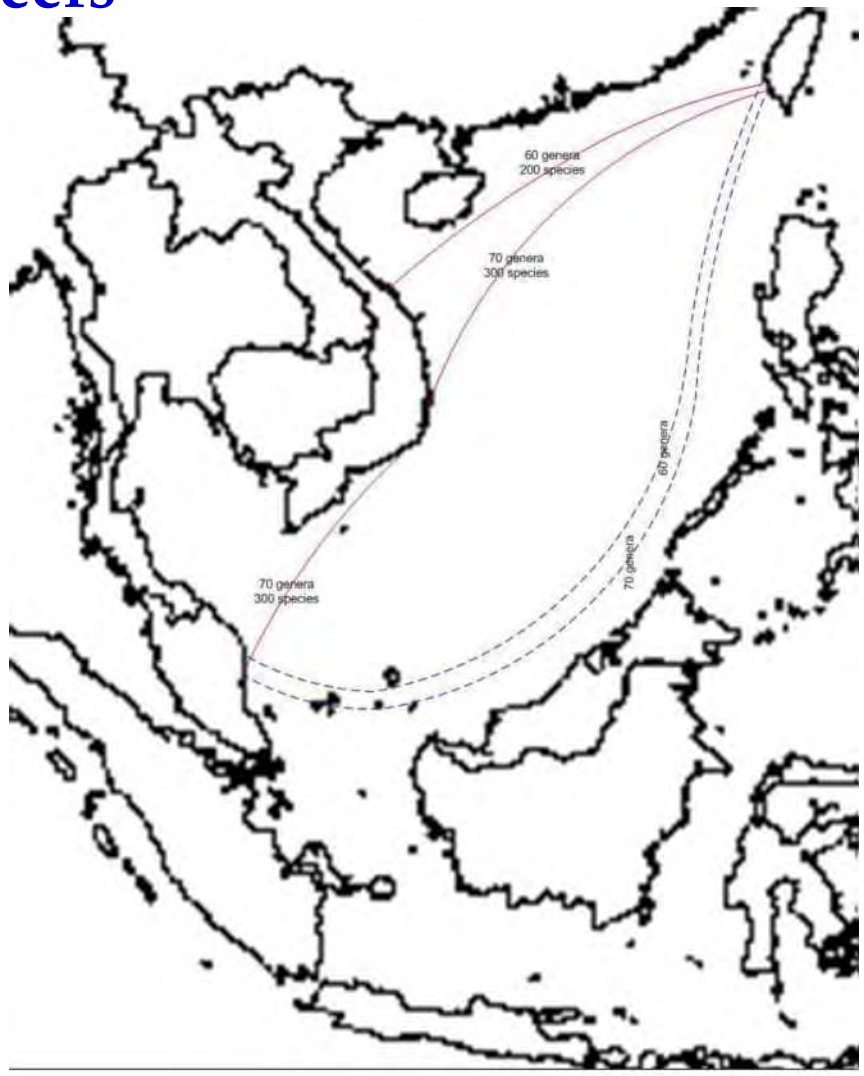

Isopangeneric countours of hemnatypic corals in South China Sea (……: after Veron, 1993; -------í Changing proposal)

Vo Si Tuan, 2014; Huang and cs, 2014;

Threats to Vietnam's marine coral reefs

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- Overexploitation
- Destructive mining

Natural disasters and harmful creatures

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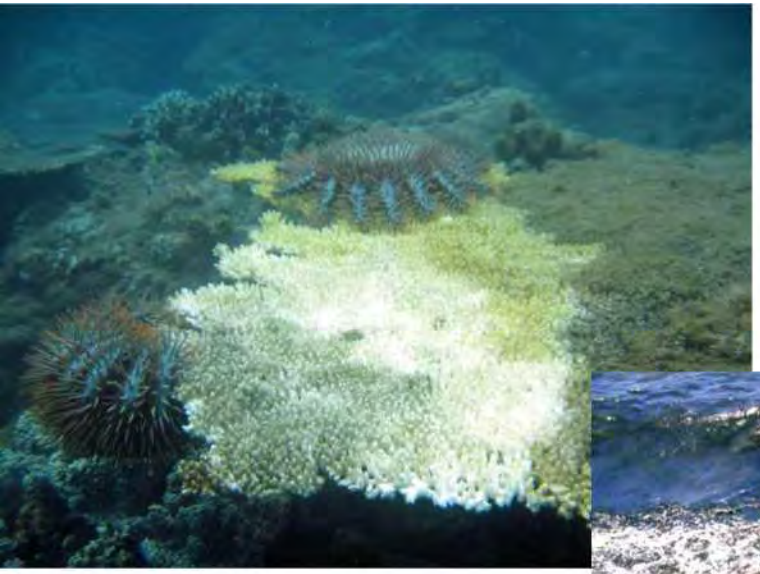

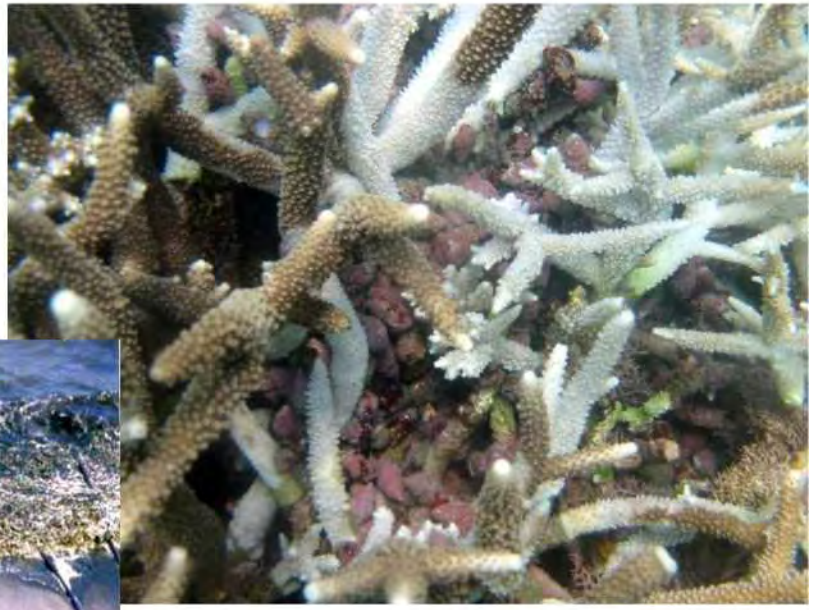

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Tourist activities
...

