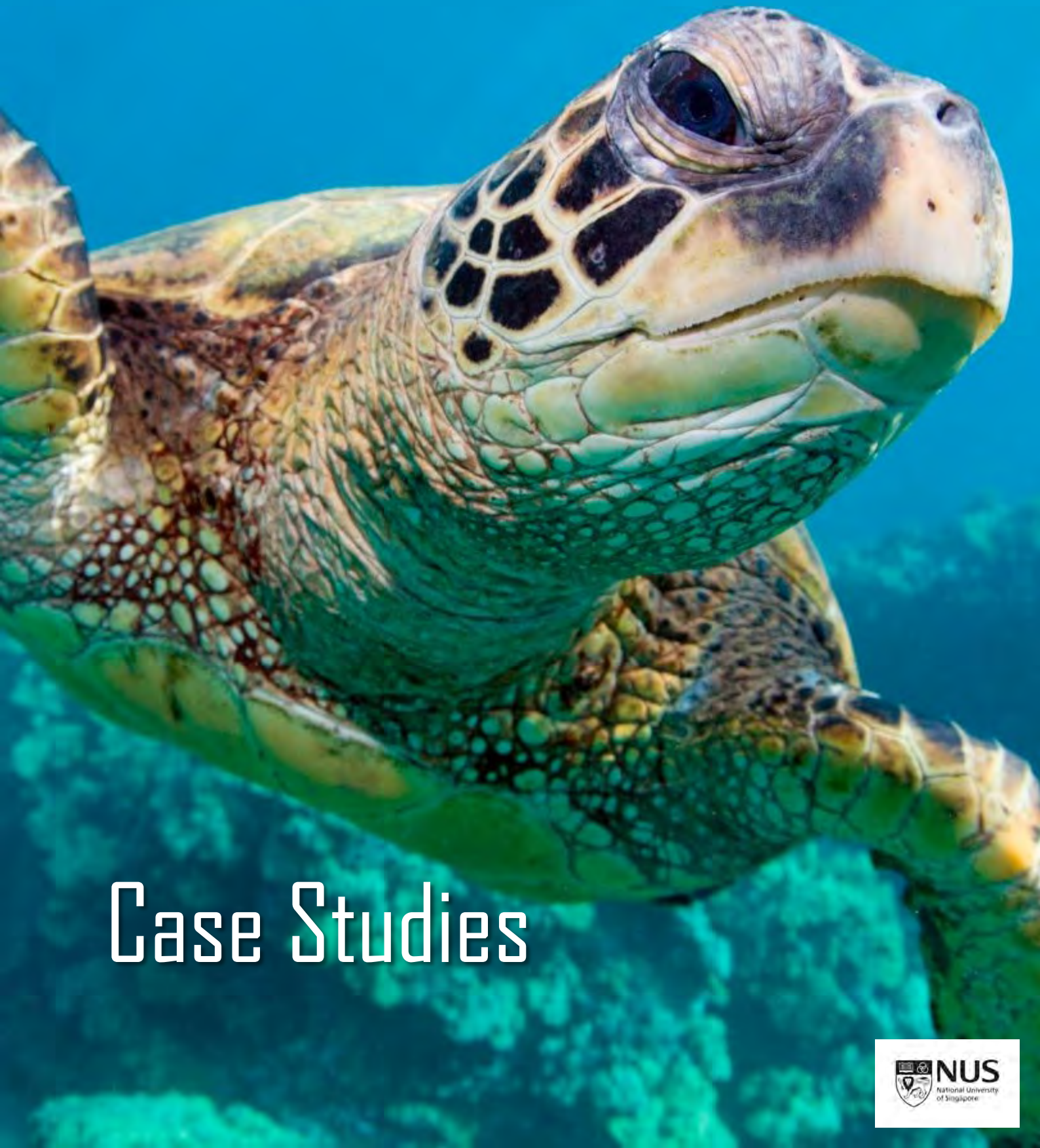


Tropical Conservation Biology

Semester I, AY24/25

LSM4262



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SCARLET MACAWS OF CENTRAL AMERICA



THE PROBLEM FACING THE SCARLET MACAW SUBSPECIES

Morphological and genetic analysis shows there are two subspecies of the scarlet macaw. Although the species as a whole is listed as **Least Concern** on the IUCN Redlist, the conservation status of *A. macao cyanoptera* (the Central American subspecies) is dire in its indigenous range. The subspecies is listed on Appendix I of CITES because it is threatened with extinction due to illegal traffic.



Although macaws, as with most threatened species, are affected by habitat loss as rainforests continue to shrink, these colourful creatures also face the threat of poaching to be sold in the illegal wildlife trade. They are highly social, intelligent and can mimic human voices, making parrots the most popular pet birds on Earth. Scarlet macaws are also monogamous and often return to the same nesting sites year after year, which makes them an easier targets for poachers to snatch chicks from nests.

THE STAKEHOLDERS

Often locals who are trying to make a living, and selling wild-caught macaw babies is an easy way to make a lot of money.

Poachers



Government



Responsible for legislation that can mandate the protection of the scarlet macaws and punish poachers.

VS

Organizations or individuals that prioritize the preservation of the species in its natural habitat.



Conservationists



Buyers

Those that provide the demand and incentive for poachers to harm wild populations.

WHAT IS THE SOLUTION TO POACHING?

Natura y Ecosistemas Mexicanos (NEM) is an organisation that runs the Scarlet Macaw Protection, Conservation and Reintegration Program.

Local landowners and NEM keep track of nesting sites and report when there is a family inside.



If nests are considered high risk

- Previously raided
- Has poacher-built infrastructure



Babies are rescued before being stolen by poachers

- Less dangerous than confronting poachers
- Less labour intensive than guarding nests

HOW ARE THE MACAWS REINTRODUCED INTO THE WILD?

Reintroduction

Intentional movement and release of the organism inside the indigenous range

Reinforcement

Intentional movement and release of the organism inside the indigenous range

Release procedures as described by (Estrada, 2014) in the tropical rainforests of Palenque, Mexico

1. **Selection of Macaws** (Genetic diversity, young individuals, balanced sex ratio, breeding age, mating pairs)
2. **Soft-Release Protocol** (Social integration, physical condition, recognition of wild foods, nest boxes, predator and human aversion)
3. **Release mechanisms** (Weather conditions, inner/outer gates, veteran macaw recruitment)
4. **Post Release monitoring** (Microchip/leg band, radio collar tagging, ground/aerial surveying, artificial nests)






GOALS OF REINTRODUCTION

1. Recovery of species
2. Local & regional biodiversity conservation
3. Umbrella effect: the restoration of a fruit and seed eating avian species leading to ecosystem stability
4. Establishment of strong genetic pool
5. Population mixing - strong families

HARMONISING MACAWS AND PEOPLE

Conservation measures are ultimately futile if they are not accepted and integrated into the livelihoods of local communities. Can we create societies that treasure macaws?

-  **Paid community patrols of macaw nests**
-  **Ex-poachers rehired as artificial nest builders**
-  **Education and outreach with children**
-  **Raising buyer's awareness**

"Conservation is a state of harmony between man and nature"

-Aldo Leopold

Honoring scarlet macaws at the the popular celebration 'Los Viejos de Catemaco', Veracruz. Photograph credits: Escalante-Pliego et al. 2019



Global demand from the pet trade remains the biggest threat to these animals. Spread awareness by talking about this issue wherever you can, be it amongst friends or family - **don't buy wild!**





The Importance of PROTECTING THE ELEPHANTS



Southern Africa is facing its worst drought in 100 years, and to curb the issue of food security, governments have decided to cull elephants. But is this justified?



THE ISSUE AT HAND

1 in 3 persons in the region is malnourished.

Drought further dropped crop and livestock production, affecting tens of millions of people.

Zimbabwe declared national disaster in April and Namibia declared a state of emergency in May.



Namibia and Zimbabwe are planning to cull 83 and 200 elephants respectively to feed communities and alleviate impacts of drought.

HOWEVER, ELEPHANTS ARE IMPORTANT TO THE ENVIRONMENT

Ecosystem Engineers:

Create and influence habitats for other animals and plants



Flagship species:

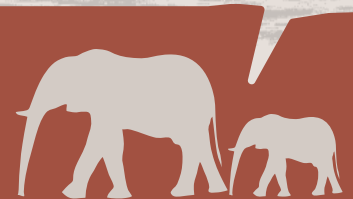
Charismatic representatives of the biodiversity within the complex ecosystems they inhabit



This is us!

WHO IS INVOLVED?

Each stakeholder involved has their own goals and challenges



Non-governmental Organisations

Goal: Protect the Elephants, Provide alternatives

Challenges Faced:

- Limited Funding, limited conservation
- Social and political challenges
- Difficulties in gaining support from local community



Governments

Goal: Boost the Economy, Support the people

Challenges Faced:

- Food and water scarcity
- Limited Resources to boost economy
- Overpopulation of elephants

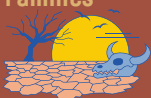


People

Goal: Survive, Provide for their families

Challenges Faced:

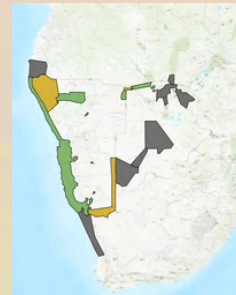
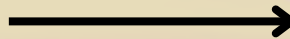
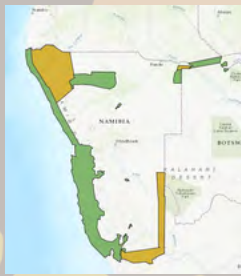
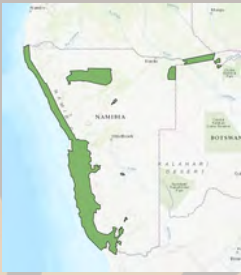
- Subsistence agriculture and livestock vulnerable to droughts
- Food and water insecurity
- Heavy reliance on foreign aid during crises



HOW CAN WE STOP THE CULLINGS?

