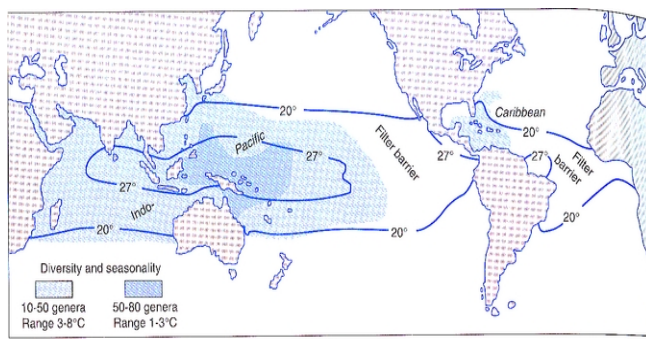


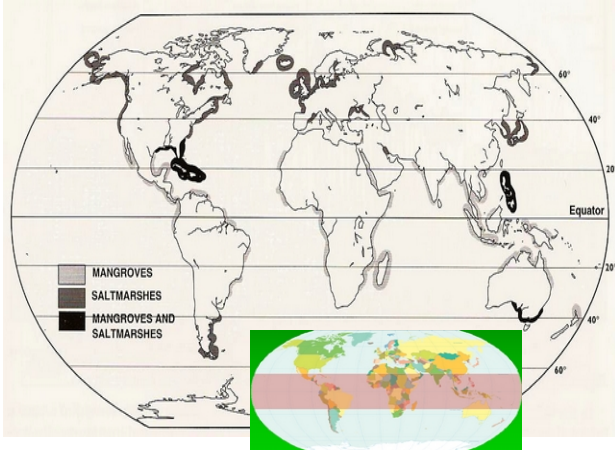
Coral reefs & mangroves

2019/2020

- ▶ Geographical distribution r&m_2
- ▶ Environmental factors
- ▶ Organisms
- ▶ Structure of the ecosystem
- ▶ Productivity
- ▶ Threats



r&m_4

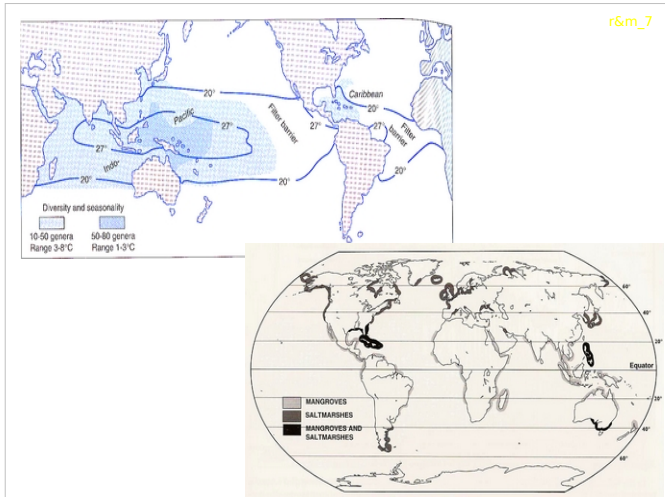


- r&m_5
- ▶ Geographical distribution
 - ▶ Environmental factors
 - ▶ Organisms
 - ▶ Structure of the ecosystem
 - ▶ Productivity
 - ▶ Threats

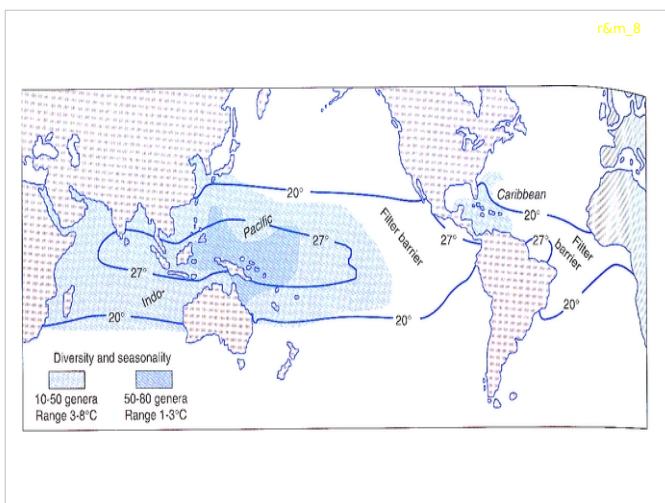
r&m_6

- ▶ temperature
- ▶ light
- ▶ substratum
- ▶ access to water
- ▶ salinity
- ▶ nutrient availability
- ▶ oxygen availability

