



MANGROVE

The guardians of our
coastline

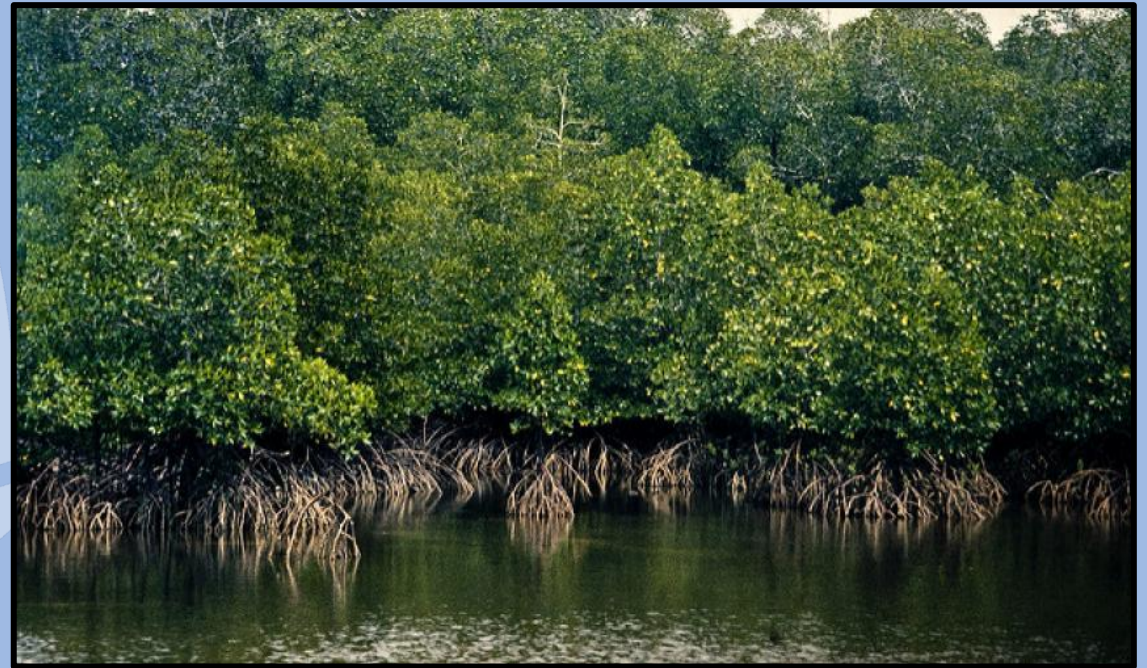
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WHAT IS "MANGROVE?"

- Mangrove commonly refers to two different things: a tidal swamp ecosystem found in coastal environments, and the classic mangrove tree that populates these ecosystems.
- Due to their sensitivity to cold, mangroves are restricted to the tropics and subtropics.
- Primarily found in two areas: The Indo West Pacific and Atlantic East Pacific



(IUCN, 2017)

LIVING IN A SALTY WORLD

Unique environment that links both freshwater and oceanic ecosystems.

Developed adaptations to help survive coastal environments.

- Survives high salinity by excreting salt through their leaves or safely keeping it within their tissues.
- Shallow root systems partly exposed to air allows them to breath in an environment that's often flooded and low in oxygen



(Global Environment Facility, 2017)

BIOLOGY OF MANGROVE ECOSYSTEMS

- Areas of incredible biodiversity, includes algae, molluscs, crustacean, fish, insects, reptiles, birds and mammal species.
- The intricate nature of the roots provides adequate shelter for many marine species.
- Popular nursing ground for fish – one third of all marine species are born in mangrove environments.



(Norbert Wu, 2019)



CERULEAN KINGFISHER
Alcedo Coerulescens



STRIATED HERON
Butorides striata



LEMON BELLED WHITE EYE
Zosterops chloris



ASIAN WATER MONITOR
Varanus salvator



BARRED MUDSKIPPER
Periophthalmus argentilineatus



FIDDLER CRAB
Ocypodidae

WHY ARE MANGROVES IMPORTANT?

Mangroves provide vital ecosystem services to people

- Helps reduce damage during increasingly frequent tropical storms: offers an obstacle to wind and waves – a mangrove section of 30 trees per 0.01 hectare with a width of 100 can reduce the destructive force of a tsunami by 90%
- When a mangrove tree grows it stores carbon in it's biomass which decreases the amount of carbon dioxide in the atmosphere. Can store up to 5x more than an equal area of rainforest.



(Ecologic, 2019)

HUMAN USES

- Most direct resource is wood – relatively quick growing – used as fuel or a construction material.
- Corks and floats
- Dyes, soap alternatives, cosmetics
- Synthetic fibers.
- Food in the form of honey, fruit, vinegar, salt or cooking oil.
- Several species have medicinal properties
- Improves the health of local fisheries



(Amazon.com, 2019)



(ICUN 2016)

MANGROVES AROUND NUSA CENINGAN AND NUSA LEMBONGAN



(Tim Birkett, 2019)

CeninganDivers

SPECIES OF MANGROVE FOUND ON THE ISLAND



Sonneratia alba



Rhizophora mucronata

PROBLEMS FACING MANGROVE

Mangroves are being lost quicker than inland tropical rainforests.