Solutions are designed to disincentivise killing and lift Africans out of poverty

Governments must work together with their citizens and NGOs to reduce culling



EXPANDING LOCAL NATIONAL PARKS

Increasing area of national parks allows individual countries to support greater population of elephants

TRANSNATIONAL NATURE RESERVE

Increase habitat space and allows for international migration of animals

GOVERNMENTAL ACTIONS FOR THE PEOPLE



INCREASE ECO-TOURISM

Increase employment rates and disposable income amongst citizens



EDUCATION

Invest more in the education sector and expand service industry to support eco-tourism



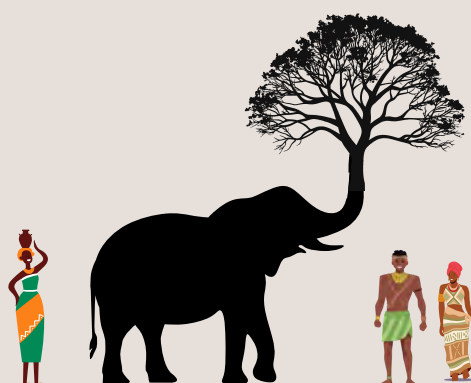
WORK WITH LOCAL NGO

Increase standard of living along and promote biodiversity conservation

ALL LIFE IS EQUAL!

Everyone must do their part to ensure human-elephant co-existence becomes a reality!

Scan for our references!



Infographic by:



Khoh Zhi Wei



Per Zi Xuan



Sng Wen Xin

INDONESIA'S FORGOTTEN BINTURONG



What are Binturongs?

- Most unique and least studied of all small carnivores
- Heavily involved in the illegal wildlife trade
- 4 subspecies in Indonesia



DEMAND:



Kopi Luwak



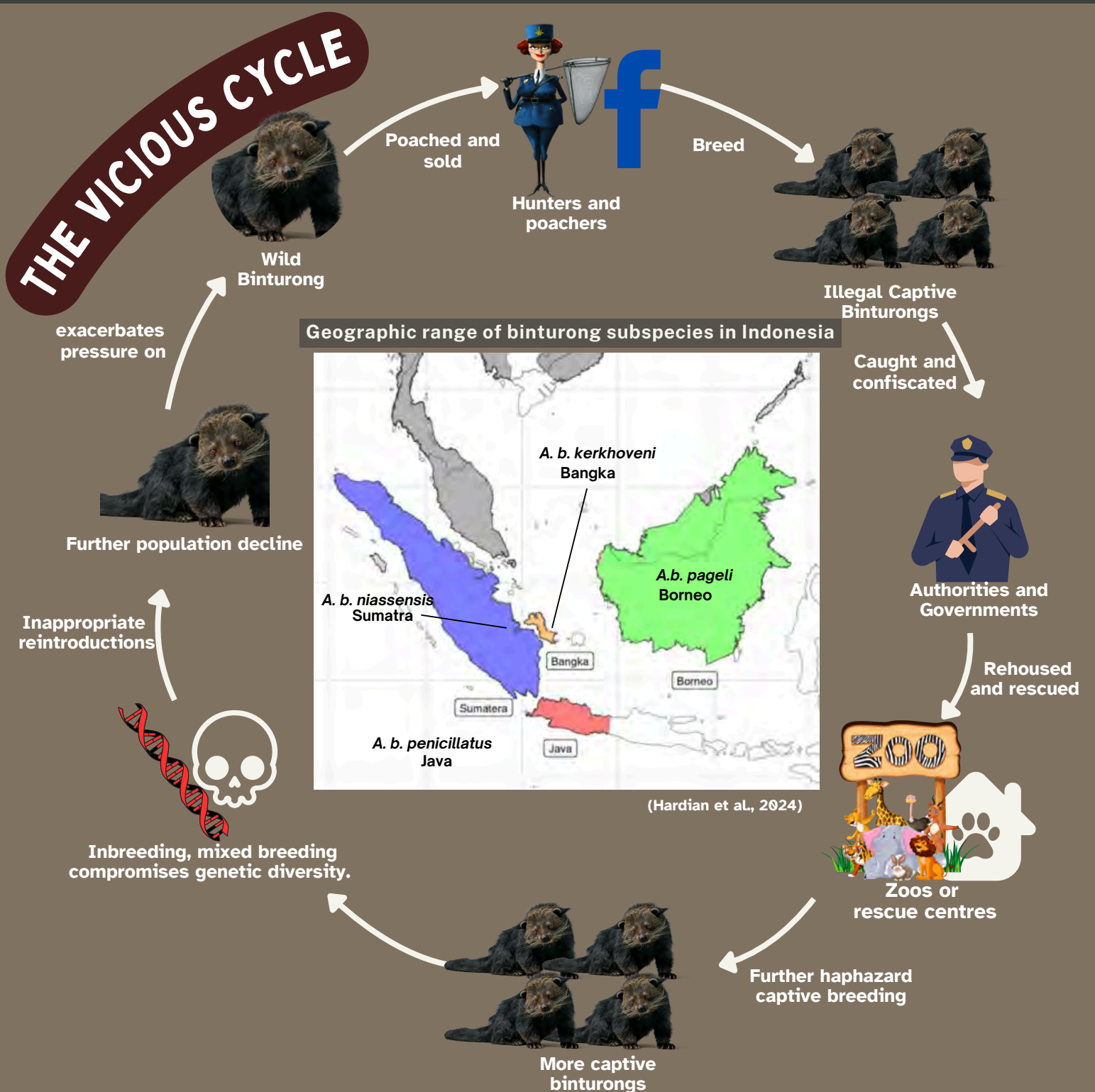
Pets



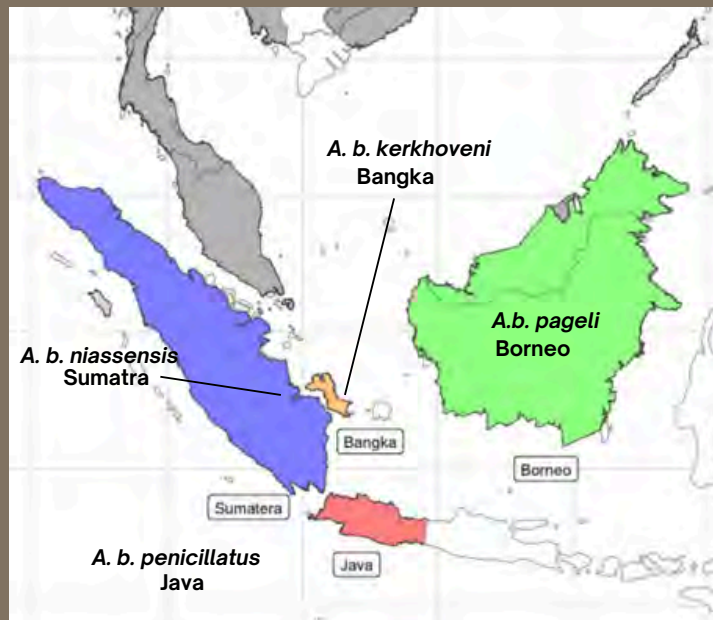
Traditional medicine



Meat



Geographic range of binturong subspecies in Indonesia



(Hardian et al., 2024)



CURRENT MEASURES



LAWS



- 1 Act of the Republic of Indonesia No. 5 of 1990 concerning Conservation of Living Resources and their Ecosystems
- 2 Government regulation No. 7 1999 Concerning the Preservation of Flora and Fauna

EVALUATION



Profits from illegal binturongs outweigh legal repercussions



PRACTICES

- 1 Rehousing seized binturongs & haphazard captive breeding
- 2 Commercial trade is legal for 2nd gen. captive-bred individuals

EVALUATION



Binturongs are rescued from illegal traders **but** haphazard captive breeding threatens genetic diversity of subspecies

THE WAY FORWARD



CONSERVATIONISTS

Protecting genetic diversity

- Elucidation of all lineages to identify other distinct lineages to conserve
- Genetic markers (Private SNPs, Haplotype-based clustering)
- Identify geographical origins on subspecies of binturongs

What can be done with this?