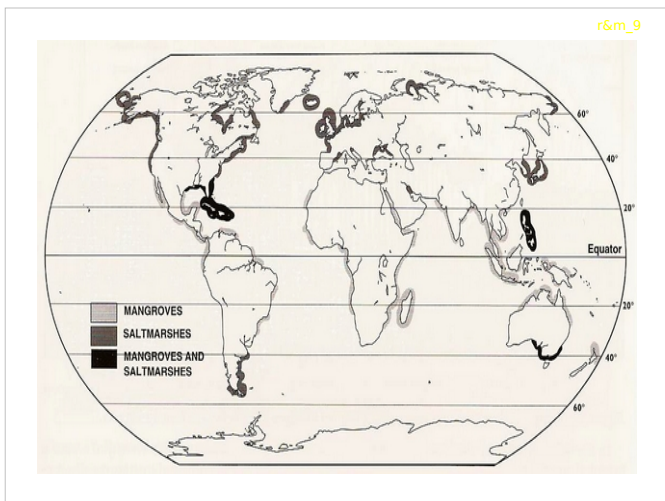
r&m_7



r&m_8



r&m_9



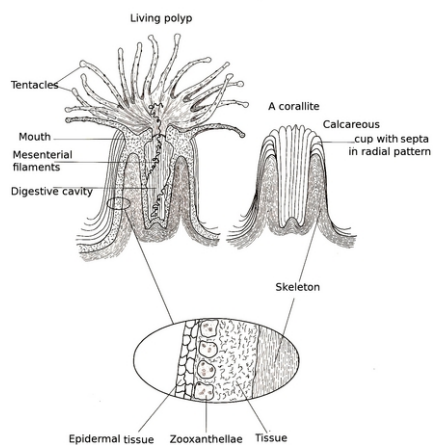
r&m_10

- ▶ Distribution
- ▶ Environmental factors
- ▶ **Organisms**
- ▶ Structure of the ecosystem
- ▶ Productivity
- ▶ Threats

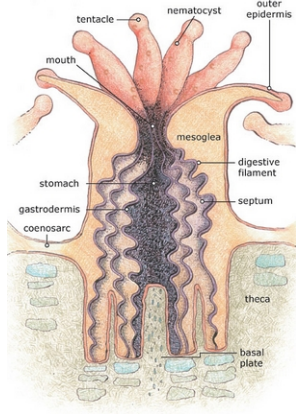
r&m_11

reef organisms

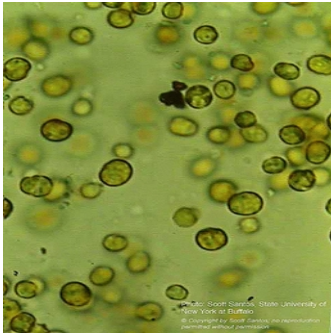
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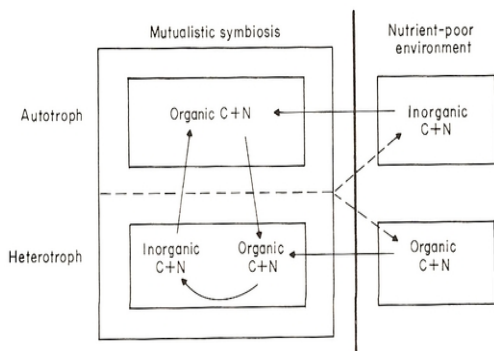
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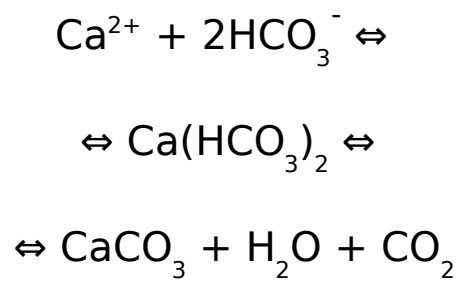
r&m_14



r&m_15



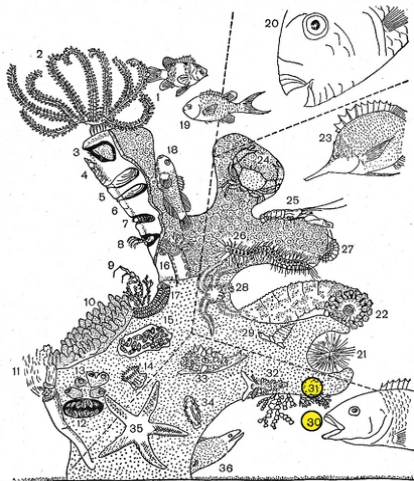
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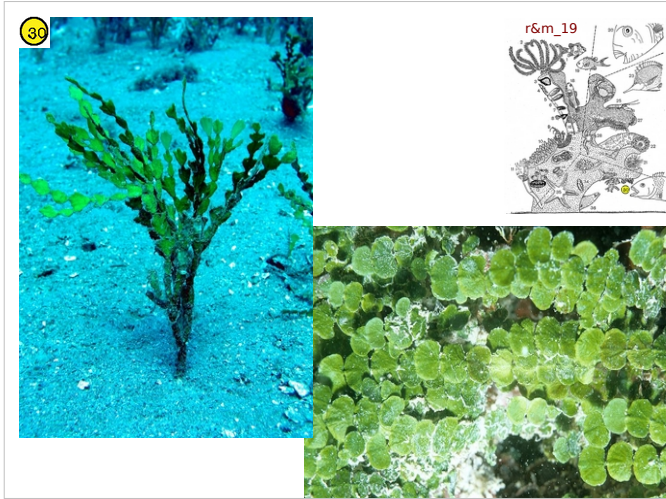