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2) Seagrass

- Seagrasses are **underwater plants that evolved from land plants**. They are like terrestrial plants in that they have leaves, flowers, seeds, roots, and connective tissues, and they make their food through photosynthesis.
- There are about 60 species of fully marine seagrasses which belong to four families, all in the order Alismatales. Seagrasses evolved from terrestrial plants which recolonised the ocean 70 to 100 million years ago
- Unlike terrestrial plants, however, they do not have strong stems to hold themselves up—instead they're supported by the buoyancy of the water that surrounds them. Seagrasses are a very important food source and habitat for wildlife, supporting a diverse community of organisms including fish, octopuses, sea turtles, shrimp, blue crabs, oysters, sponges, sea urchins, anemones, clams, and squid. Seagrasses have been called "the lungs of the sea" because they release oxygen into the water through the process of photosynthesis.

2) Seagrass

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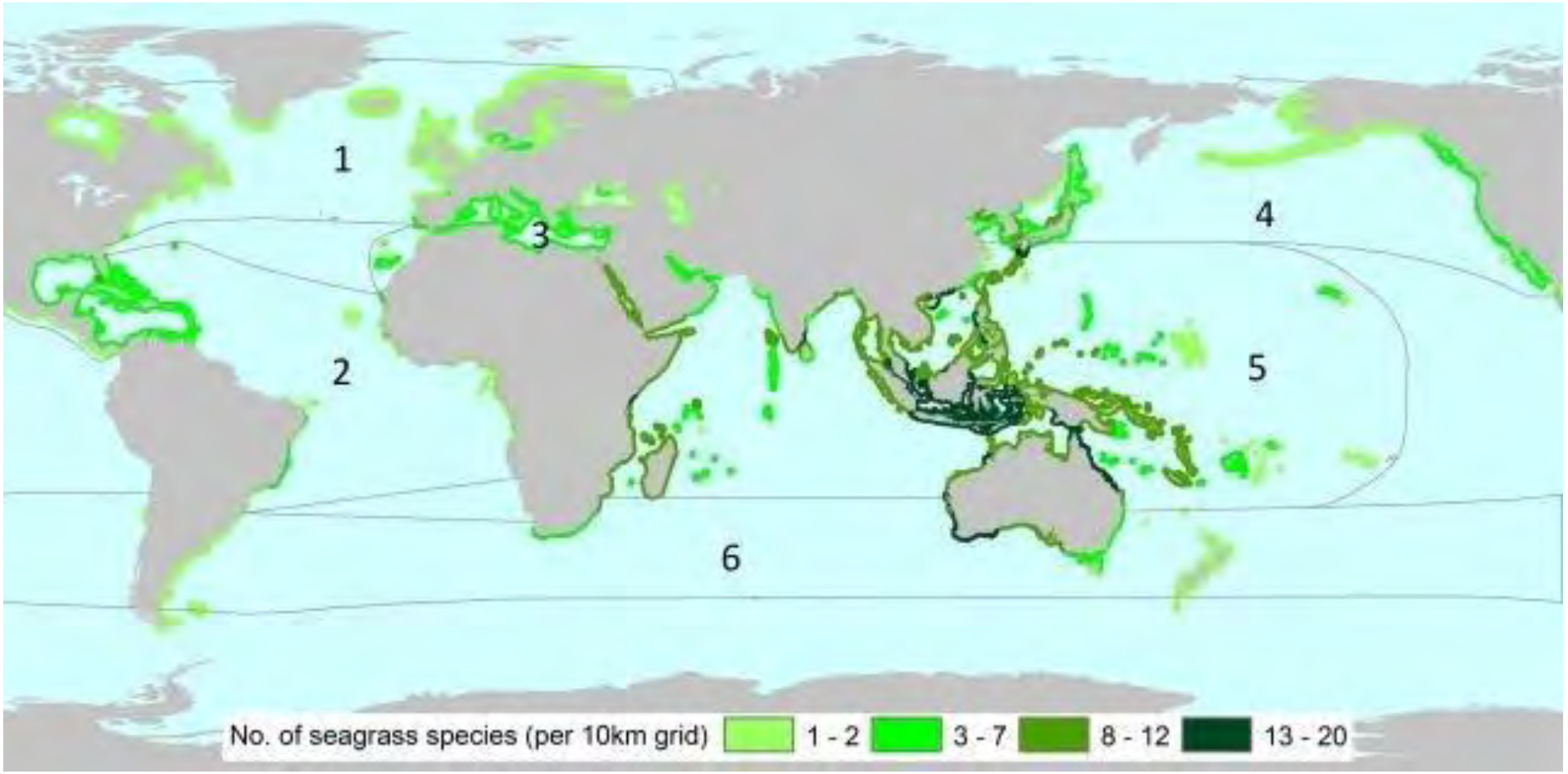