- Compulsory genetic analysis on individuals before reintroduction/captive breeding
- Collaboration with zoos and researchers



GOVERNMENT

- Improve laws and legislation to reduce loopholes
- Harsher punishment of offenders and corrupt officials



NGOs

- Increase awareness of importance of binturongs
- Educate illegal farmers and poachers and provide alternative livelihoods such as being park rangers



Genevieve Koh
Ruth Ang
Natasha Koh



The Iconic Philippine Coral Reef at Steinhart Aquarium

Group 4

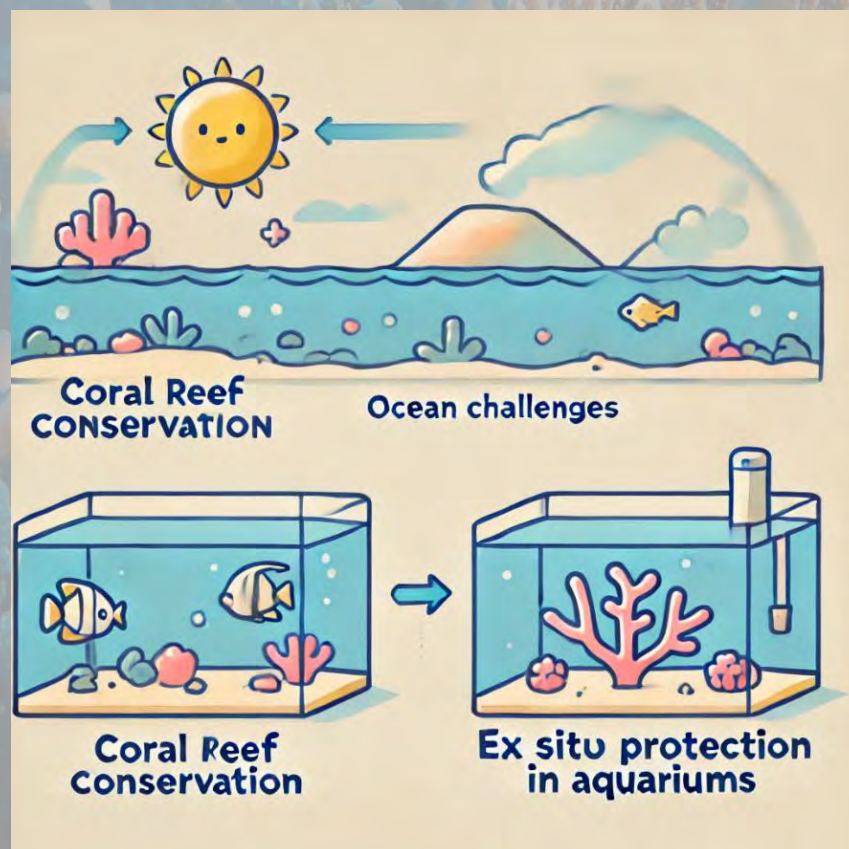
JIA DUN

SHI WANYING

IRENE BEUMER

· Background

With climate change, coral reefs in the ocean are facing increasing challenges. In order to better protect corals, people have carried out ex situ protection on them and raised them in the aquarium, which also has the role of education, science popularization and scientific research.



In order to make the corals live better in the aquarium, the Steinhart aquarium has taken some measures to ensure the animal welfare of the corals (coral is animal!)

The Iconic Philippine Coral Reef at Steinhart Aquarium

• Methods

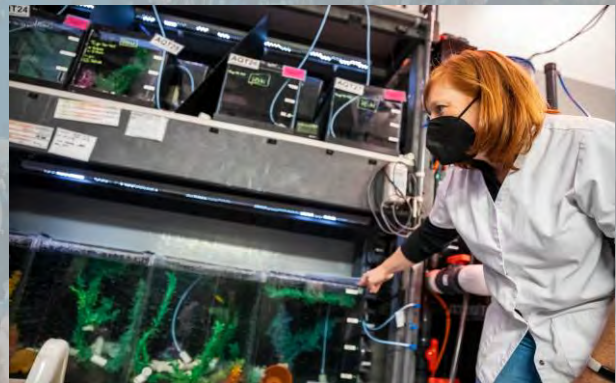
• Physical condition

The chemical composition of the water, the water flow rate, the intensity of light and light seasonal changes.



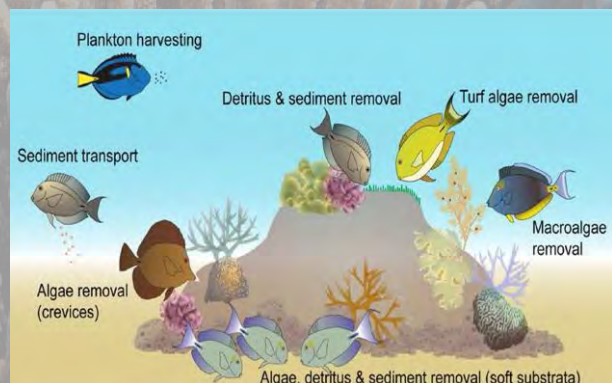
• Medical Welfare

Treat sick corals and fish, such as giving salves to corals that are difficult to move, and giving sick fish separate tank treatments.



• Welfare in Biotic community

Provide suitable animal companions for the corals. Different Marine organisms have different roles in coral reefs, such as cleaning algae, controlling pests and so on.



• Summary

This is a very successful example of coral raising, or an ex situ conservation for aquarium. In this case, we have learned that we can provide better welfare for animals by mimicking their native environment. It is not just the physical conditions, but the interactions of other species, which can make them live better and save protectors time and money.

INDONESIA'S BAWEAN ISLAND

- Located in Java Sea
- Area: 197.42 km²
- Population: 70,000 people
- Livelihood: Agriculture, fishing, logging



Problem in short

- Population of endemic species is decreasing
- No long-term monitoring is in place
 - Species are not well studied
- No legal protection for the Bawean Warty Pig
 - Potentially due to less critical status
- Human Wildlife Conflict
 - Animals' preference for habitats in proximity to humans



Bawean Deer

Axis kuhlii

This deer is endemic to Bawean Island. It is critically endangered and is protected under national law.

Its population is significantly less than previous estimates of 227-416 individuals in 2014.

It seems to prefer forest edges and areas with fresh lalang to graze on.



Bawean Warty Pig

Sus blouchi

This pig is endemic to Bawean Island. It is endangered and is NOT protected under national law. Some sources consider it a subspecies of the Javan Warty Pig, which is also endangered.

Its population is around 234-467 mature individuals in 2015.

It seems to prefer areas in close proximity with villages and frequent human-modified habitats

Stakeholders

Indigenous Peoples and Local Communities

- Crop plantations suffer damage from wild animals. The Bawean warty pig is specifically known to damage rice, coconut, banana and cassava crops. As Bawean island is a rural area, this can significantly affect the livelihoods of its inhabitants. Methods such as snares and hunting are used to help reduce this damage.
- Though inhabitants generally acknowledge the value of nature, pigs are viewed as a major pest. The banning of hunting may exacerbate this negative perception as the problem of crop-raiding wildlife may be seen as increasingly unmanageable.



Nature and Wildlife

- Non-specific snares pose a threat to endangered species. Though Bawean warty pigs are not hunted for food, trapped pigs are often killed. Other fatal methods used by farmers include knives, spears and dogs.
- Both species may prefer forest edges, putting them at greater risk of conflict with humans and predation by feral hunting dogs.
- These endangered species play important roles in maintaining biodiversity, both directly through their roles in the ecosystem and by raising awareness on conservation.



Governmental Bodies

- Local: Though protected areas have been designated on Bawean island, they are reportedly poorly managed and demarcated. As a result, these areas are sometimes illegally logged, burned or converted to agricultural land.
- Local: Farmers are not compensated for damage to crops caused by wild animals, which may cause them to overestimate the extent of damage and respond as such.
- National: The Bawean warty pig (including the Javan warty pig) is not a protected species under Indonesian law. They can thus be hunted legally.



Ways to deal with the human aspect of the issue



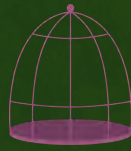
Population growth management of people and inspiring admiration for endemics via education



Hiring locals to safeguard protected areas (PAs)



Human hair and loud noises as repellent



Trapping feral dogs and using them as pig deterrence



Fences made of easily accessible materials like coconut tree bunches

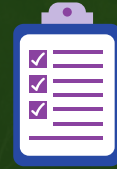


Prompt maintenance of farms e.g. Clearing fallen fruits



Pig-centred ecotourism

Ways to deal with the nature side of the issue



Conservation that accounts for absence of deer in interior of PAs aka effective planning of conservation measures



Reintroduction that follows IUCN guidelines

Further studies



Effectiveness of pig deterrence measures adopted



More data needed to analyse habitat preference of the deer



Quantifying poaching on the island and its impact on behavior patterns of pigs

Key lessons from case study



- Lack of protection of less threatened species can hamper conservation of protected species
- Protected areas implemented have to account for habitat preference of species to be protected
- Perceptions of a species can influence conservation efforts

Food for thought

How can we change people's perception towards threatened species that are less charismatic?



ORANGUTAN DIPLOMACY

ORANG(E) IS THE NEW BLACK?

★ THE ★ PROBLEM

Malaysia wishes to gift Orangutans to its oil palm importers to establish diplomatic ties, hoping to clean up the reputation of its palm oil industry and reaffirm its commitment to conserving Orangutans.

ORANGUTAN CONSIDERATIONS

Why Orangutans?



Critically endangered



Intelligent creatures



National treasure



Threatened by palm-oil induced deforestation



1

Malaysia has strong reliance on EU's palm oil imports for its economy.

2

Using orangutan diplomacy can strengthen strategic relationship ties and show Malaysia's commitment to conservation.

MALAYSIA'S POV



MOVING AWAY FROM PALM OIL

Palm oil cultivated on deforested land after 31 December 2020 will be banned from being imported into the EU, effective from 31 December 2024.



HOW CAN ORANGUTAN DIPLOMACY AID CONSERVATION EFFORTS?

Orangutan diplomacy can emphasize conservation and sustainable palm oil production. Growing global interest in orangutans may encourage Malaysia to strengthen its protection efforts.