r&m_17



r&m_18





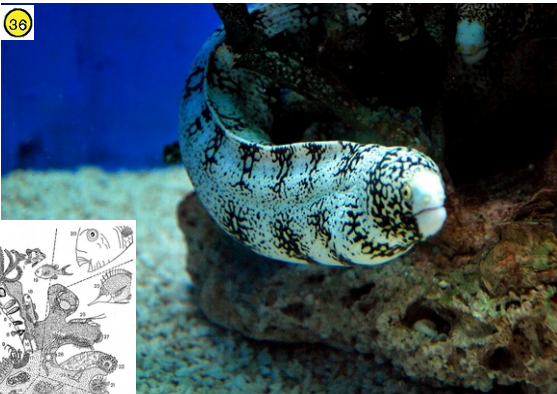
r&m_22



23



r&m_23



36



r&m_24



1



r&m_25

18



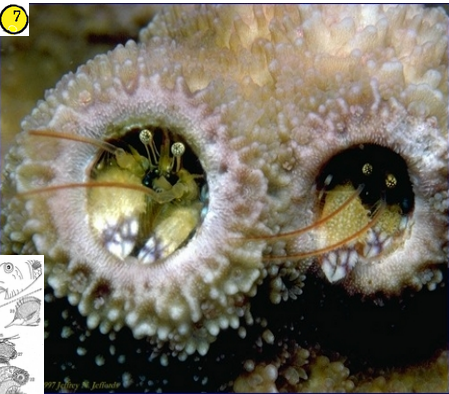
r&m_26

19



r&m_27

7



r&m_28



r&m_29



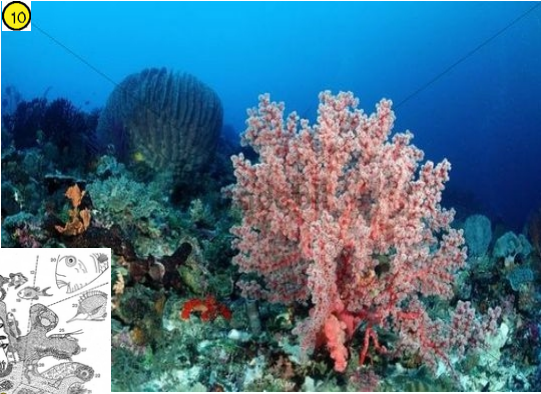
r&m_30



r&m_31



r&m_32



r&m_33



r&m_34



<http://reefguide.org>



r&m_35



<http://kosreevillage.com/blog/>



r&m_36



r&m_37

<http://reefguide.org/clavelinarobusta.html>

15



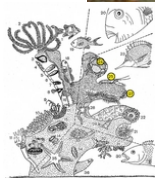
r&m_38

16

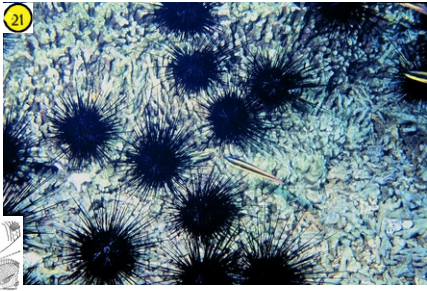


r&m_39

25



r&m_40



www.columbia.edu/itc/eeeb/baker/



r&m_41



www.fishchannel.com/images



r&m_42



r&m_43



r&m_44



r&m_45



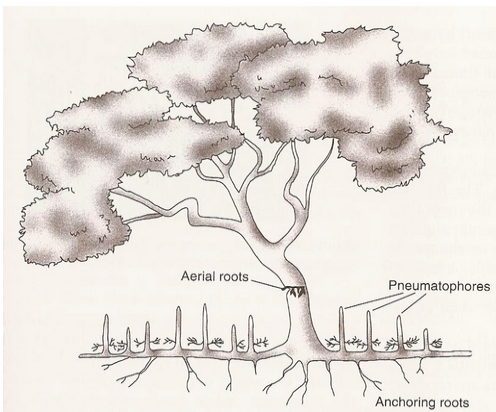
r&m_46



r&m_47

mangrove organisms

r&m_48



r&m_49

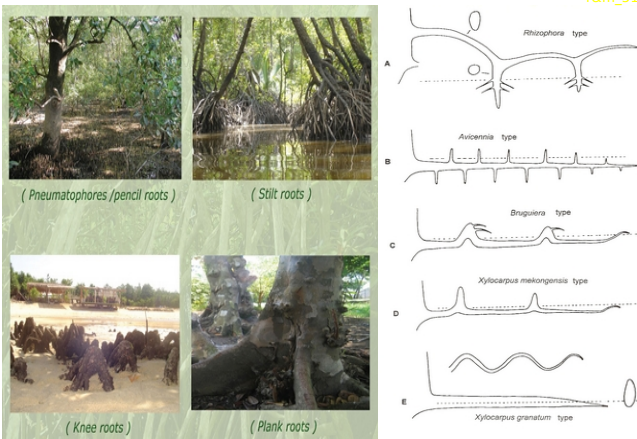
Family	Genus	Number of species
Major components		
Avicenniaceae	<i>Avicennia</i>	8
Combretaceae	<i>Laguncularia</i>	1
	<i>Lumnitzera</i>	2
Palmae	<i>Nypa</i>	1
Rhizophoraceae	<i>Bruguiera</i>	6
	<i>Ceriops</i>	2
	<i>Kandelia</i>	1
	<i>Rhizophora</i>	8