- Sea level rise, sediment imbalance inhibits growth/recovery of mangrove and also can kill mangrove.
- Human induced thermal, nutrient, agrochemical, heavy metal and oil spill pollution.
- Coastal erosion
- Deforestation and coastal development is the largest growing threat.
- Intensified shrimp farming activities



(Joe Hughes, 2019)

SPOTLIGHT ON BENOA BAY DEVELOPMENT

The Benoa Bay development is a controversial plan to add artificial islands with developments on to a bay area just outside a large mangrove area and is one of the biggest threats to mangroves in Bali.

It is believed by conservationists ecologists that this will damage the mangrove area and be detrimental to local fisheries.

The original planning permission expired 2018 but no protection is in place



(Wira Suryantala, 2018)



(FORBali, 2018)

Rencana Pembangunan Kawasan Teluk Benoa

1. Pusat Budaya Bali dan Eksibisi
2. Pusat perdagangan produk bali dan nasional ke seluruh dunia
3. Pusat Konvensi dan Selebrasi Dunia
4. Botanical garden
5. Eco park dan Eco resort
6. Fasilitas Umum dan Sosial
7. Infrastruktur Jalan Alternatif dari Timur ke Barat
8. Taman rekreasi berkelas dunia
9. Kawasan water & waste management, green energy development
10. Ikon Bangunan
11. Ikon Jembatan
12. Pusat Akomodasi Pariwisata Dunia
13. Sarana Pelabuhan untuk yacht dan wisata laut
14. Pusat komersil
15. Pengembangan lain yang bermanfaat bagi masyarakat Bali



MANGROVE RESTORATION PROJECT

- It is easier to reintroduce mangrove to an area than it is to introduce it.
- Care needs to be taken to understand why the mangrove was destroyed in the first place – how can you ensure that the mangroves you plant will not just die again?
- Important to grow species native to the area
- Adhere to the ecological principles – mangroves are easy to plant but understand their environmental requirements.



(Nelleke de Weerd, 2019)

MANGROVE RESTORATION PROJECT

We have our own mangrove nursery at the resort!

The structure is a repurposed jungle gym, the “plant pots” are bottles found during our weekly clean up – Trash Hero - and the water to nourish the propagules is taken directly from the ocean.

The propagules themselves are taken from along the shore so they are native species of mangrove.



(Nelleke de Weerd, 2019)



7 THINGS DIVERS MUST DO



Respect marine life & shoot photos without disturbing the environment

Support conservation & champion Green Fins

Practice buoyancy control & photography skills

Ensure all equipment is secured & do not drag over reefs

Practice advanced finning techniques

Only touch rock or dead coral if necessary

Avoid stirring up sediment by keeping your distance

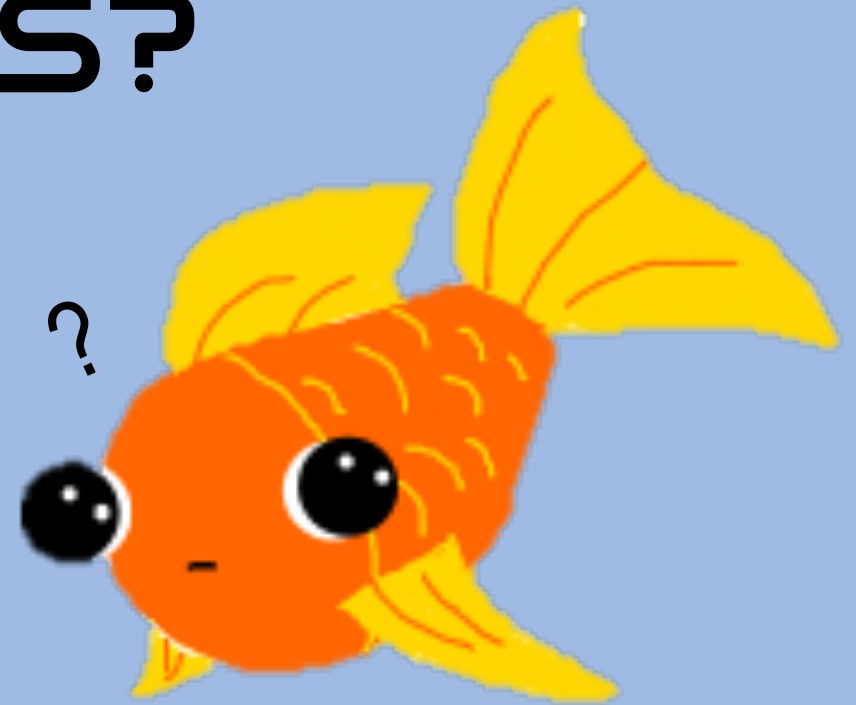
7 THINGS DIVERS MUST NOT DO X



WANT TO FIND OUT MORE?

- <http://fpmbali.org/en/mangrove/bali>
- <https://www.thegef.org/news/mangroves-spotlight>
- <https://oceanservice.noaa.gov/facts/mangroves.html>
- <https://www.conservation.org/stories/11-facts-you-need-to-know-about-mangroves>
- <https://www.iucn.org/theme/forests/our-work/forest-landscape-restoration/mangrove-restoration>
- <https://www.iucn.org/news/forests/201707/mangroves-make-great-conservation-allies>

ANY QUESTIONS?



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