EDRIC WEE

LEW ZHIYI

JOAN CHIN

6 Challenges Identified & Lessons Learnt



1 Shared conservation commitment

As EU nations shift away from palm oil-related deforestation, orangutan diplomacy fails to meet crucial conservation needs. Without a structured plan, there's a risk of favoring symbolic diplomacy over effective conservation efforts.



4 Importance of a holistic and stringent plan

Species management and monitoring are crucial for conservation. Nations must protect habitats, conduct regular monitoring to maintain quality, and enhance habitat restoration efforts.



2 Conservation suitability of orangutans

Orangutans are endangered with fewer than 50,000 in the wild. They breed poorly, and have lower survivability in captivity, including reduced lifespans and disease resistance.

5 Aligning political interests

Animal diplomacy involves collaboration between gifting and receiving nations, promoting positive international relations through symbolic animals that represent strategic partnerships. It is essential for both countries to align their conservation frameworks and strategies.

3 Lack of goals and root cause focus

Orangutan diplomacy often lacks clear conservation goals, accountability, and structured success measures.

It fails to address root causes of orangutan endangerment, like palm oil-driven deforestation, rendering it a symbolic gesture.



6 Implementing sustainable funding mechanisms

This fosters shared financial responsibilities and encourages the involvement of stakeholders beyond just governments, which is essential for the long-term success of conservation initiatives.

B E A R B I L E

Bear bile has been used in traditional Chinese/Asian medicines (TCM) since 500CE to treat many ailments.



Extracted from wild bears, populations of Asian bears have fallen dramatically from the past. In the 1990s, bears began to be farmed to meet the demand of bear bile. This only further fueled the industry and in 2005, 4,000 bears were in bear farms.

overexploitation and conservation in Vietnam

Above are images of Asiatic black bears on farms in Vietnam. Bears are kept in cramped cages and bile is extracted from these bears whilst alive. Centre image on the left shows this process.



*Under the IUCN (International Union for Conservation of Nature) Red List, species are considered vulnerable when facing a high risk of extinction in the wild.

^Under CITES (Convention on International Trade in Endangered Species of Wild Fauna and Flora) Appendix 1: "species are highly endangered and could become extinct if their trade is not severely restricted."

Both wild bear populations have fallen by around 30% over the past 30 years.

STAKEHOLDERS

Illegal bear poachers



Exploitation [Hunting/live capture]

Asiatic black bear

Supply captive bears

Bear farmer

Keep bears in cramped cages for easy extraction of bear bile

Remaining farmers continue to replace their bears and do not see the poor living conditions as problematic. The last bear farms are surrounding Hanoi as of 2024.

Collaborative work

Bear bile supply



TCM Practitioners

Prescribe bear bile for medicinal purposes such as for liver diseases and Covid-19.

Can be educated on ethical alternatives.

Vietnamese consumers

Seek treatment from TCM practitioners and consume bear bile as prescribed for medicinal purposes

Can be educated on ethical alternatives.



Animals Asia

Charity/Non-governmental organisation (NGO)

Establish and maintain bear sanctuaries that rehabilitate and house surrendered bears as they cannot return to the wild.

Lobby for the end of bear farming and use of bear bile in Vietnam. In 2005, the Vietnamese government signed a Memorandum of Understanding with AnimalsAsia to end all bear bile farming by end 2026.

Raise awareness in consumers and TCM practitioners on dwindling bear numbers and cruelty of bear farming. In turn, they share about synthetic and herbal bear bile alternatives.

Forest Protection Department

Governmental body

Policy action

- 1992: Banned bear hunting
- 2005: Responded to the massive number (4,500) of captive bears and made it illegal to acquire new bears

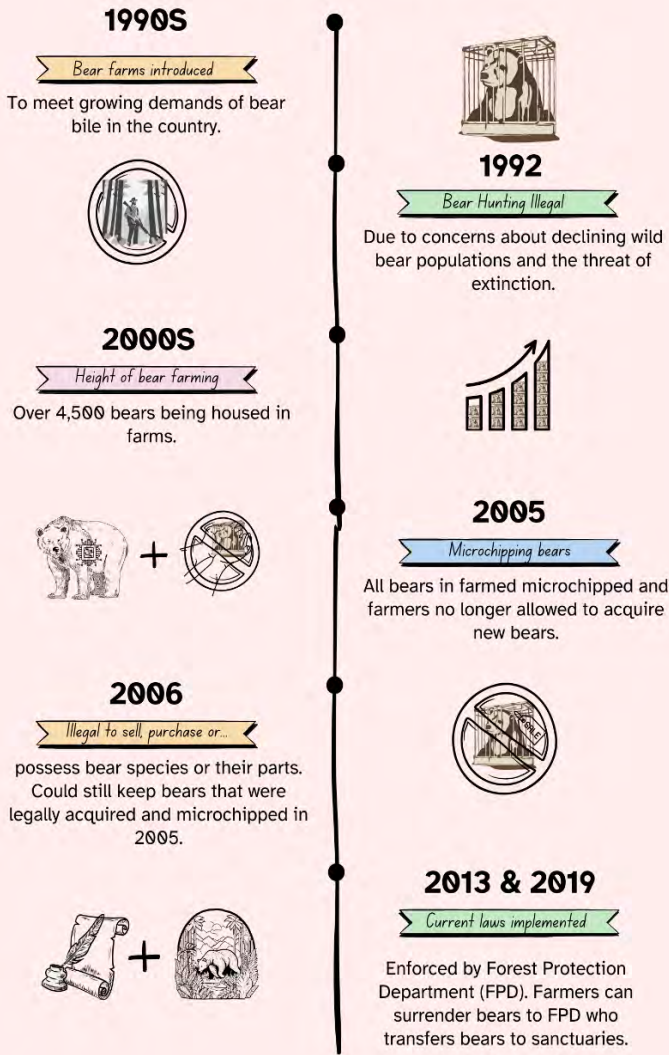
Collaborative work with NGOs

- Educate bear farmers on the illegality of bile extraction and options to surrender captive bears.
- Assist in establishing bear sanctuaries and facilitate the transfer of surrendered bears

Enforcement Clamp down on any illegal activities



Timeline of bear farming in Vietnam



Conservation Efforts

Farms introduced to reduce poaching

Unfortunately, the advent of farming only incentivised poaching of live bears to meet consumer demand of bear bile. As a result, wild bear population remained low.

Animals Asia and other charities enter Vietnam to raise awareness on animal welfare concerns

92% of farmers keep their bears in small cages 24hours a day and 22% starve their bears for 2-3 days before bile extraction. Bile extraction is done on live bears and is a painful process that can often lead to infection and death.

Current status

There has been a decrease in captive bears from 4,500 in the 2000s to 327 bears as of August 2021. This is due to the illegality of bile extraction and the option to surrender bears to sanctuaries. Consumer demand in Vietnam remains high but has been reported to be falling

A glimpse of success: Animals Asia Vietnam Bear Sanctuary

Animals Asia is a charity that focuses on ending the practice of bear bile farming.

What Animal Asia does



What more can be done?



1. Reach out to remaining active farmers to communicate to them system changes and options.



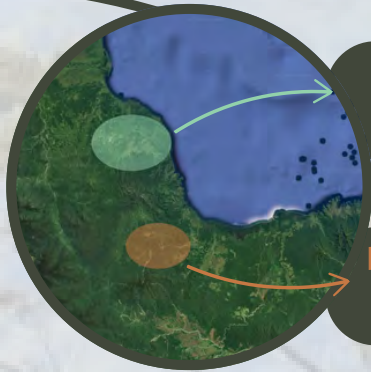
2. Provide alternative income streams to incentivise remaining farmers to surrender their bears and exit the practice.

Group 7

Hails Tanwen Hazel Maskrey
 A0294242E
 Lim Yi Zhen A0239618U
 McIntyre Denise Ann A0070266J

THE DYING QUEEN

Restoring the Kingdom of Queen Alexandra's Birdwing Butterfly



Lowland Population
Popondetta Plains

Highland Population
Managalas Plateau

Facts & Status

- World's largest butterfly (up to 30cm!)
- Microendemic to Oro Province in Papua New Guinea
- Endangered in the IUCN Red List
- Listed on CITES Appendix I



Threats to Survival

1. Deforestation

- Large amounts of forest removed for agriculture and valuable timber
- Nature conservation not included in local planning developments
- Corrupt governmental officials approve illegal Special Agriculture Business Leases for forest clearing

2. Poaching

- Much higher source of income compared to other means
- Lack of law enforcement despite protected status
- Some local farmers are interested in preserving the butterfly to sell



Existing Solutions

Captive-breeding program by New Britain Palm Oil

- Facilities built in private-owned oil palm plantations
- Reintroduction of butterflies to former habitats
- Long-term goal to improve its endangered status

Proposed Solutions

1. Protected Areas with Enforced Legislation

- Collaboration between private landowners & state authority
- Requires enhanced legislation & funding to prevent illegal land-grabbing & clearance
 - 20 of 27 former butterfly reserves converted into oil palm plantations



2. Landowner Breeding Programmes

- Aim to increase population size
- Need to propagate host vine for eggs & larvae, and nectar plants for adults
- More ground-up initiatives to involve indigenous landowners, especially those whose lands border forests



Female Queen Alexandra's Birdwing



3. Youth Education

- Nature schools with conservation education
- Inculcate conservation values, creating a sense of ownership in youth
- Create long-term societal change
- Passing the baton to ensure protected areas will be safeguarded by the next generation



Brought to you by:



Oh Jun Nings



Eugene Tan



Aristia Ho

Claws and Conservation



Man-eating Tigers in the Sundarbans



The Sundarbans is the world's largest mangrove forest, with an area spanning over 10,000km, across parts of India and Bangladesh

It comprises of 4 Protected Areas, all of which are UNESCO World Heritage Sites

The Bengal Tiger *Panthera tigris tigris*

Populations have fallen drastically in the last 20 years despite heavy conservation efforts, due to habitat loss



Although not recognized taxonomically, Sundarban Bengal Tigers are smaller, and possess a unique skull shape compared to mainland Bengal Tigers

Habitat Loss in the Sundarbans



Rising sea levels mean the Sundarban coastline now retreats up to 200m annually



Tropical cyclones increasing in frequency and intensity, damaging mangrove forests



Increasing water and air pollution from newly constructed power plants upstream



Increasing deforestation due to human expansion and illegal wood harvesting

Studies predict a **complete loss** of tiger habitat in the Sundarbans by 2070. As tiger habitats shrink, they are forced to move ever closer to civilisation. This has resulted in more frequent **human-tiger conflicts** threatening both humans and Bengal Tigers

Human-Tiger Conflicts



References

The Threat from Tigers



About 7.5 million people reside in the Sundarban region



Up to 2006, about 50 tiger-related deaths occurred annually, and numerous livestock are also killed



Climate change has forced locals further into the mangroves to earn a living through fishing, hunting and honey farming, putting them back into the danger zone

Impact on Conservation



Locals have a poor outlook and receptiveness to tiger conservation efforts



The killing of 'problem tigers' is common, and even legal in some areas of Bangladesh



Balancing between tiger conservation and dealing with human-tiger conflicts

Current Measures

Tiger fences, *Village Tiger Response Teams* that patrol the forests and safely shoo away tigers ①

Educational centres that teach the importance of tigers and the Sundarbans; how to contribute to tiger conservation and reducing human-tiger conflicts ②

Extensive mangrove restoration projects and research on tigers and in-situ conservation methods ③



The Way Forward

what more can be done

Setting up a robust **early warning surveillance system** using camera traps, drones and trackers, to alert locals when tigers are near important settlements or frequented human areas

More **research and investment** in protecting the Sundarbans from the effects of climate change and making tiger habitat more resilient

Address the root causes of both tiger habitat loss and human-tiger conflicts: the impacts of **climate change**

Cooperation is needed from the various stakeholders – locals, authorities of both India and Bangladesh and NGOs

CONSERVATION APPROACHES IN VIRUNGA NATIONAL PARK

Africa's oldest national park and a UNESCO World Heritage site. Home to more than 1000 animal species, including critically endangered ones.

ABOUT VIRUNGA NATIONAL PARK

Established in 1925, the park holds significant biodiversity value and houses the only remaining wild population of mountain gorillas, spurring global support for conservation.

CIVIL CONFLICT

- 1996-2003: Congo Wars violence and active militias
- 2012-2013: Formation of M23 rebels attacks on villages
- Today: Ongoing conflicts and illegal activities by rebels

Region's natural resources, i.e oil reserves, have led to conflicts of interests, illegal charcoal production, and poaching which are driven by poverty

LOCATION

Located in the eastern part of the Democratic Republic of Congo (DRC), the park is situated along the borders of Uganda and Rwanda



home to

MOUNTAIN GORILLAS

1/3 of the global mountain gorilla population is housed at Virunga National Park

HIPPOPOTAMUS



Vulnerable



Endangered

BLACK RHINO



Critically endangered

OKAPI



Endangered

AFRICAN SAVANNA ELEPHANT



Endangered

SHOEBILL STORK



Vulnerable

RUWENZORI DUIKER



Endangered

AFRICAN GREY PARROT



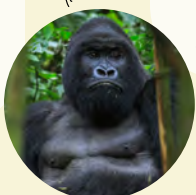
Endangered



Virunga National Park houses the world's largest lava lake (Mount Nyiragongo)

Lions of the Ishasha Valley are known to climb trees, a behaviour which no other local population is known to replicate

The Senkwekwe Centre, located in the park is the only mountain gorilla sanctuary in the world!



THREE DISTINCT CONSERVATION APPROACHES

in Virunga National Park

GREEN MILITARISATION

WHAT

The use of military forces, armed rangers and security tactics to safeguard the park's wildlife and natural resources from threats like poaching, illegal mining and armed militias



HOW

Starting in the 1990s, this approach was driven by rising threats to biodiversity and regional poverty. It expanded further in the 2000s, fuelled by the War on Drugs and post 9/11 frameworks that linked environmental protection with national security



MILITARY WARFARE TACTICS

ADVANCED TECHNOLOGY

ISSUES

VICIOUS CYCLES OF VIOLENCE



- Arms race observed between poachers and rangers

MISALLOCATION OF RESOURCES



- Diverting efforts away from community-based conservation efforts that are proven to be more effective long-term solutions

HUMAN RIGHTS VIOLATION



- Unwarranted raiding of homes
- Forceful displacement of local communities

RELIANCE ON HARMFUL NARRATIVES



- Rangers as heroes; poachers as evil
 - Dehumanises poachers, disregarding their reasons for poaching (i.e poverty)
- Contributes to militarised conservation

SUSTAINABLE UTILISATION

Using biodiversity resources to can meet long-term needs

Lake Edward



WHAT

Building hydropower plants in Park's lakes to generate energy rather than using charcoal from trees



WHY

- MORE JOBS & ACCESSIBLE ENERGY**
Alleviates poverty and deters people from joining militias for money
- DETER ILLEGAL ACTIVITIES THAT HARMS WILDLIFE**
e.g logging, poaching, etc.
- MAKES CHARCOAL LESS ATTRACTIVE**
Discourages charcoal extraction schemes

HOW

Build 3 hydropower plants
Power grids to surrounding communities
Encourages switching to hydropower

Energy for > 30,000 households and 1000 local businesses

ISSUES

HIGH COSTS



Hydropower capital cost > cost of charcoal = Not competitive
High operational cost to defend against militia clashes

ALTERED HYDROLOGY



Affects ecosystem & subsistence fishermen

INEQUITABLE USE



Energy used for bitcoin mining, unclear amount of energy used to benefit locals directly

ECOTOURISM

WHAT

Responsible travel to natural areas that conserves the environment, sustains the well-being of the local people, and involves education of members of public, particularly eco-tourists

WHY

Alleviate violence, poverty and trafficking in the region by creating highly skilled and profitable employment

TREKS



Guided by trained rangers who ensure safety while providing ecological insights

LODGING



Eco-friendly lodges minimise environmental impact and offer a connection to nature

ASPECTS

LOCAL COMMUNITY ENGAGEMENT



Earns support for conservation, reduces incentives for poaching, raises awareness about the ecological importance of the park

CONSERVATION FUNDING

Ecotourism is a significant source of funding for conservation in Virunga, with revenue from permits and park fees reinvested in the park

SAFETY



ISSUES

PRESENCE OF ARMED GROUPS

Attack on rangers (>200 lives lost) and tourist kidnappings

POLITICAL INSTABILITY

Prolonged political instability, including civil conflict and regional disputes

NATURAL DISASTERS

Eruption of Mount Nyiragongo

STABILITY

ULTIMATELY RESULTING IN...

UNFORESEEN PARK CLOSURES


>40% of park's income immediately disappears

REAL CONSERVATION

1


Ian: Hello, I'm Ian! I want to get my friend, Chan, more interested in conservation!


Chan: Hello, I'm Chan! Ian asked me to watch Finding Nemo and Rio tomorrow!



2


Filling Chan's conservation action meter:


Step 1: Make Chan watch Finding Nemo & Rio (learn about conservation in a fun way!)
 Chan's conservation action meter!

Step 2: Raise Chan's awareness on the species and their conservation issues!