Sonneratiaceae	<i>Sonneratia</i>	5
Minor components		
Bombacaceae	<i>Camptostemon</i>	2
Euphorbiaceae	<i>Excoecaria</i>	2
Lythraceae	<i>Pemphis</i>	1
Meliaceae	<i>Xylocarpus</i>	2
Myrsinaceae	<i>Aegiceras</i>	2
Myrtaceae	<i>Osbornia</i>	1
Pelliceraceae	<i>Pellciera</i>	1
Plumbaginaceae	<i>Aegialitis</i>	2
Pteridaceae	<i>Acrostichum</i>	3
Rubiaceae	<i>Scyphiphora</i>	1
Sterculiaceae	<i>Heritiera</i>	3

r&m_50

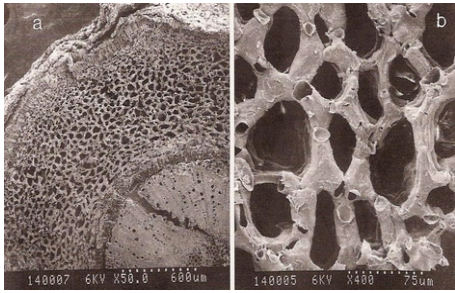
some of
**MAJOR
COMPONENTS**



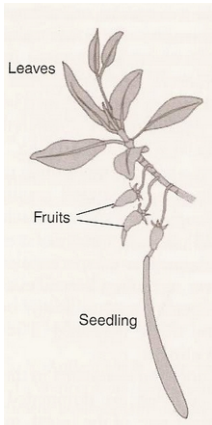
r&m_51



r&m_52



r&m_53

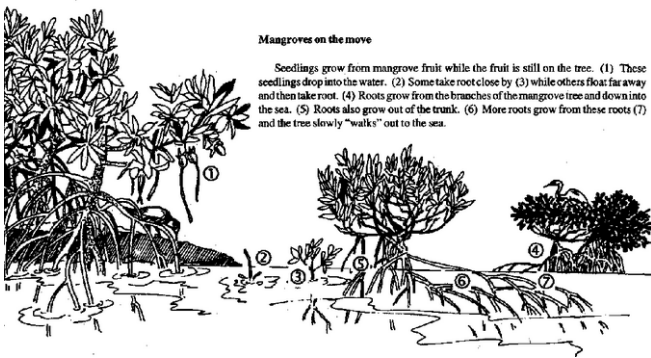


r&m_54

How mangroves propagate

Mangroves on the move

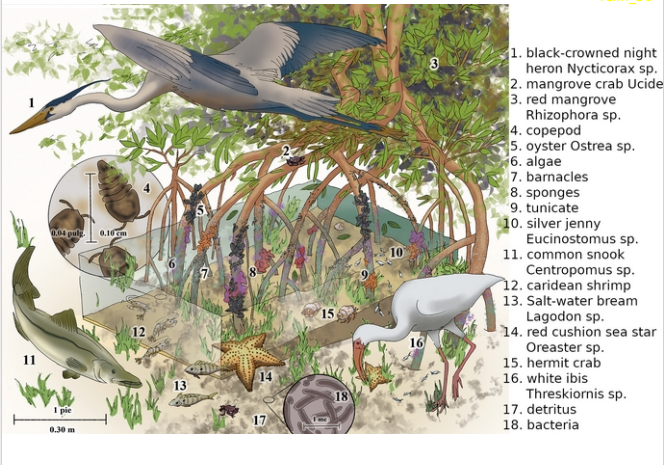
Seedlings grow from mangrove fruit while the fruit is still on the tree. (1) These seedlings drop into the water. (2) Some take root close by (3) while others float far away and then take root. (4) Roots grow from the branches of the mangrove tree and down into the sea. (5) Roots also grow out of the trunk. (6) More roots grow from these roots (7) and the tree slowly "walks" out to the sea.