2) Seagrass

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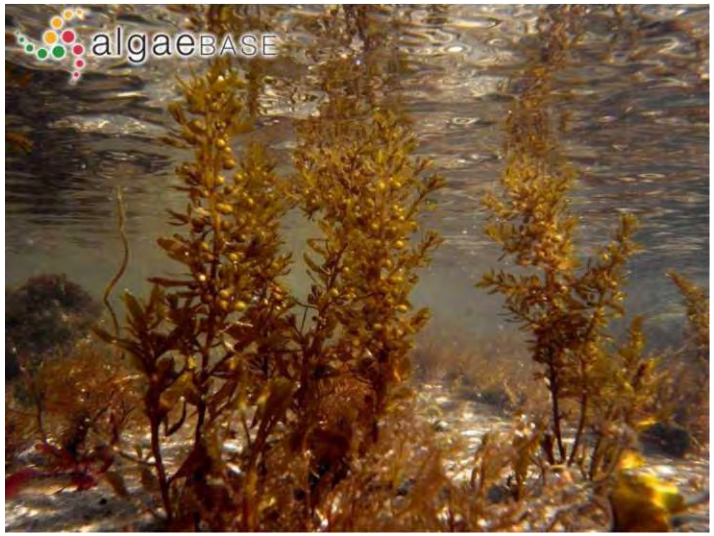
Seaweed

Seaweed with Seaweed?

- They are all lower plants



Multicellular

Unicellular

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Rhodophyta


Porphyra

- Rhodophytas have an additional pigment phicoerithrin that gives most of these algae their red color.
- In the tropics, they have the highest percentage of species groups.
- Diversity in morphology and size: single-celled or forming large flakes of several kg

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Phaeophyta

- Pigments: chlorophyll, carotene, xanthphin...
- - Different shapes.
- - Cell membranes are low in cellulose, but high in alginic acid, up to 39%.

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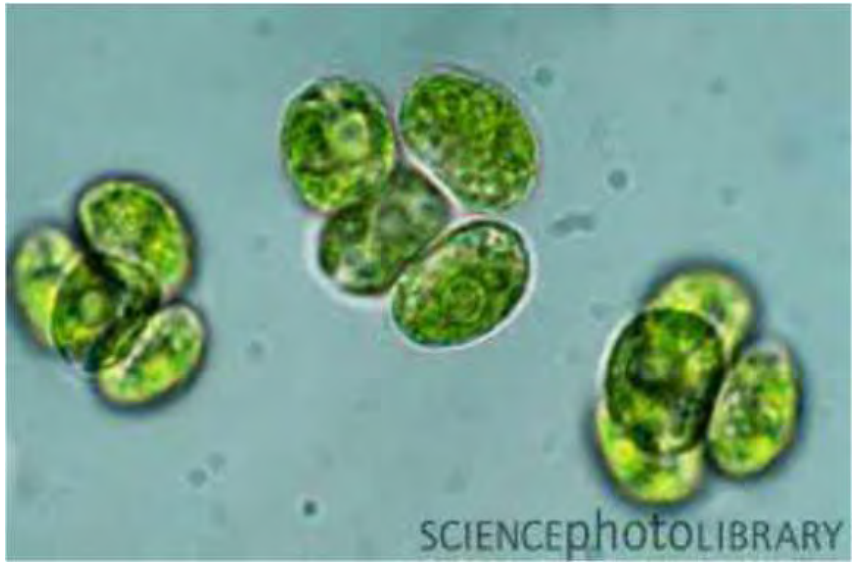
- Chlorophyta

- Chlorophyta have additional pigments chlorophyll a, b, carotene, xanthphin.
- The reserve substance is usually starch.
- Size: Unicellular or multicellular



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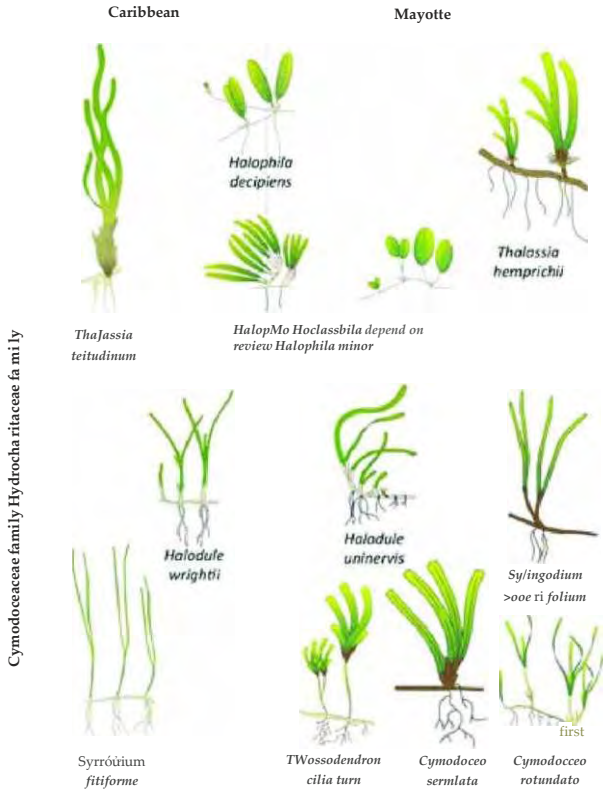
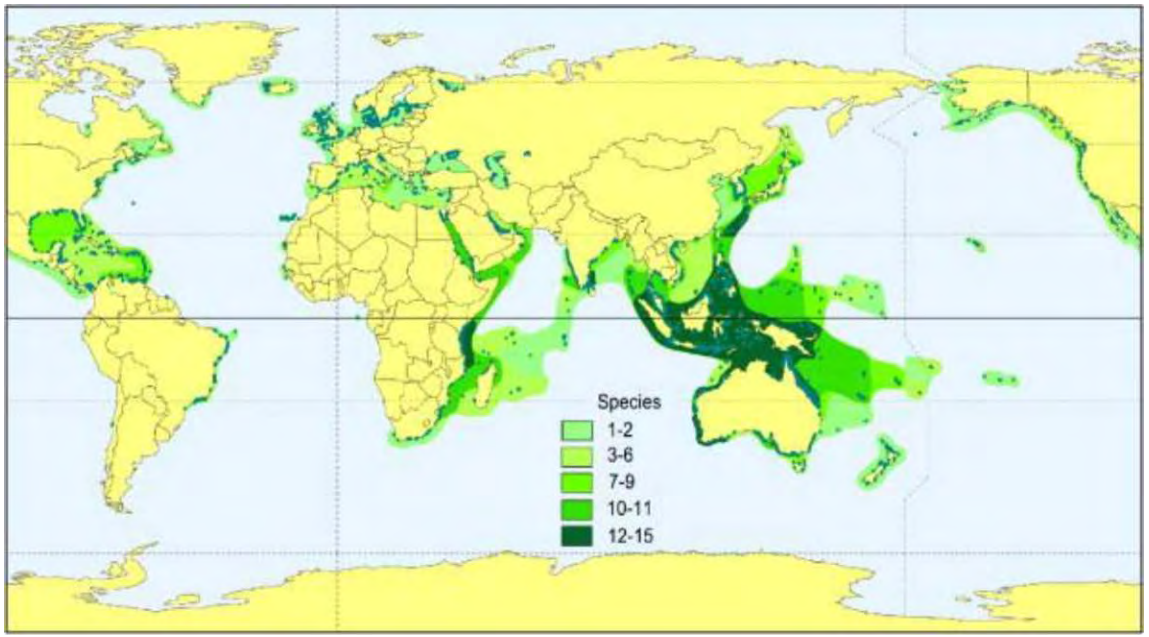
Seagrasses