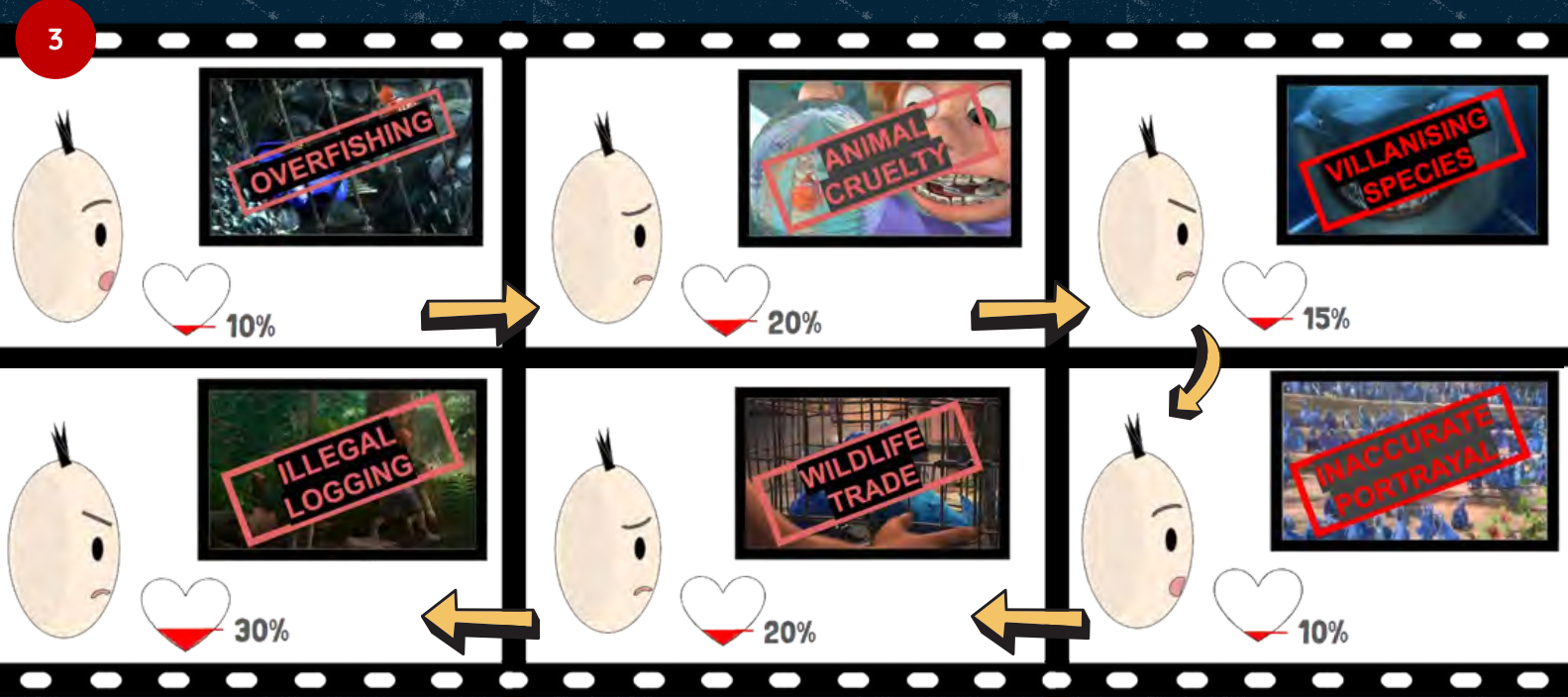
Result: Chan becomes driven to take action and join conservation efforts!!

The Conservation Action Meter:

When empty:  → The person has no drive to take any action for conservation at all.

When full:  → The person will be driven to take action for conservation!

3



The film strip shows Chan's conservation action meter decreasing from 10% to 30% as he watches various environmental issues:


- 10%: OVERFISHING
- 20%: ANIMAL CRUELTY
- 15%: VILLANISING SPECIES
- 30%: ILLEGAL LOGGING
- 20%: WILDLIFE TRADE
- 10%: INACCURATE PORTRAYAL


4

Ian: Rio Bird is reportedly EXTINCT in the Wild!!

The Washington Toast: More people are buying Nemo fish as pets!!


MANGOBAY: Extinction rates are CRAZY!

Chan's Meter:  60%




5

Chan's Meter

 60%

Wait, why is it not full??



WELL...

Raising Awareness



Educating the masses on biodiversity & conservation themes

Although movies can help us in



BUT...



Inaccurately portraying species (& interactions)



They can still fall short by

Being the medium for the spread of misinformation

Getting global outreach



Generating some action

Villainizing an entire species



SO, HOW DO WE GET CHAN'S CONSERVATION ACTION METER UP?



By improving on what they are currently doing well

✓ Popularity

Finding Nemo

- 2nd highest grossing film worldwide in 2003

Rio

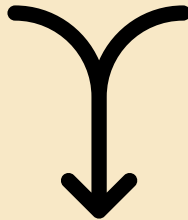
- 13th highest grossing film worldwide in 2011

✓ Sparking Action

- Petitions being started to save the Blue Spix Macaw
- 20th Century Fox donating \$100k to WWF for conservation efforts



AND BY COMBINING THESE TOGETHER



By fixing their pitfalls and unlocking their potential

Consulting conservation experts pre-production

- Allowing movies to be scientifically accurate and also entertaining

Portray conspecifics as both heroes & villains

- Prevents people from potentially hating the villain species

Portray conspecifics as both heroes & villains

- Prevents people from potentially hating the villain species

That was fun! I don't think I would have ever planted trees if I didn't watch those 2 movies.



I'm glad you came. This tree you planted will be home to many animals in the future!

In Conclusion!



NI YUAN



DR CHAN



CHEN XI

Movies do hold the power to influence and direct people



& ALL OUR LSM4262 FRIENDS!

As long as care is taken to share the correct message, movies can play a role in raising awareness and calling people into ACTION!



XIN YEE

CAUGHT IN THE CROSSFIRE: THE OKAPIS OF CONGO

BRENNA LIM YI EN, AIN NURUL
IMAN, REIKO NG ZITONG



Endemic to the Democratic Republic of Congo, these elusive animals are an important national and cultural symbol. However, their numbers are slowly dwindling, with only an estimated 10-15,000 left in the wild. The Okapi Wildlife Reserve in the Ituri Forest is one of the few protected areas left for them. But trying to save them isn't so easy - what happens to conservation when political tensions and armed conflict are involved?

KEY STAKEHOLDERS

Issues

Okapis are plagued by many threats, but the most pressing issues include **deforestation**, which directly threatens their habitats, **violence and unrest**, which poses a threat to their safety, and **poaching and hunting**, which threatens their numbers.



Legend

- Positive influence
- Negative influence
- - - → Can be Positive or Negative influence



SO NOW WHAT?

CURRENT ACTIONS



RESEARCH

Both in situ and ex situ research are being carried out to better understand okapi behaviour in the wild, and to bridge research gaps.



OKAPI CONSERVATION PROJECT

NGO managing the Okapi Wildlife Reserve, focusing on aspects such as wildlife protection, community assistance and conservation education.

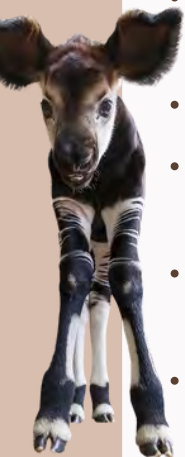


OKAPI STUDBOOK

Keeps track of the 100+ okapi that are in the zoos. Assurance through in-situ conservation to ensure that it does not fall below the minimum viable population.

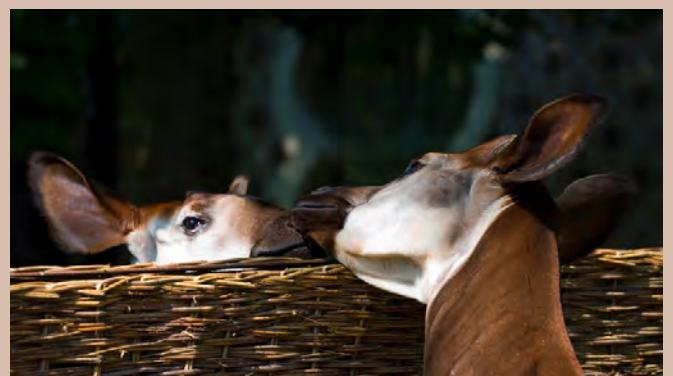
WHAT NEEDS TO BE DONE?

- Internal restructuring of the government to strengthen state authority
- International intervention to lend aid and call for peaceful negotiations with armed militants
- Stricter legislations and punishments for poaching and hunting
- Creation of alternative livelihoods for poor locals
- Form a fully protected core area in the reserve to protect okapis
- Use existing research methods such as faecal sampling to estimate population sizes
- International collaboration to prevent illegally extracted minerals from entering the global market



KEY TAKEAWAYS

1. Social issues makes conservation complex, different groups with varying interests
2. International collaboration and multidisciplinary solutions are required to address
3. Ex-situ conservation is an important tool, especially when the wild population numbers are unknown





THE BATTLE FOR DOVER FOREST



BY: LER SHAN, SHAO YING, MICHELLE

Dover Forest is a 50-year-old young secondary regrowth forest located in southwest Singapore.

IT CONTAINS

120 FLORA SPECIES
42.5% NATIVE
12.5% THREATENED

158 FAUNA SPECIES
11% NEAR THREATENED OR THREATENED



THE BATTLE BEGINS



announced their plans to

CLEAR DOVER FOREST to make way for

NEW BTOS.



then asked

for **PUBLIC FEEDBACK** on the plans.



Artist's impression of the BTOS to be built on Dover Forest

THE BATTLERS ASSEMBLE

Some looked forward to a new home...

The BTO at Dover MRT is in a very good location

...while others vouched for nature



Use vacant plots of land and old school campuses. Greenery should be cherished!

HOLLAND-BUKIT TIMAH MP CHRISTOPHER DE SOUZA



CHUA CHIN TAT

Personally surveying trees in hopes of protecting them

Petition with over 51000 signatures to keep Dover Forest





Forest's importance to biodiversity



Turn the forest into a public-cum-nature park to let people enjoy and protect nature

Dear HOUSING & DEVELOPMENT BOARD
Choose other vacant or unused plots.
From NSS

BATTLE RESULTS: A COMPROMISE

DOVER FOREST WEST WILL BE SAFEGUARDED AS A NATURE PARK

DOVER FOREST EAST WILL BE CLEARED FOR BTOS

MORE COMPLEX VEGETATION
BETTER QUALITY VEGETATION
MORE THREATENED SPECIES

THAN
DOVER
FOREST
EAST

FROM 2017 TO 2020, THERE WAS AN INCREASE IN DEMAND FOR BTO FLATS, ESPECIALLY FOR MATURE AREAS.

WHAT CAN WE LEARN FROM THIS?

MAINSTREAMING NATURE CONSCIOUSNESS IS KEY!

IN THE PAST...

WHAT WORKED HERE?