r&m_55



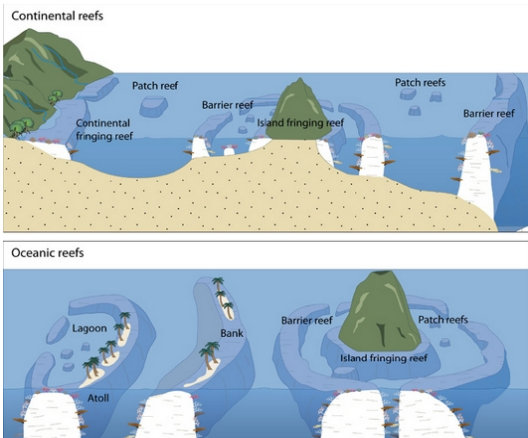
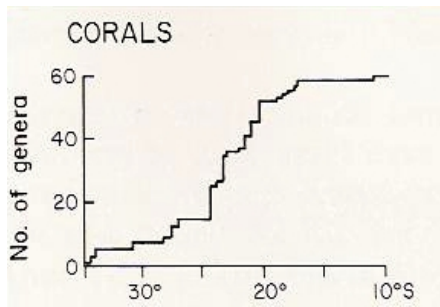
r&m_56

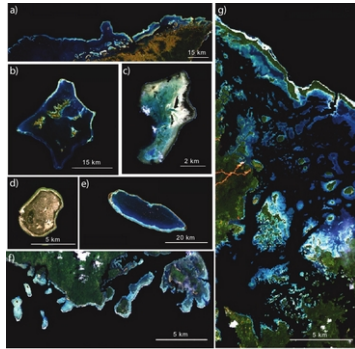


r&m_57

- ▶ Distribution
- ▶ Environmental factors
- ▶ Organisms
- ▶ Structure of the ecosystem
- ▶ Productivity
- ▶ Threats

reef structure





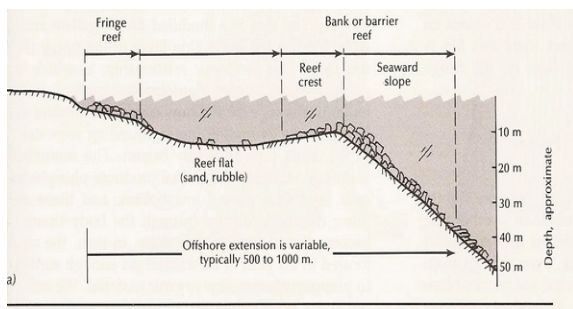
r&m_61

Examples of the main coral reef types in the tropical Pacific Ocean: (a) continental barrier reef, protecting lagoonal patch and fringing reefs; (b) oceanic barrier reef surrounding a lagoon with fringing and patch reefs; (c) oceanic reef island bank; (d) oceanic atoll that has been uplifted with a narrow fringing reef; (e) closed oceanic atoll; (f) fringing and patch reefs around an oceanic island; (g) lagoonal patch and fringing reefs.

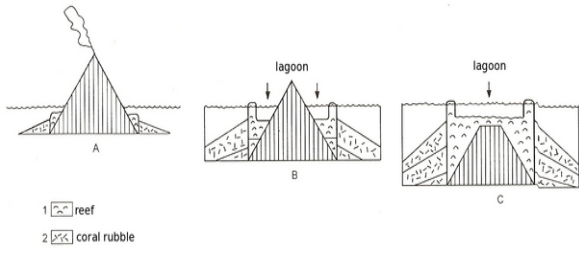
r&m_62



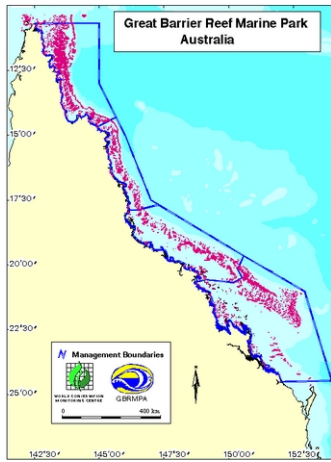
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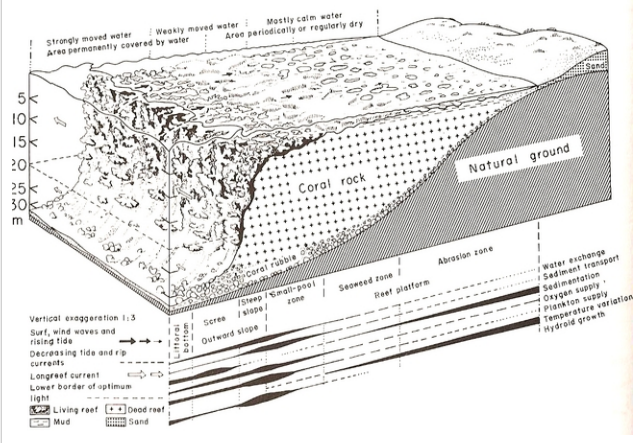
r&m_64