Species distribution in the world



Short et al. 2017

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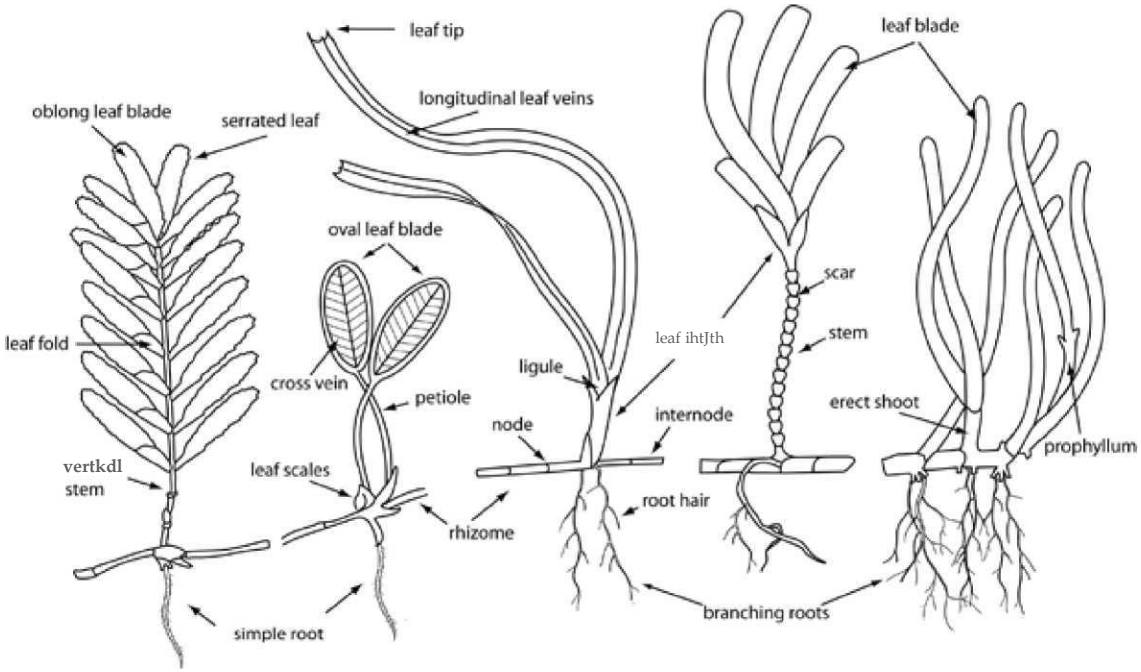
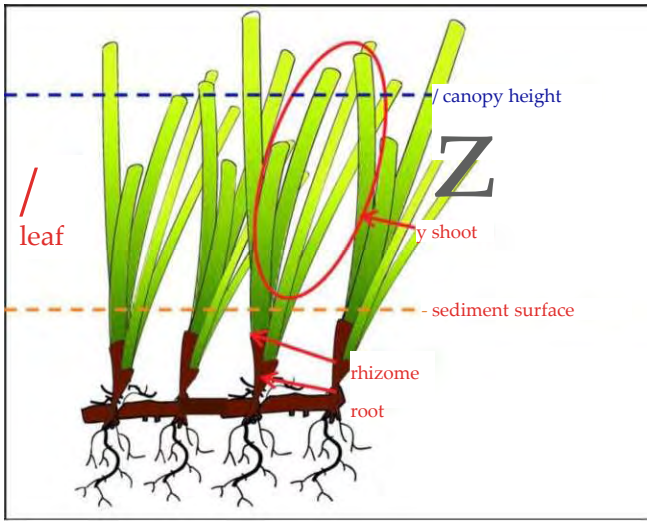
Seagrasses



Seagrass shape



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Seagrasses: Taxonomy and Species Diversity

