

Speaker Name : Dr. Zach Boakes

Institution :

1. Co-founder of NGO “North Bali Reef Conservation”
2. Post doctoral research fellow at BRIN and PI on Earthwatch Institute research project in Bali

Topic : Artificial Reef, Monitoring in North Bali Indonesia

Type of Activity : Artificial Reef Monitoring

Project Location : North Bali

Project Duration : 6-7 year

Summary Presentation :

The monitoring in Bali funded through Earthwatch, an international citizen science research organization

1. Primary threats to Bali’s reefs
 - a. Physical damage, one of the key threats to the reefs. In North Bali, corals were broken due to coral harvesting for building material but now it is illegal but left the big damage and there’s no natural recovery of the physical damage. Additional boat anchoring, destructive fishing practices and scuba diving still threat in Bali, especially in tourism area.
 - b. Plastic pollution, it can kill coral in cases when it became trapped or entangle. In monsoon season (December-February) the plastic gets much worse.
 - c. Coral bleaching, coral expelling the algae living in their tissue which can lead to mortalities. This is linked with climate change (El-Nino).
2. Protecting coral reefs
 - a. Climate change is a huge threat to coral reefs, it’s approximately destroyed 50% reefs. Limiting climate change with mitigating is the best way to protect the coral reefs.
 - b. In the localized scale is challenging to protect coral from climate change.
 - c. Recent project in North Bali, restore reefs and build resilience on a localized level to lead more fish, higher biodiversity, and reduce localized threats such as pollution and overfishing.
3. North Bali Reef Conservation
 - Founded in 2017 and working with fisher communities in North Bali and international volunteers to restore the coral reef.
 - The area restored started in with no coral, fish (empty area) that have been degraded and then put the artificial reef.
4. Artificial Reef

- Activities of volunteering are the building of artificial reefs with the aim of restoring marine biodiversity and provide habitats for fish juvenile and smaller fish, also sheltering fish. 30.000 artificial reef structure made from calcium, sand, and cement.
- After 3 years deployment artificial reef, the coral and benthic growth and the natural recruitments onto the structures and lead to significant fish abundance.

5. Monitoring Reef

- Indonesia has the most reef restoration program in the world, but lack of monitoring is often due to the limited funding. Monitoring is expensive and so many program don't prioritize monitoring. Monitoring is the huge work to understanding if the restoration method works effective or not, for instance the artificial roof method is not working for coral and fish biodiversity, and they change into a different artificial design and it more successful.
- By monitoring is provides the real data that allow in many cases get additional funding report to governments (benefit for the organization).

6. Earthwatch: citizen science research

- international volunteers is pay a fee to join the program and that fee effectively provides funding for the scientist to collect data dan do monitoring (monitoring funding from 2021).

7. Citizen sciend pros and cons:

a. Pros:

- Provides funding model for post-installation modelling.
- Engagement the general public in science, increasing awareness and interest.
- Increase the scale of the work and frequency of monitoring activity that can make the data more statistically.

b. Cons:

- Working with citizen science that not expert in the data collection is care needed ensure the quality data collecting and avoidance of bias data.
- Training the citizen science in data collection take time.
- Being invited the international volunteers, increased carbon emission due to flying from abroad to Indonesia to assist the monitoring.

8. Method for monitoring

- Reef fish transect surveys (snorkeling or diving).
- Randomized benthic quadrant surveys.
- Remote underwater video, to understand the living organism in that area from a mobile phone. Put the GoPro cameras with enable standing down and leave for 30 minutes.

9. Key monitoring questions

This question is allow to limit the amount of threats to the reef future. It is depends by the monitoring activity, the restoration is work or not:

- a. Which localized threats are still present?
- b. What changed need to be made to optimize the restoration work?
- c. Can artificial reef effectively restore degraded coral reef communities?
- d. To what extent can artificial reefs function as natural reefs?

10. Result of the monitoring by the data collection

- From 3 years monitoring, ecologically there is not significant different of reef fish from natural coral with the artificial reefs. The artificial reef communities are getting similar to the natural coral reefs over time.
- Artificial reefs are showing early signs a functioning as natural reefs, in terms of nutrients like phosphates and nitrates. Also starting to store carbon in the same way as natural reefs.

11. Publishing monitoring data

Many reef restoration program aims the monitoring to get the data for effectiveness of the restoration, but only some of program aim the monitoring for publish the data.