INCREASED COLLABORATION



MORE PUBLIC SUPPORT DUE TO CHANGING SENTIMENT

**PEOPLE'S VOICE:
A POWERFUL TOOL THAT DRIVES
GOVERNMENT ACTION**

NEXT STEP: ECOCENTRIC APPROACH TO DEVELOPMENT

WHERE CONSERVATION IS INTEGRATED INTO DEVELOPMENT



Looking scrumptious?

SAMBAL STINGRAY CRISIS!

Collin Chua (A0233109N), Ivan Neo (A0229832Y), Regina Lai (A0239277R)



Sources

THE SPICY SITUATION FOR THE STINGRAYS



18% more stingray species than sharks are listed as **THREATENED** by the IUCN

YET...

NO stingray species are **protected** under CITES unlike sharks

6X more **stingrays** than sharks were imported into Singapore from **2017-2020**

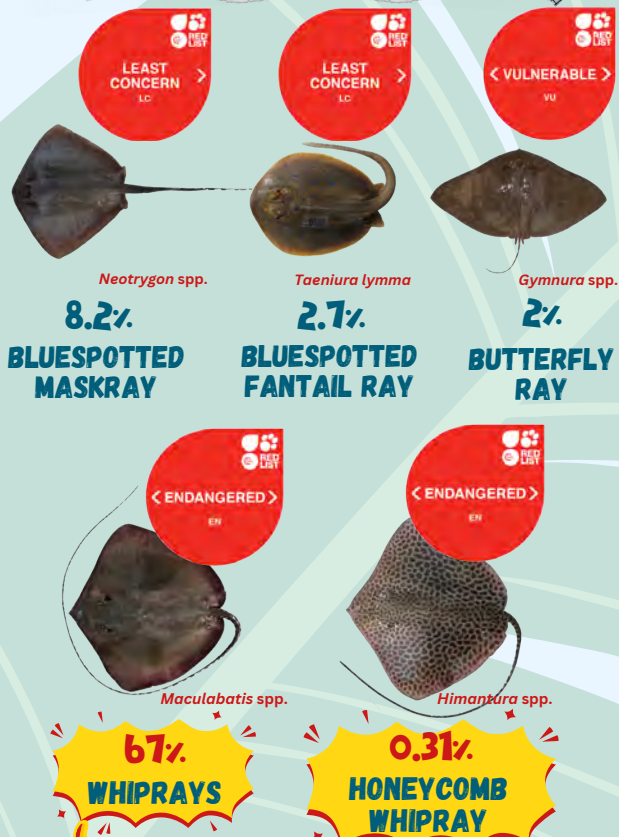
JUST TO MEET DEMAND FOR SAMBAL STINGRAY



▲ A day's catch at just 1 of 103 stalls at Jurong Fishery Port, Singapore



STINGRAY CATCH STATISTICS



MOST SOUGHT AFTER!



STAKEHOLDERS AND CHALLENGES



Stingrays	Authorities (local & int'l)	Researchers
<ul style="list-style-type: none"> Long maturity duration (9 years!) Slow replacement rate (1-4 pups per litter) Often left on hooks to slowly die of starvation and bacterial infection 	<ul style="list-style-type: none"> Difficult to trace complex international supply chain Difficulties in enforcement Lack of expertise to inform policy-making 	<ul style="list-style-type: none"> Lack of funding to conduct research Lack of taxonomic expertise Lack of cooperation from locals (viewed as threatening their livelihoods)
Fishermen	Consumers	Consumers
<ul style="list-style-type: none"> Facing poverty Fishing for stingray species in demand until the population is depleted 	<ul style="list-style-type: none"> Struggle to meet demand from consumers Little incentive to sell sustainably caught catches 	<ul style="list-style-type: none"> Unaware of stingray status of the culturally significant dish Less easily influenced by less charismatic species



Looking scrumptious?

SAMBAL STINGRAY CRISIS!

Collin Chua (A0233109N), Ivan Neo (A0229832Y),
Regina Lai (A0239277R)



Sources



POSSIBLE SOLUTIONS



TO INFORM POLICY-MAKING



Catch Reporting



Sheds light on the sources, movements, and landings of stingrays, providing insights for establishing protected areas or sustainable fishing zones. However, the industry's cross-border nature—spanning Indonesia, Malaysia, and Thailand—poses challenges, requiring regional and international cooperation. Additionally, accurate catch reporting requires taxonomic knowledge from fishermen to fishmongers, as some stingrays belong to species complexes that are difficult to distinguish (even by experts) based on morphology alone.

Research



Significant knowledge gaps remain, from the taxonomy of stingrays and bioengineering of fishing methods to reduce bycatch, to social science research on the needs and motivations of stakeholders across the supply chain. Comprehensive interdisciplinary research could deepen our understanding and provide stronger support for science-based policies. However, the scale of this research means it will take time to produce results.

Species Uplisting



Research findings can help international bodies like IUCN and CITES accurately assign conservation statuses and recommend protections against overexploitation for various stingray species, strengthening global commitment to their conservation.



TO SHIFT MINDSETS



Alternative livelihoods



Exploring alternative livelihoods for fishermen could include developing marine stingray farms, similar to existing freshwater farms that support the pet trade. Shifting from wild-caught to farmed stingrays for consumption is a viable option, but given the distinct ecological needs of marine stingrays, focused research is necessary to make such farms viable.

Education



Education is key for all stakeholders, from raising consumer awareness to reduce stingray demand, to providing fishermen with taxonomic knowledge and the benefits of alternative fishing methods to improve catch reporting and reduce bycatch. Shifting mindsets is a monumental task, hence understanding the needs and motivations of each group through research is crucial for developing effective strategies to drive change.

Alternative fishing methods



Bioengineered nets and hooks, such as larger 'J' or circle hooks and turtle excluder devices, can help retain the yield of targeted species while reducing bycatch. To encourage adoption, these alternatives must be affordable and easily accessible, accompanied by education on their benefits and proper usage.

Certifications for Sustainable fishing



Implementing certification for sustainable fishing can motivate fishermen to adopt responsible practices, while encouraging retailers—from fishmongers to vendors—to source certified catches. However, this requires regular audits to prevent exploitation and greenwashing.



DIRECT PROTECTION MEASURES



Protected areas & catch rotation zones



Gazetting protected areas or establishing catch rotation zones will help safeguard stingray populations and the broader marine ecosystem, allowing for recovery alongside other sustainable fishing measures. However, these actions may displace fishermen from traditional grounds, hence it is imperative that catch-reporting schemes are effective to increase knowledge on both the ecology of stingrays, as well as the hotspots for people's livelihoods. Strong enforcement is also needed to deter non-compliance with regulations.



WHAT CAN YOU DO ?



STOP CONSUMING STINGRAYS

Or seek alternative sustainable options



SPREAD THE WORD

Educate those around you on the unseen perils of stingray harvesting



CONTRIBUTE !

Contribute in stingray research and conservation by donating, participating and volunteering!

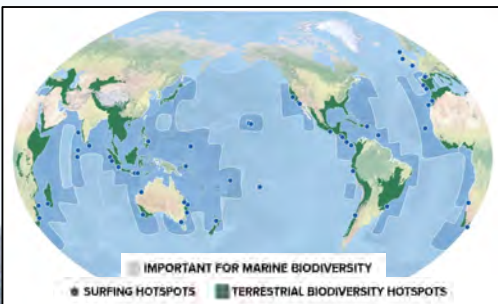
ULUWATU'S WAVES OF CHANGE

Navigating the riptides of culture, development and conservation in Bali's iconic surf break

CONSERVATION VALUE OF SURFING

Cultural Ecosystem Services:

- Surfing delivers multiple benefits
 - Health**
 - Social**
 - Economic**
 - Surfing's benefits go beyond surfers, impacting broader coastal communities and connecting multiple stakeholders
- Biodiversity Hotspots:** Surf breaks often overlap with Key Biodiversity Areas (KBAs), offering conservation opportunities.
- Carbon-Rich Ecosystems:** Many surf sites contain carbon-dense habitats like mangroves and seagrasses, enhancing conservation potential.
- Research suggests that surfers often have **pro-environmental behaviour**, which can drive local environmental activism



... BUT:

- Overlooked Benefits:** Surfing's ecosystem value is often ignored in coastal policies.
- Lack of Surf Break Management:** Little government-level management or research on the economic and environmental value of surf breaks.
- Threats from Climate Change & Development:**
 - High-quality surf breaks face threats like infrastructure development and pollution.
 - E.g.: Surf breaks degraded or lost due to projects in the Maldives, Madeira, and Peru.*

Surf Break Name	Location	Threat and Impact
Male Point	Maldives	Infrastructure. Tetrapods were placed around the island for coastal protection, thus destroying the surf break.
Jardim do Mar	Madeira	Infrastructure. Construction of a promenade changed the wave dynamics, greatly reducing the 'surfability' of the wave.
La Herradura	Peru	Infrastructure. An unsuccessful road project destroyed the natural hill surrounding the bay, changing the ocean floor and thus affecting the surf break.

(Scheske et al., 2019)

Surfing: A Global Phenomenon
\$60B in annual revenue
>35M participants

Interest will only grow - Surfing debuted in the Olympics in 2020!

Surf breaks are **scarce** and **valuable**. Compared to the length of the world's coastlines, there are relatively few breaks that are suitable for surfing.

High quality waves, characterised by consistent clean, peeling waves, depend on a unique composition of geographical features.