Branch: Tracheophyta Class: Monocots The set: Alismales Surname: 4 Surname

Posidoniaceae	Zosteraceae	Hydrocharitaceae	Cymodoceaceae
Genus: Posidonia	Genus Heterozostera*	Genus Halophila*	Genus Amphibolis
7 species	2 species	20 species (Vietnam: 5)	2 species
	Genus Nanozostera*	Genus Thalassia	Cymodocea
	7 species	2 species (Vietnam: 1)	4 species (Vietnam: 2)
	Genus Zostera	Genus Enhalus	Genus Halodule
	6 species (Vietnam: 1)	first species (Vietnam: 1)	8 species (Vietnam: 2)
	Phyllospadix		Genus Syringodium: 2 species; first
	5 species		Genus Thalassodendron: 3 species; first
7	**20**	**23**	**19**

3) Mangroves

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- Mangroves - Mangroves - Mangrove ecosystems
- Mangroves: are shrubs, tall trees living in areas affected by tides, lagoons.
- Mangrove forest: A collection of many mangrove tree populations
- Mangrove ecosystem: Including flora and fauna associated with mangroves

3) Mangroves

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- Mangroves are a tropical species of trees or shrubs that have adapted to live in coastal regions. They grow on loose wet soil that is periodically flooded by salty seawater during high tides.
- There are about 54 species of mangroves in the world, and we have four of those types in the Caribbean: Red, Black, White, and Buttonwood mangroves. The bark of mangroves is used as a source of dyes, and as durable and water resistant wood. Black and Buttonwood mangroves are used in charcoal production.
- Mangrove fruits can be eaten, and the leaves can be consumed as tea and medicine.

3) Mangroves

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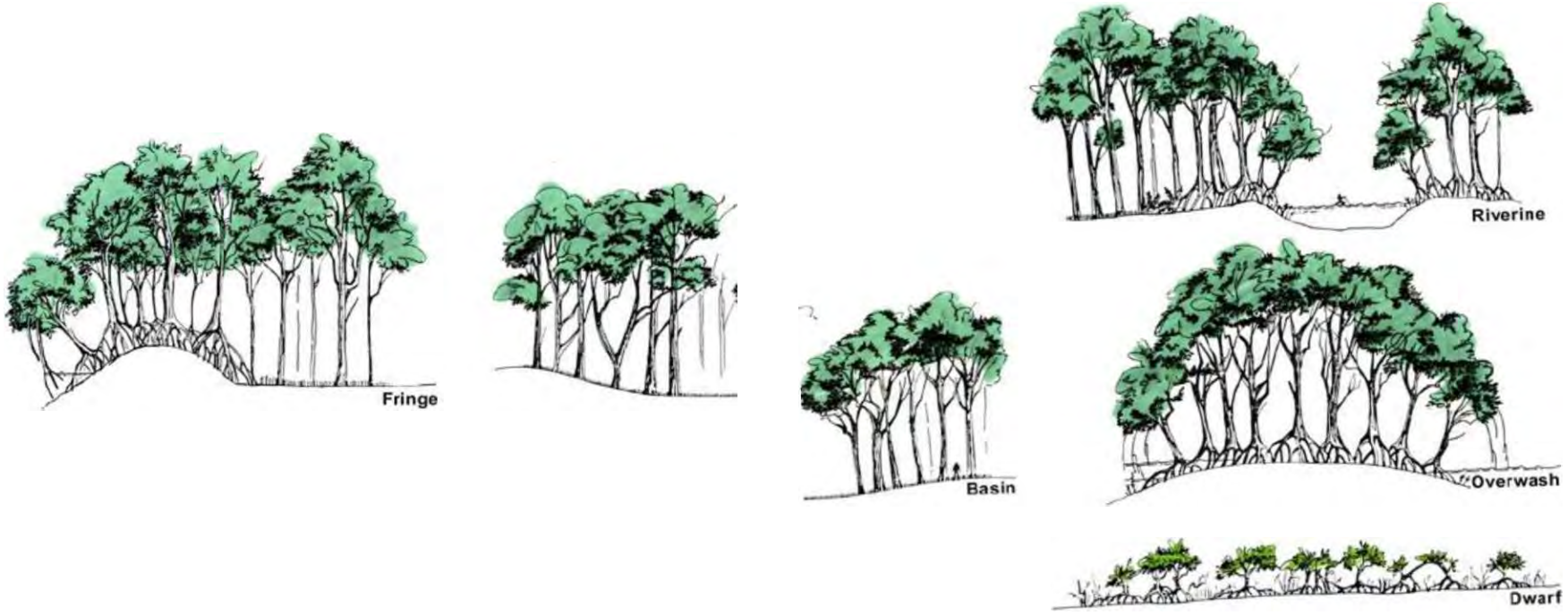
Basic information