- a. Create the research question and hypothesis before starting data collection and plan the methods for answering it.
- b. Stay up to date with current literature and think about how the data and research fit into the wider context
- c. Consider the “so-what” use the data to help answer current questions in the coral reef science.

Question and Answer :

1. Sebastian Ferse

- a. Are some areas f in Nort Bali there was coral reef before, but they have been remove by the mining activities as you describe or it is possible to putting that in areas where there was no coral before?
 - By discussed with the local community (qualitative information), the area where we're deploying artificial reefs was subject to coral harvesting several decades ago.
- b. What do you actually want to achieve? And is the method that you're using most suitable to that? And what kind of indicators would really tell you if you're effective in meeting your conservation or restoration objectives.
 - The aims of the restoration programs are to understand how to recover some of the ecosystem services of natural reefs by building the artificial reefs and provide benefits for local communities. The indicator specifically related to the ecosystem functioning.

2. Veda Santiaji

Is there any recommended monitoring method for the coral restoration in the remote islands that have limited availability of the "scientist" to do regular monitoring?

- Using RUV method by leaving the camera and putting the data on the laptop, then identify by coral and fish book identification . Only need the basic camera equipment like GoPro and some dive or snorkel gear
- Besides that, you can also use like the Data Mermaid, ReefCheck and Reef Life Survey are quite well-known initiatives for citizen science monitoring, including sharing of data (on demand)

3. Permas

In what year the coral development or coral interaction with the surrounding community reaches its peak growth? coral with fish with invertebrates, etc.

- Based on the experience peak stability, the time for coral ability to stable after 2-3 years (there is not huge difference) and the natural coral recruitments on artificial reefs is quite slow. The artificial reef shows the high coral cover but doesn't mean performing some of the key function as the natural reef, because is not gonna have a fully functioning. Perhaps it need a decade for artificial reefs to fully functioning.
- (Sebastian) I think if the question is about community development, rather than individual corals, reefs undergo a post-disturbance succession, and it may take several decades (if no further disturbance occurs) until a mature community develops

4. Tries

Do you do transplantation as well or you rely on completely natural requirements or combined?

- Because we have healthy natural reefs, we don't need the transplantation. We have high levels of natural recruitment and coral growth, meaning that we don't need to transplant corals, so we just leave the structure.

5. Addin Mazni

What are the monitoring protocols for assessing the resilience of restored corals to future climate stressors like ocean warming or acidification?

- Key measurements to assess resilience, look at the species from the natural coral, acropora is an example. The acropora will not going to be particularly resilient to future stress, like ocean warning and acidification. A simple monitoring protocol to assess the resilience would be look at the reef biodiversity are more resilient to increased acidification and temperatures.

6. Shindy Pattiasina

Bagaimana rekomendasi agar nelayan tidak merusak terumbu karang?

- Kita tetap harus melibatkan masyarakat dalam kegiatan konservasi, jelaskan manfaat dan kesempatan untuk ikut kegiatan konservasi, made them empowered by joining this project, so they feel be part of the conservation too.

- Tidak ada kompensasi, lebih menjelaskan kearah manfaat konservasi seperti menarik daya turis sehingga mereka bisa lebih banyak mendapatkan pekerjaan dibidang pariwisata

7. Irawan mahadi

Apakah North Bali spot for restoration is too close to ALKI 2, deep sea trench of Lombok and Makassar Strait also current from India Sea n Pacific disturbing your spot biodiversity growing?

- This is not something I have experienced, North Bali is not close to the trench or shipping routes. Tidak terdapat gangguan dari arus atau yang lainnya seperti yang ditanyakan
- (Karel Satriawan-Poshidrosal), kegiatan konservasi terumbu karang tidak melebihi 50 meter, sedangkan daerah ALKI 2 tidak akan dijadikan konservasi karena kedalamannya lebih dari 50. Jadi daerah konservasi dan ALKI merupakan dua hal yang berbeda

8. Dondy - IPB

Latar belakang mendirikan North Bali Conservation:

- Tujuannya adalah konservasi terumbu karang, bukan monitoring atau research. Karna di Indonesia banyak program restorasi terumbu karang. Awalnya hanya bertujuan untuk konservasi tetapi seiring berjalannya waktu melakukan monitoring dan research

9. Imran Lapong – YKPI

Is there any recommendation that which one is better to use or develop an artificial reef or making a coral transplantation for restoration?

- The best way to restore reef, it's dependen on the conditions and the biodiversity in the area. So, the partitioner can decide that the best way and method for restore reef.