r&m_65



r&m_66



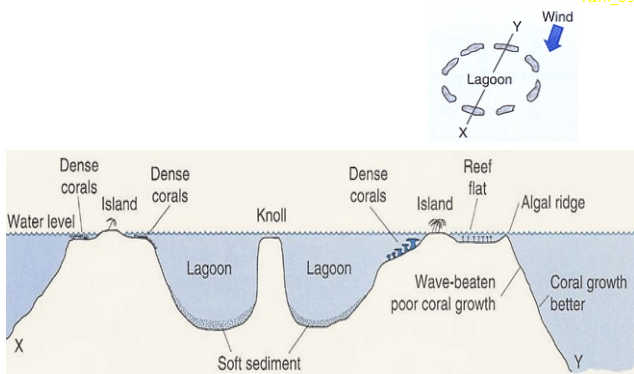
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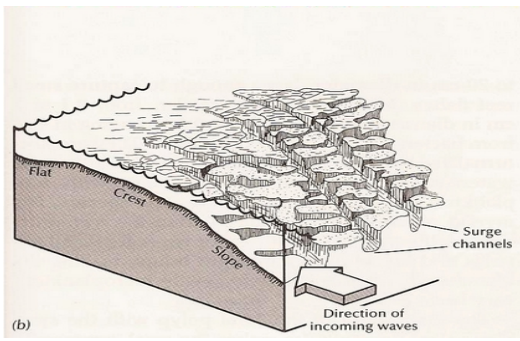
r&m_68



r&m_69



r&m_70



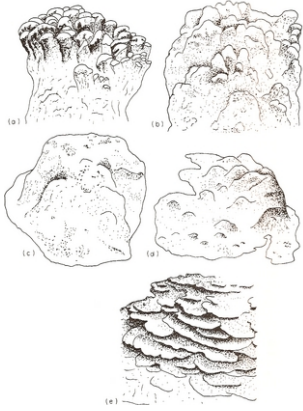
r&m_71



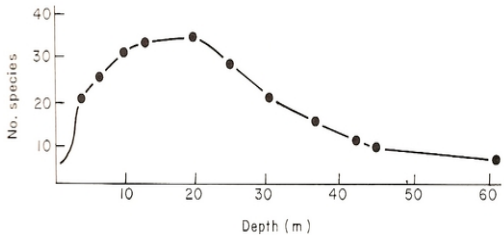
r&m_72



r&m_73



r&m_74

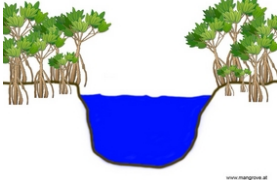
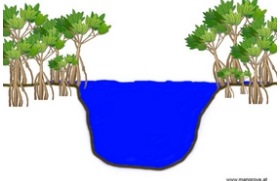


r&m_75

mangrove structure

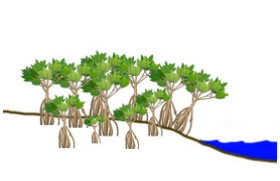
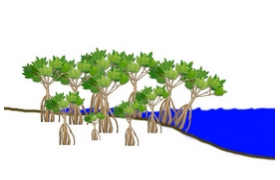
riverine

r&m_76



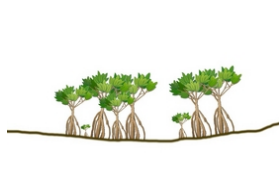
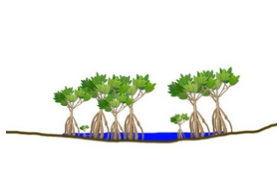
tide-dominated (fringe)