Types of mangroves



Basic information

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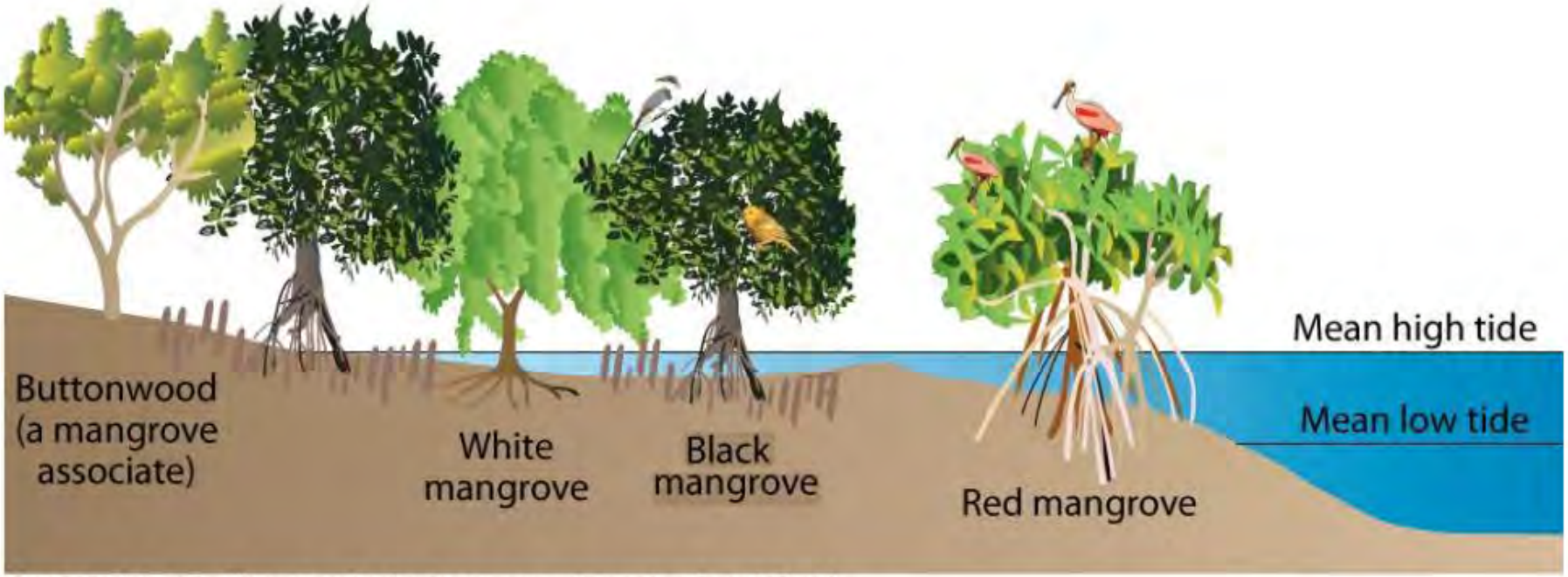
"Mangrove zonation" describes the order in which the four different types of mangroves are found on land. The red mangrove is closest to the water, while the buttonwood mangrove is found the farthest from the water (deeper inland). Their positions depend on land elevation, water and soil salt levels, and tidal changes.



Conceptual diagram illustrating the dominant mangrove species of south Florida.
Diagram courtesy of the Integration and Application Network (ian.umces.edu), University of Maryland Center for Environmental Science. Source: Kruczynski, W.L., and P.J. Fletcher (eds.). 2012. Tropical Connections: South Florida's marine environment. IAN Press, University of Maryland Center for Environmental Science, Cambridge, Maryland. 492 pp.

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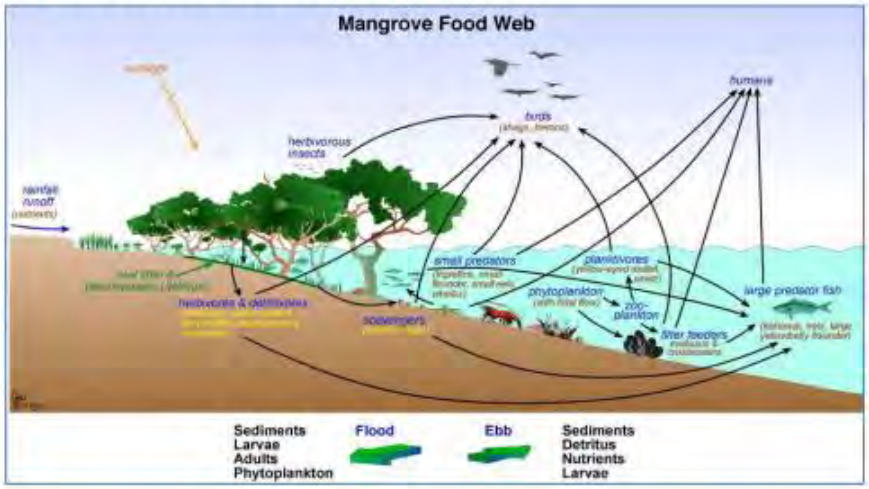
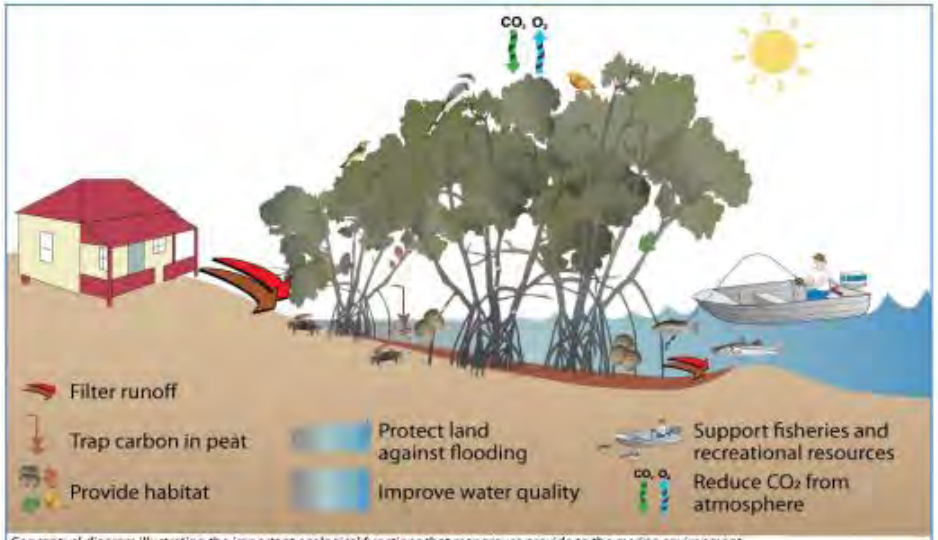
Importance of Mangroves





Conceptual diagram illustrating the important ecological functions that mangroves provide to the marine environment.
Diagram courtesy of the Integration and Application Network (ian.umces.edu), University of Maryland Center for Environmental Science. Source: Kruczynski, W.L., and P.J. Fletcher (eds.). 2012. Tropical Connections: South Florida's marine environment. IAN Press, University of Maryland Center for Environmental Science, Cambridge, Maryland. 492 pp.

