Marine Conservation Philippines

PRIMER ON MARINE MONITORING

Using citizen science in Marine Conservation Philippines

OUR MONITORING

Focus

- Assess locally managed Protected Areas's effectiveness at providing food security for the community.
- Assess regional reef's heath and resilience .
- Assess threats and sustainability of he local MPAs at keeping on providing desired goods for the community in the coming future.

The **Philippines** is home to one of the highest amount of **Marine Protected Areas** in Southeast Asia with a range of 1500 to 1800 MPAs of diverse regulation status. While famous marine parks such as Tubbataha reef are managed at a national level (under the NIPAS act) with the ambition to protect and enhance biodiversity, most marine protected areas are locally managed. Understanding the close relationship Filipinos have with the ocean and the dependance coastal communities have on its resources, locally-managed marine protected areas are established as a tool to protect and enhance food security for the people. Through regulating human activities and pressures in set areas and ensuring the preservation of healthy, biodiverse key ecosystems such as coral reefs, seagrass and mangroves; they are part of a national strategy to balance the impacts of fishing practices and other human activities and ensure sustainability of the coastal resources.

Targets for MPA coverage in the Philippines have been specified in the 1998 Fisheries Code legislation, which calls for **15% of coastal municipal water**s (within 15 km of the coastline) to be **protected** within **no-take MPAs**, and in the Philippine Marine Sanctuary Strategy (Areco et al 2004), which aims to **protect 10% of coral reef area** in no-take MPAs by 2020.

The effectiveness of Marine Protected Areas greatly varies per sites depending on multiple factors including the establishment of a site-specific long term management strategy and allocated resources for its execution and enforcement.

Through a volunteer-based scientific diving program, Marine Conservation Philippines is focused on collecting and analysing biophysical data on locally-managed MPAs effectiveness & resilience and offer support to local and regional management units.

MCP's expertise is directed towards commercial productivity of the ecosystem as a primary indicator of effectiveness, followed by substrate composition and resilience considered as indirect indicators, being essential for maintaining productivity and food security over the long-term. MCP's ecological monitoring program has been developed to be able to provide broad understanding of the regional health and abundance of the reef ecosystems, as well as create very detailed high resolution data sets for individual MPA sites, across individual depth and species level. In this process, quality, high accuracy of the collected data and transparency remains constant priorities at MCP.

OUR MONITORING

METHODOLOGY

- Stratified Random Sampling on continuous reef.
- 30 meter transects.
- Set compass headings and depth ranges.
- Visual Census for Fish Monitoring.
- Belt Transect for invertebrates.
- Point Intercept for Substrate.

To ensure accurate representation of the MPA's ecosystems and being able to extract precise information pertinent to answer broader research questions, compliance in following a strict methodology is crucially important.

Commercial fish & invertebrates diversity, abundance and fluctuations as well as **substrate lifeforms composition & resilience** in the MPAs are being monitored on a **seasonal basis**. By collecting the same representative dataset per season, change over the seasons can be tracked, giving a much more detailed picture of change in the MPA over time. Seasons have been defined following PAGASA (Philippines Atmospheric, Geophysical and Astronomical Services Administration)'s local recommendation ([December, January, February]; [March, April, May]; [June, July, August]; [September, October, November]).

The monitoring method used employs the use of 30m transects in a **stratified random sampling** strategy that recognises **three depth ranges** (3-7, 9-13, 15-19). The depth ranges selected were chosen based on the spatial distribution of indicator life forms, and the difference in indicator densities at different depths.

In order to collect a dataset representative of the ecosystem it was necessary to identify these spatial differences and account for them to avoid bias. By **observing each depth range and treating the results as an ecologically-representative set**, it is possible to generate an accurate model of the entire reef structure and community, determine its relative health, and track changes in the ecosystem over time.

The challenge in collecting an ecologically representative dataset lies in **conducting a sufficient number of replicates** to ensure that all present life forms are accounted for. For each of our sites, monitoring is therefore conducted across the 3 depth ranges and repeated frequently enough to raise accuracy.

Since our data collection over time is partially based on citizen science and the use of a high quantity of trained volunteers, a dedicated training program has been developed to ensure quality, accuracy and standardisation of the collected data. This training is conducted so as to enhance knowledge on marine ecology and key organisms monitored, develop scientific-diving practical skills, and ensure understanding and compliance with the adopted methodology used at MCP. To ease the training, it is spread out in different "specialties" allowing volunteers to focus on relevant knowledge and skills necessary to survey one group of indicators and focus on either substrate, commercial fish or invertebrates.

Post training, applicants who wish to participate in the monitoring program survey teams are required to successfully pass relevant tests proving their ability to collect accurate data (a minimum 90% accuracy is required for passing rate in each area). Scientific diving skills and knowledge are assessed in various areas including ability to spot, identify and size organisms with high accuracy, respect of the methodology, key knowledge of the organisms monitored, dive skills and ability to dive safely in a buddy pair without endangering themselves or the environment.