r&m_77



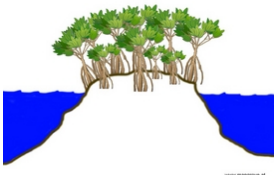
basin

r&m_78



overwashed

r&m_79



www.mangrove.nl

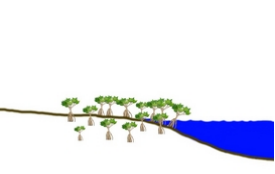


www.mangrove.nl

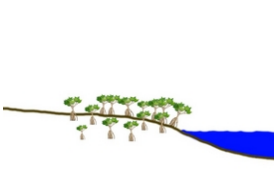


dwarf

r&m_80



www.mangrove.nl

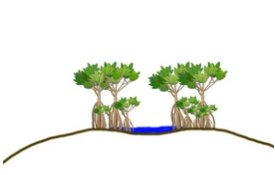


www.mangrove.nl

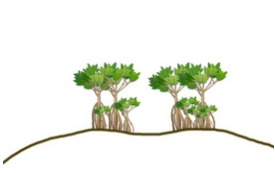


hammock

r&m_81



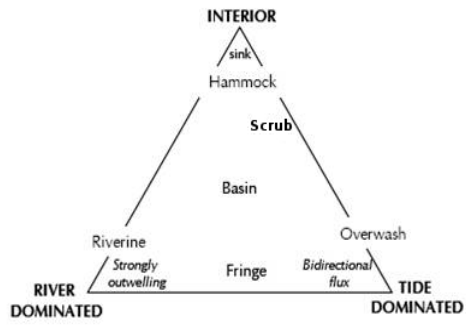
www.mangrove.nl



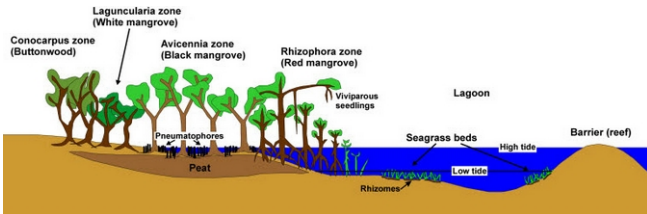
www.mangrove.nl



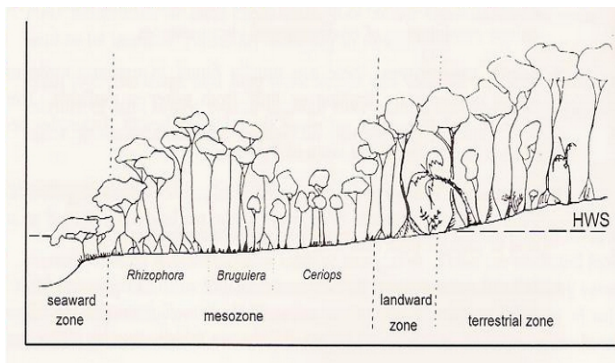
r&m_82



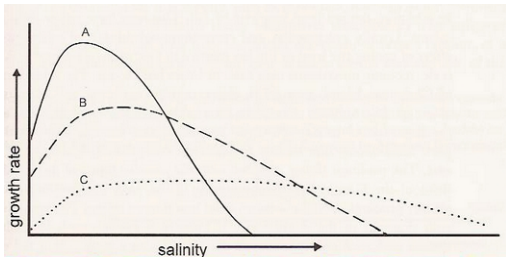
r&m_83



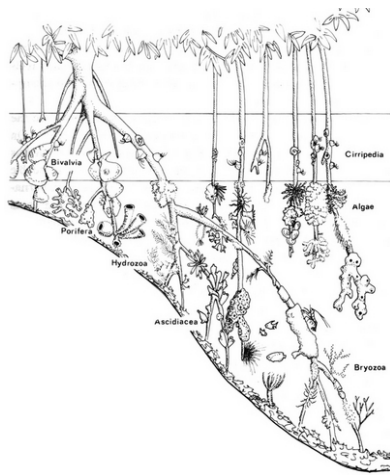
r&m_84



r&m_88



r&m_89



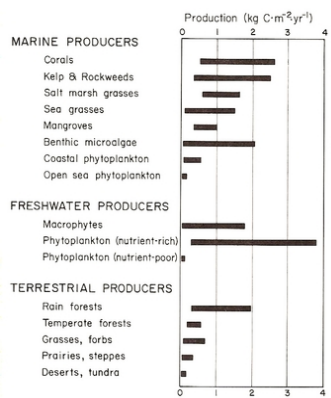
r&m_90

- ▶ Distribution
- ▶ Environmental factors
- ▶ Organisms
- ▶ Structure of the ecosystem
- ▶ **Productivity**
- ▶ Threats

r&m_91



r&m_92



r&m_93

production at a Caribbean reef
[$\text{g C m}^{-2} \text{yr}^{-1}$]

corals 630.

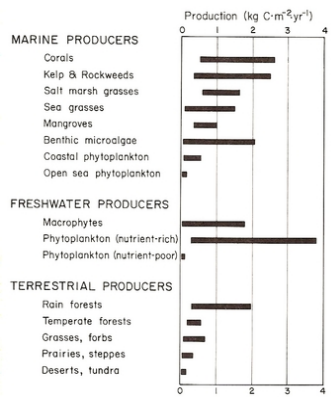
brown algae 1170.

filamentous algae 700.

r&m_94

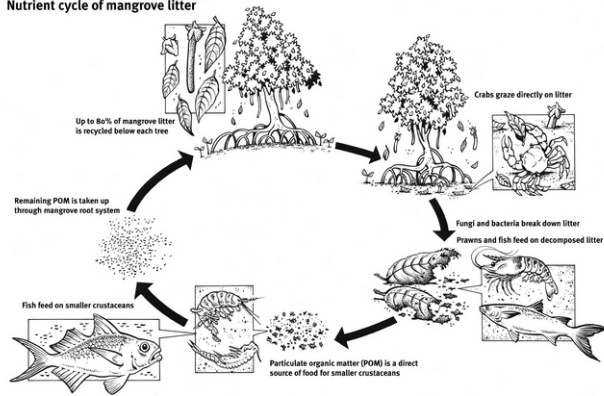


r&m_95

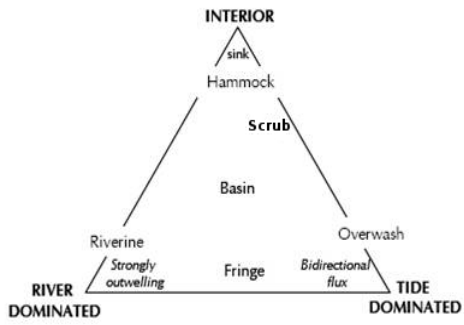


r&m_96

Nutrient cycle of mangrove litter



r&m_97

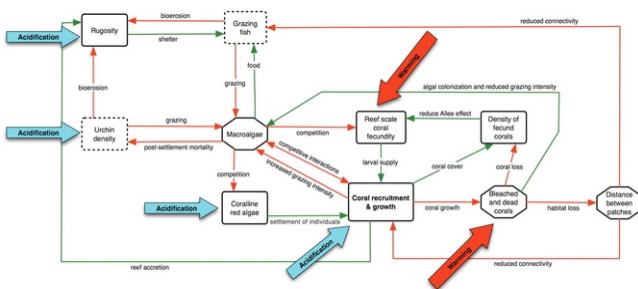


r&m_98

- ▶ Distribution
- ▶ Environmental factors
- ▶ Organisms
- ▶ Structure of the ecosystem
- ▶ Productivity
- ▶ Threats