- **Provide a physical habitat and nursery grounds for marine organisms**
  - These organisms have important recreational and commercial value
  - Mangroves are nurseries for shrimp, crabs, and fish
  - The roots protect organisms from predators
- **Serve as buffers for storms (and hurricanes)**
  - Mangroves reduce the damaging effects of storm winds and waves.
- **Protect shorelines from erosion**
  - Mangrove roots hold sediments and loose soil together. They stabilize the land
- **Provide roosting and nesting sites for many birds**
- **Improve water clarity and quality**
  - The tangled root systems filter runoff that may include pollutants. They trap sediments and debris from the land
- **Provide food for many marine organisms**
  - Fish like the snook, gray snapper, and the tarpon find food here
- **Trap and cycle organic materials, chemicals, and nutrients that sustain ecosystems**
- **Support endangered species**
  - The hawksbill and green sea turtle, for example
- **Used as a renewable resource**
  - As mentioned in the introduction

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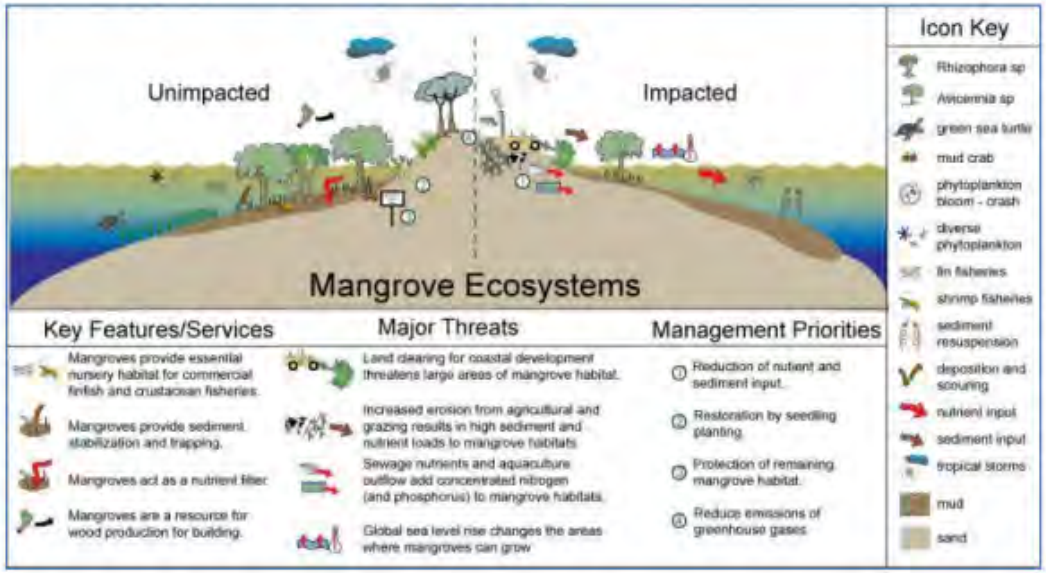
Damage to the Mangroves



- **Climate change**
  - Mangroves require a stable sea level to survive
  - Climate change causes sea levels to rise
- **Floods and Hurricanes**
  - Strong waves and currents prevents seedlings from taking root in the sediment and washes nutrients away
- **Wildlife, pests, and weeds**
  - Wildlife damage seedlings, leaves, flowers, roots, and propagules
  - Pests eat mangrove foliage and damage the wood
  - Weeds restrict the growth of mangroves

- **Tourism**
  - Visitors bring garbage, sewage, noise, fumes, lights, and other disturbances that put a stress on mangrove ecosystems
- **Coastal development**
  - Building of ports, docks, hotels, marinas, and human settlements pollute the water and mangrove forests
  - People involved in the construction bring traffic, garbage, and noise which put a stress on mangroves and their habitats
  - Deforestation increases erosion and the amount of sediments in the water, which affects mangroves' filtering ability
- **Agriculture**
  - Mangrove forests are being cleared to make way for rice paddies, rubber trees, palm oil plantations
  - Fertilizers, pesticides, waste, and other agricultural products block pneumatophores, chocking the mangroves
  - Natural flow of water to mangroves is disrupted by paving roads over waterways or diverting waterways for irrigation
- **Lumber industries**
  - Mangrove wood is harvested for building material, fencing, fuel, firewood, construction wood, and charcoal production
  - The problem is that the harvesting of wood is no longer sustainable
- **Shrimp farming**
  - Mangrove forests are being replaced by artificial shrimp farming ponds
  - Farmers divert water to their ponds, which reduces the amount of freshwater supplied to mangroves and makes it difficult for mangrove seeds to be dispersed