For quality control, random tests are continuously carried out post-admission, to maintain the data accuracy standards in the survey teams and assess our seasonal accuracy score. If data quality of one surveyor is compromised, all the data collected by this individual until this point will be retroactively redacted and he will have to go through additional training and tests before eventually being able to participate again in data collection.

Substrate Monitoring

- Random Stratified Sampling with 30 meter transects on continuous reef.
- Point intercept transects every 25cm.
- Substrate lifeforms identification (16 main life form groups).
- Additional Hard Coral classification per growth forms (9 groups).
- Health assessment for organisms of the phylum Cnidaria.

Surveys conducted at MCP use a stratified random sampling methodology. To monitor substrate lifeforms composition and resilience, a point intercept transect method is used with the identification of each substrate organism lying directly under a point marked every 25cm of the transect line.

Each transect is 30m long, resulting in 120 points to be recorded. Abundance of the substrate lifeforms is recorded using a tally, surveyors are trained to identify and collect additional data on coral health such as signs of bleaching, diseases, predation, infestation, siltation and death.

The monitoring should be conducted over continuous reef, hence all substrate surveys should have less than 10m of sand (i.e. less than 40 sand tallies) in one transect. The method involves a dive buddy team: one person identifies the substrata and records it. The buddy using a belt transect method similar to the invertebrate methodology, looks for 3 main coral predators and marine debris on the reef and records abundance and size.

Commercial Fish Biomass and Abundance

- Random Stratified Sampling with 30 meter transects on continuous reef
- Visual census survey method on 2.5 meter on each side of the transect line with recording of fish population in that zone.
- Transect area must have been left undisturbed for 15 minutes minimum before starting the survey.
- Survey length of 10 minutes.

Surveys conducted at MCP are using a stratified random sampling methodology. To monitor commercial fish biomass and abundance, a visual census survey method is used on a modified belt transect of 5 meter total, 2.5meter on each side of the transect wide) x 30meter length to cover a full area of 150m squared each transect. Before starting a survey, the transect area (with tape laid out) must have been left undisturbed for 15 minutes minimum to allow fish behaviour to return to normal. The total survey length is 10 minutes with the identification and sizing of all indicator fish passing in that zone during this time. The indicator list recognises 26 fish families and 30 additional target species at all different stages of maturity. Most have been selected for their commercial value to various local stakeholders such as various species of Snappers, Groupers, Tunas, Jacks etc. Some have however additionally (or primarily) been selected for their function role, habitat or diet (browsers, scrapers, small or larger excavators, detritivores, etc.) and are used in analysis as indicators of health of an ecosystem.

Fish are identified and measured in 5 centimetre increments to estimate biomass and maturity stage. Increments start at 0-5, 5-10, 10-15 etc. Specific biomass coefficients were found in literature and selected for species in the Philippines or closest region too, with the best accuracy. When not available, biomass coefficients for family are used. Using the midpoint of the size range as fish length.

The monitoring should be conducted over continuous reef, hence all surveys should have less than 10m of sand in one transect. The method involves a dive buddy team: one buddy on each side of the transect line performing parallel recordings in 2.5 meter wide zone on their sides. They work together to ensure they not recording the same fish (with set protocols when organisms are moving from one side to the other) and will later on merge the data collected as one survey replicate.

Commercial Invertebrates Abundance

- Random Stratified Sampling with 30 meter transects on continuous reef.
- Belt transect method.
- ·5 meter wide x 30 meter length transects.

Surveys conducted at MCP are using a stratified random sampling methodology. To monitor commercial invertebrates abundance, a belt transect method is used with 5meter total x 30meter length to cover a full area of 150m squared each transect. Invertebrates are identified, tallied and measured in centimetre increments to estimate abundance, biomass (for some) and maturity stage. The increments are similar to the fish methodology (i.e 0-5, 6-10, 11-25, 26-30 etc). The indicator list recognises 8 groups of organisms and 55 species at all different stages of maturity. Most organisms have been selected for their commercial value to various local stakeholders such as edible cephalopods, arthropods, sea cucumbers, and gleaned gastropods and bivalves. Some however (such as corallivore organisms prone to outbreaks or herbivorous organisms) are monitored and analysed for their ecological value as indicator of health of an ecosystem.

Training at MCP

Monitoring training can take from 3 to 4 weeks average for 1 specialty. Training length varies depending on the speciality selected (various size and complexity of the indicator lists and requirements to master before being able to do surveys) but also sight, learning abilities and dive skills of the students. Training includes theoretical knowledge as well as practical experience and is organised in small groups of 2 - 4 volunteers (sometimes more for classroom session).

Specialties are selected by the science team depending on the timeframe available by the students in monitoring as well as their profiles and skills.