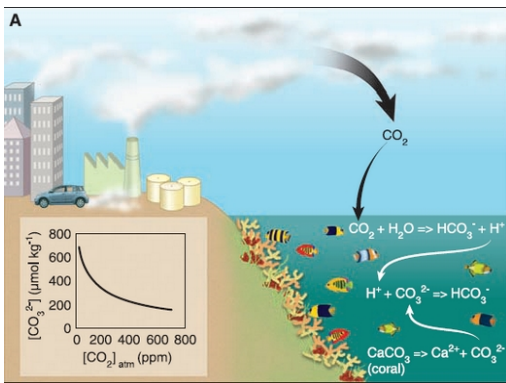
r&m_99

acidification & warming



Acidification

r&m_100



Acidification

r&m_101

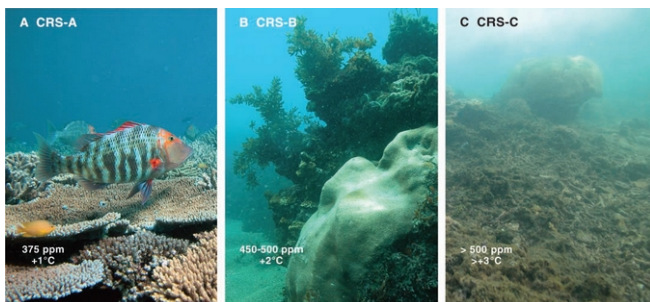
Possible coral responses

- decreased linear extension rate and skeletal density of coral colonies.
- maintaining physical extension or growth rate by reducing skeletal density.
- maintaining skeletal growth and density by investing greater energy in calcification.

Acidification

r&m_102

Possible scenarios



r&m_103

CORAL BLEACHING

Have you ever wondered how a coral becomes bleached?

HEALTHY CORAL

1 Coral and algae depend on each other to survive.



Coral has a symbiotic relationship with microscopic algae called zooxanthellae that live in their tissues. These algae are the coral's primary food source and give them their color.

STRESSED CORAL

2 If stressed, algae leaves the coral.



When the symbiotic relationship becomes stressed due to increasing ocean temperatures or pollution, the algae leave the coral's tissue.

BLEACHED CORAL

3 Corals left bleached and vulnerable.



Without the algae, the coral loses its major source of food, turns white or very pale, and is more susceptible to disease.

WHAT CAUSES CORAL BLEACHING?

Change in ocean temperature
Increased ocean temperatures caused by climate change is the leading cause of coral bleaching.

Runoff and pollution
Storm-generated precipitation can wash clean water and runoff can carry pollutants — these can bleach near shore corals.

Overexposure to sunlight
When temperatures are high, high solar radiation contributes to bleaching in shallow-water corals.

Extreme low tides
Exposure to air during extreme low tides can cause bleaching in shallow corals.



Coral bleaching – causes

r&m_104

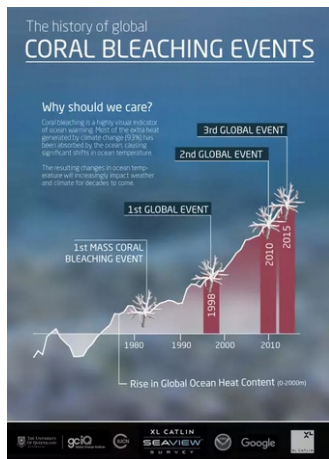
- increased, or reduced water temperatures
- oxygen starvation caused by an increase in zooplankton levels as a result of overfishing
- increased solar irradiance
- increased sedimentation (due to silt runoff)
- bacterial infections
- changes in salinity
- herbicides
- low tide and exposure to air
- cyanide fishing

r&m_105

	GROWTH FORM	CORAL FAMILY	EXAMPLES
LOW	Fine branching	Pocilloporidae	<i>Seriatopora</i> <i>Stryllophora</i> <i>Pocillopora</i>
	Branching, tabulate, encrusting/foliose	Acroporidae	<i>Acropora</i> <i>Montipora</i>
MEDIUM	Massive, brain	Favidae	<i>Favia</i> <i>Favites</i> <i>Leptocoria</i> <i>Goniastrea</i> <i>Platygyra</i>
	Massive, boulder	Poritidae	<i>Porites</i> <i>Goniopora</i>
HIGH	Various	Various	<i>Turbinaria</i> <i>Cyphastrea</i>

A generalised hierarchy of coral susceptibility to bleaching

r&m_106



r&m_107

Topic for discussion:

*Ecosystem services
provided by, and
threats to the mangroves*