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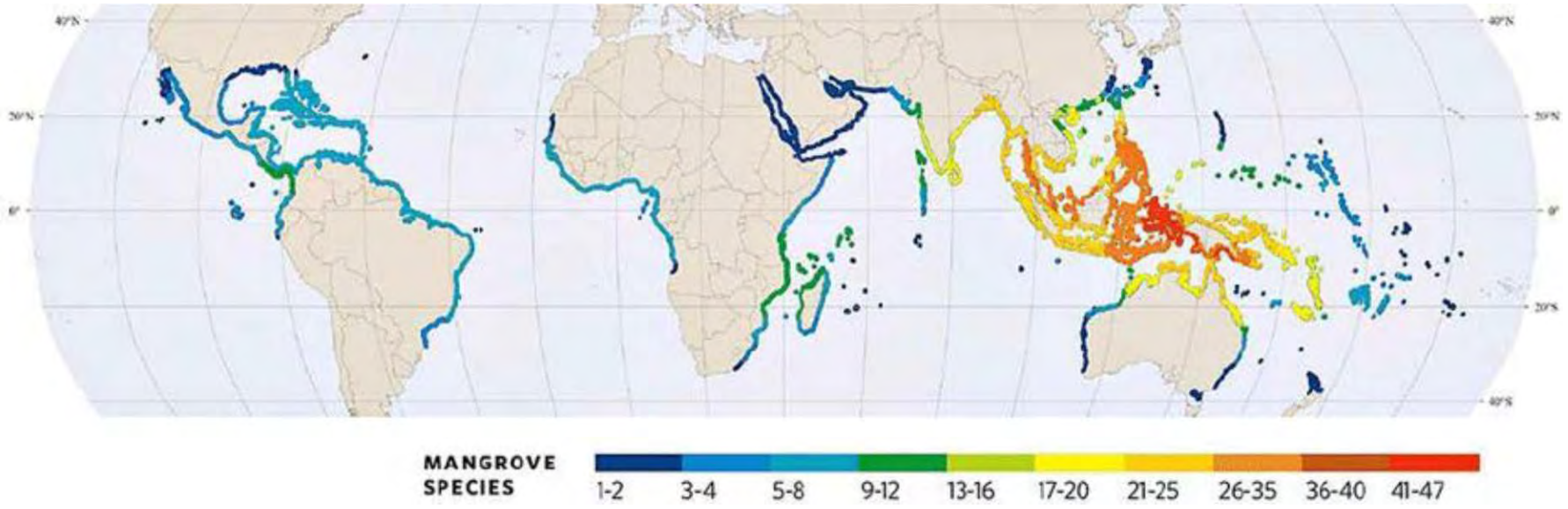
Distribution of mangroves in the world



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Area mangrove forest In the world

- Current area now: 145,494 km2 in 108 countrys
- - Failure reduce : 9,736 km2 from year 1996

Global mangrove losses and gains, 1996-2016, including annualised percentage change					
Variable	**1996**	**2007**	**2010**	**2016**	**1996-2016**
Extent (kilometer ^{2})	142.795	138,901	137,629	136.714	**-**
Losses (krr ^{2}>	-	5,969	**3,498**	3.057	**8,437**
Gains (kilometer ^{3})	-	2.074	2,227	2.142	2.356
% Change	-	-2.73	-0.92	-0.66	4.26
Annual % Change	-	-0.25	**-0.31**	-0.11	-0.21

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Area of mangroves in the world
Areas of decline, recovery

By region: global mangrove net losses and gains, 1996-2016, Including annualized percentage change

Region	1996 Area km ²	2016 Area km ²	Loss km²	Gain km²	% Change	Annual % Change
Australia & New Zealand	10,332	10,037	370	74	-2.86	-0.14
East & Southern Africa	7,630	7,329	424	122	-3.95	-0.2
East Asia	159	159	12	13	0.55	0.03
North & Central America & the Caribbean	22,702	21,072	2,196	566	-7.18	-0.36
Pacific Islands	6/410	6,327	146	63	-1.29	-0.06
South America	19,632	19,063	1,106	537	-2.9	-0.14
South Asia	8,701	8,492	435	226	-2.4	-0.12
South East Asia	46,789	44,060	3,308	579	-5.83	-0.29
The Middle East	334	319	19	4	-4.54	-0.23
West & Central Africa	20,107	19,857	422	171	-1.24	-0.06
Total km ²	142.795	136.714	8,437	2,356	-4.26	-0.21

Mangroves in Vietnam

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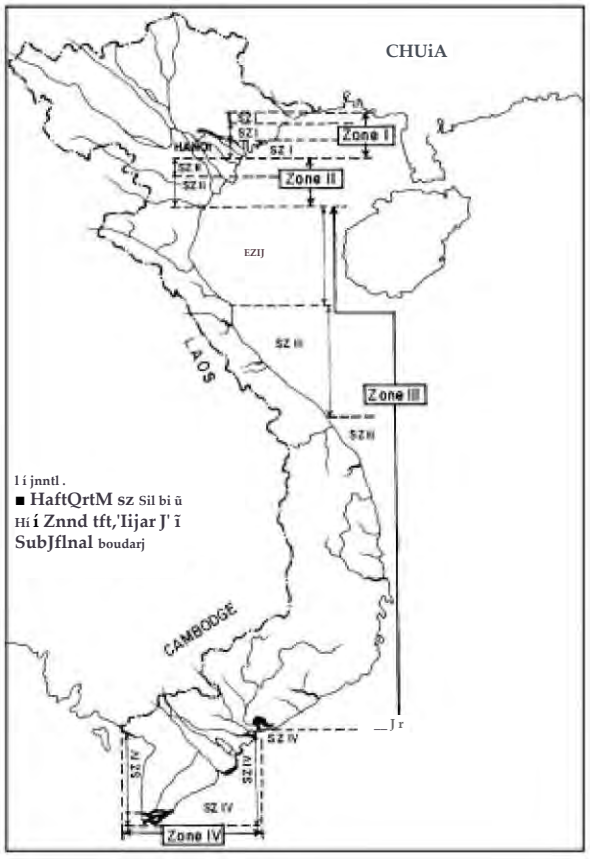

Divided into 4 regions:

I. Mui Ngoc-Do Son
II. II. Along the coast of the Northern Delta, from Do Son cape to Lach Truong estuary
III. III. Central Coast from Lach Truong estuary to Vung Tau cape
IV. IV. South Coast, from Vung Tau cape to Ha Tien

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Distribution of Mangrove Forest in Viet Nam