Introduction Week

1 week of introduction to refresh dive skills and marine ecology

Substrate

Average training time: 2 weeks

Identification training

3 presentations, 6 dives average 1 week

Method & ID-practice

2 dives /day, avg 1 week

Surveys tests

Avg 1 - 2 days

Invertebrates

Average training time: 3 weeks

Identification training

3 presentations, 6 dives average 1 week

Method & ID-practice

2 dives /day, avg 2 weeks

Surveys tests

Avg 1 - 2 days

Fish

Average training time: 3 weeks

Identification training

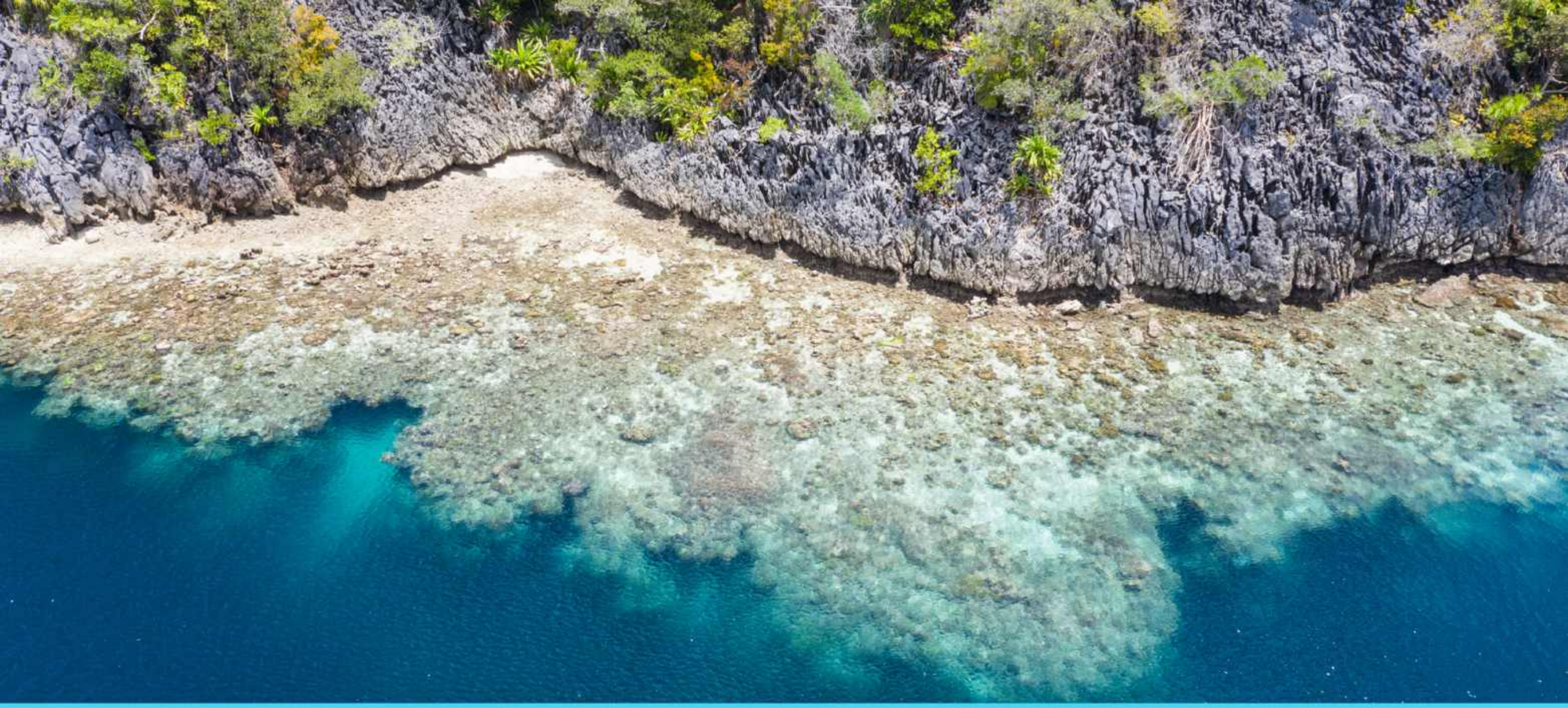
3 presentations, 6 dives average 1.5 week

Method & ID-practice

2 dives /day, avg 2 weeks

Surveys tests

Avg 1 - 2 days



Even if it's enjoyable, the weeks of training are intense, and participants generally find it very rewarding to finally be able to do surveys and be part of the ecological monitoring team. From their arrival at base to the time they are finally ready to conduct surveys independently (in buddy pairs), each volunteer's understanding of reef ecology and scientific diving skills will have increased dramatically. Unquestionably, the sheer amount of hours spent underwater on dive and monitoring training makes for very competent scuba divers. At this point, being able to do surveys and focus only on marine life and the underwater mission is gratifying and relaxing. Surveyors will challenge their new skills in different conditions and visit more dive sites including more advanced-level ones. For prospective volunteers reading this, we highly recommend you plan enough time to appreciate this experience, as this level of accomplishment is very gratifying and worthwhile!