ULUWATU, BALI: A CASE STUDY

- Location:** Uluwatu, on Bali's Bukit Peninsula; iconic for its world-class waves and cultural significance.
- Pressures:** Growing tourism, water shortages, and development projects like the seawall project for temple protection.
- Stakeholders Involved:**
 - Local and national government
 - Hindu religious leaders
 - Surf tourism operators
 - Environmental activists and conservationists
 - Local communities
 - Tourists



- Construction of service access road along cliffs near Uluwatu surf break
- First phase of cliff reinforcement project under Uluwatu Temple
- Evidence of irresponsible construction processes, including dumping of limestone off the cliff
- No Environmental Impact Assessment (EIA) performed
- Part of a US\$5 million project funded by Badung Regency government
 - Citing cultural and religious reasons
 - Sign of more development for economic gain to come?

THE SEAWALL PROJECT



KEY CONCERNS

- **Economic Impact:** Surf tourism generates \$35M annually, attracting 240,000 surfers.
- **Environmental Value:** Located in the Coral Triangle, home to:
 - 500+ reef-building coral species, 200+ soft coral species, and diverse marine life (e.g., Hawksbill turtle, manta ray).
 - Lack of comprehensive environmental assessments.



RISK OF CONSTRUCTION

Potential effects include habitat damage, sediment cover, and increased turbidity.

BROADER IMPLICATIONS

- **Cultural and Natural Identity at Risk:** Bali's unique blend of religion, surf culture, and biodiversity faces erosion.
- **Governance Issues:** Unregulated development and limited public consultation.



No.	Site name	Exact location	Biological characteristics	Management status
1	Bali Barat National Park	West Bali, Buleleng	Coral reef, reef fish, sea turtle, cetaceans	An official MPA
2	West Buleleng MPA	Pemecutan, Buleleng	Coral reef, reef fish, sea turtle	Declared as an MPA*
3	Central Buleleng MPA	Lorina, Buleleng	Coral reef, reef fish, cetaceans, whale shark	Declared as an MPA*
4	East Buleleng MPA	Tijahala, Buleleng	Coral reef, reef fish, whale shark	Declared as an MPA*
5	Amed - Tidamben	Karangasem	Coral reef, sea turtle, reef fish, shark	n.a.
6	Palang Rai - Candidasa	Karangasem	Coral reef	n.a.
7	Nusa Penida	Klungkung	Coral reef, mangroves, reef fish, cetaceans, whale shark	Declared as an MPA**
8	The Peninsula (including Nusa Dua and Bukit Uluwatu)	Baliung	Coral reef, reef fish, cetaceans, sea turtles	n.a.
9	Pemutak	Negara	Sea turtles, mangroves	n.a.

Note:
 *Declared on 22 August 2011
 **Declared in September 2010

Figure 6.1. Proposed MPAs recommended for inclusion in the Bali MPA Network (see Table 6.3 for MPA names)

"The wave exposed S coast community was not thoroughly surveyed because of large ocean swell. Many of these S coast reefs are highly prized for surfing, and as such draw large numbers of tourists to Bali each year. In the latter respect, their future conservation should be considered a priority for maintaining surf tourism on the island."

Source: Bali Marine Rapid Assessment Program 2011

A study in 2011 identified Bukit Peninsula (including Uluwatu) as a priority site to be considered for a Marine Protected Area (MPA), despite its biodiversity not being fully accounted for.

Source: Save The Waves Coalition

Solutions

SURF-BREAK PROTECTION MECHANISMS AS POTENTIAL OECMS:

THE WORLD SURFING RESERVES

The World Surfing Reserves (WSR) programme, initiated by Save the Waves Coalition in 2009, is an international program that designates iconic surf breaks and surrounding ecosystems for informal conservation, through community-led stewardship with the aim of eventual legal protections.

THE PERUVIAN *LEY DE ROMPIENTES*

Peru's Ley de Rompientes (Law of the Breakers), enacted in 2014, became the world's first law to grant legal protection to surf breaks. This landmark law defines surf breaks as part of Peru's natural heritage, ensuring public access and preserving these sites from threats like infrastructure projects and oil exploration.



* Map in progress. If you are aware of a country with surf break that is legally protected or pursuing legal protection please contact us at: bmonteferril@spda.org.pe

Immediate Actions:

- Conduct a comprehensive Environmental Impact Assessment (EIA).
- Perform an economic valuation of Uluwatu's surf ecosystem.
- Community Collaboration: Engage local voices and surfers in planning.

RECOMMENDATIONS FOR ULUWATU, BALI

- **Long-Term Monitoring:** Adopt indices like the Surf Resource Sustainability Index (SRSI) or the Surf Conservation Index to evaluate and protect surf sites.

The case of Uluwatu illustrates the urgent need for innovative conservation solutions to address the complex threats facing surf ecosystems worldwide. As surf breaks face increasing pressures from tourism, climate change, and development, preserving these areas is crucial—not only for their recreational and economic significance but for the unique biodiversity they support.

Emerging frameworks like **Other Effective Area-Based Conservation Measures (OECMs)** offer a promising way forward, demonstrating that conservation can come from unexpected places and people, reminding us that conservation is a collective effort open to all, from any walk of life.

Credits: Stijn, Ying Ying, Eunice

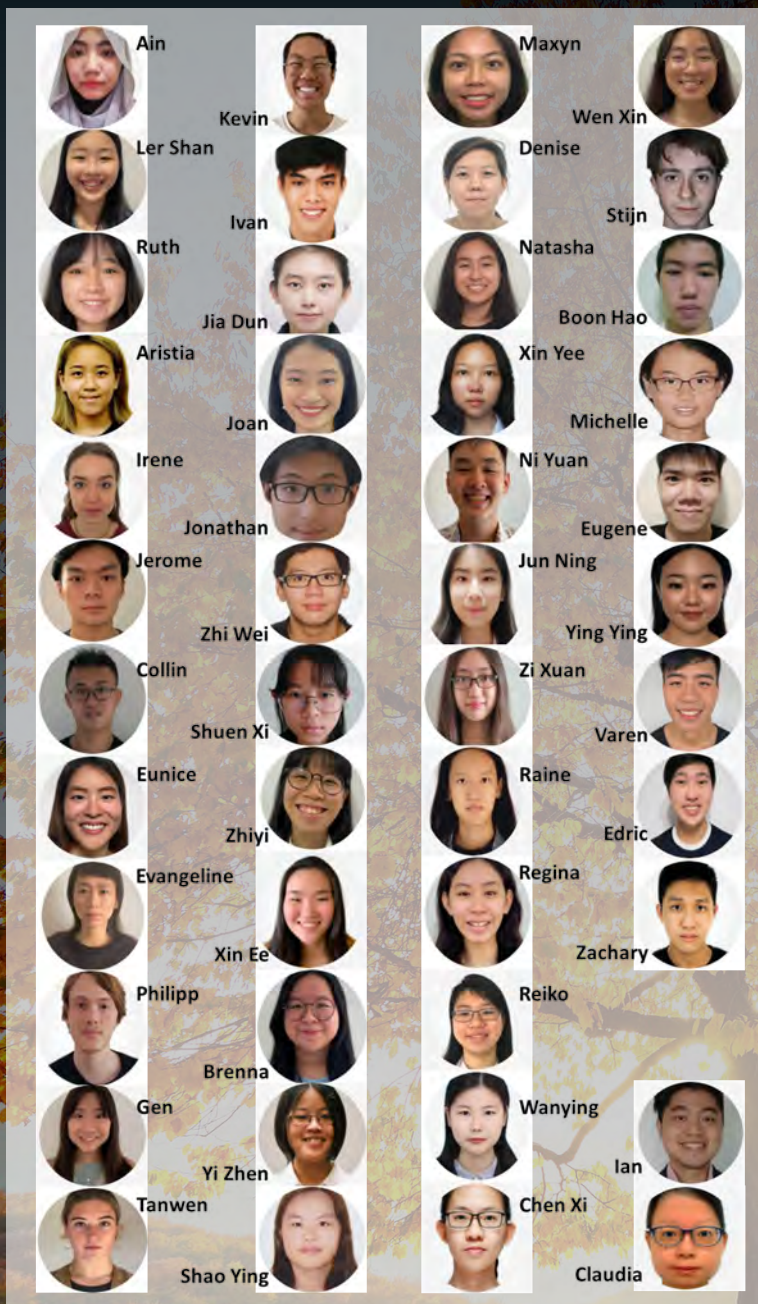


REFERENCES:



Over these past 13 weeks, from August to November 2024, 15 groups of 45 individuals, passionate about saving our world and the biodiversity in it, worked together on our shared dream.

In this compilation of case studies, you will find the **lessons** we've learnt as a class, the **hopes** we hold for our world, and the **dreams** we dare to dream for our shared future.



We Alone Decide

Our only Earth is doomed to die
And only fools would still believe
Saving every life is a worthy fight
Even if the world falls to heat or freeze
Soon enough we'll come to see
The only species that matters is humanity
Fighting for our future can't possibly mean
Every life is equal to that of you and me
The truth we know, as clear as day
Hope is a dying star a lifetime away
On this planet no one will say
We can carve a different future today

Both land and sea are dying as we write
The fate of millions of innocents worldwide
I wonder - do we alone get to decide
What gets to live and what will die?

[Read the poem again from bottom to top]

An original poem by
Aristia Ho (with Eugene and Jun Ning)
LSM4262, AY24/25

Be the best tree you can be!