Addendum: ICRI Recommended coral reef indicators

This document forms a part of the ICRI Recommendation "Inclusion of coral reefs and related ecosystems within the CBD Post-2020 Global Biodiversity Framework".

- The indicators recommended are those that are already suitable for use at the global scale.
- In addition, selected, prioritised indicators in development are recommended. It is acknowledged that this is not an exhaustive list of available indicators and should be kept under review.
- Reference to Goals and Targets relates to the structure presented in the Zero Draft of the Global Biodiversity Framework[1] published 13 January 2020.

Note on Baselines/ Reference years

- ICRI proposes to use 2020 as the reference year for measuring changes in area and integrity of coral reefs.
- It is important to note that using a 2020 baseline reference year represents an already altered state, where 50% of reefs have already been lost (IPBES, 2019). However, it will provide the strongest baseline for measuring changes and promoting the 2050 goals of increase in area and integrity closer to less altered states. Whatever date is chosen, there will be the issue of a shifting baseline. This must be acknowledged in how the results are reported.

Indicator	Relevant to Goal/ Target	Rationale for ICRI recommendation	Readiness	Currently included in Preliminary Draft Monitoring Framework?	Baseline/ Reference year
Live Coral Cover	Goal A Target 1	Critical: this is the most important coral reef indicator for use in national to global policy	Already in use at global scale	Included	The GCRMN report on the status of coral reefs will be published in 2020. This report will provide a global baseline for coral reef condition and give the most up-to-date assessment of quality and coverage of data compared to any earlier baseline date that might be selected.
Coral Reef	Goal A	This is a key metric for	Already in use at	Recommended	Sources of coral reef extent can be

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[1] CBD/WG2020/2/3

Extent		understanding the area and changing extent of coral reef ecosystems at national and higher levels	global scale	for inclusion	determined from a variety of existing data at regional and national scales. Initiatives are underway to develop a global extent layer.
Fleshy Algae Cover and Cover of key benthic groups	Goal A Target 1 Target 6	Fleshy algae are a dominant competitor to corals, indicating decline in coral reef health; algae- dominated reefs are the most likely alternative state for corals. Data on other key benthic groups is collected simultaneously with coral and algae cover, but with more variable methods (e.g. bare substrate, crustose coralline algae, cyanobacteria, other invertebrates, rubble, sand, seagrass, soft coral). Greater standardization of these will enable a more comprehensive assessment of reef health and status.	Already in use. Global analyses possible in the near future with additional standardization of methods and capacity development for use of this indicator in monitoring protocols.	Recommended for inclusion	The GCRMN Status report 2020.
Fish Abundance and Biomass	Goal A Target 1	Critical for understanding reef productivity, functioning of food webs, potential fisheries yields.	In use within many countries and multiple geographies. Efforts are underway to further standardize and collect data for global analyses.	Recommended for inclusion and further development	At present, data on fish biomass is being collected and reported on by many different agencies and organizations, at varied levels. There are persistent challenges in aggregating these for a global assessment. This is an important indicator and work needs to be accelerated to overcome current challenges.
[Percentage/	Target 2	Recommended as a measure of	Already in use	Recommended for inclusion	Determined from the World Database on Protected Areas.

area] of coral reefs included in [effectively managed] MPAs and OECMs		representativity of coral reefs as a key ecosystems.			
Index of coastal eutrophication	Target 4	Recommended to ensure that information on key pollution pressures on reefs and changes in pressure levels are measured. The ICEP methodology is based on the collection of water samples from rivers as they reach a coastline. Further studies would be needed to determine whether the ICEP could be used for coral reef nations or territories without major rivers.	Already in use (SDG indicator 14.1.1) but would need some adaptation for use in coral reef areas with no rivers. This could be possible by 2021	Included, and ICRI supports this as a useful coral reef related indicator	The ICEP is a new methodology that is not yet being used globally, and so there is no current baseline. In the interim, for SDG Target 14.1, chlorophyll-a concentration (surface waters) is to be used as a proxy indicator for eutrophication. This is already used as an indicator for eutrophication in some regions and is measured using remote sensing. Further work would be needed to determine whether this would be useful in the case of coral reefs.

Future indicators for priority development

These indicators are identified as important to be able to provide information on integrity and function of coral reef ecosystems and are currently at various stages of development with timelines within the next 5 years.

Red list of ecosystems (coral reef ecosystems): *Relevant to Goal A and Target 1*

The Red List of Ecosystems is a derived indicator that incorporates information from multiple metrics. The intention is that it provides a standardized assessment of how close an ecosystem is to collapse/disappearance. It incorporates elements of area and integrity, thus closely matching the wording for Goal A. This indicator has been applied at the regional scale and will be available for use at the global scale in 2-4 years. ICRI recommends the inclusion of this indicator for further development.

Hard coral genera richness: *Relevant to Goal A and Target 1*

This is an important indicator to use in the future for coral reef ecosystem integrity as it helps to improve understanding of coral community change and function. Methods are widely available, and data are already being collected. Global analyses will be possible in the near future once some additional standardization has been undertaken and capacity improved for data collection and analysis.

Hard coral identification to genus level is collected by professional scientists, NGOs and government agencies. Efforts are underway to make use of standardized data platforms and to ensure that these data can be made available for use in regional and global assessment processes. Additional capacity development and underwater training would help national parties measure this indicator.

Structural complexity of coral reefs: *Relevant to Goal A, Target 1, Target 6*

This indicates carbonate architecture and complexity available for recruit settlement and survival of juvenile corals and reef fish, and provides important information on the expected function of the system. It also provides important insights for Goal A. Methods are widely available and data are already being collected by existing monitoring efforts. Global analyses will be possible in the near future with some additional standardization and capacity development.

Baseline: Methods and data are sufficiently standardized for larger scale and regional analyses (see Graham and Nash 2013, Darling et al. 2017).

CATAMI Classification Scheme: *Relevant to Goal A, Target 1*

Collaborative and Annotation Tools for Analysis of Marine Imagery and video is a standard classification scheme for scoring marine biota and physical characteristics from underwater imagery. This provides a standardised approach for the transformation of underwater raw imagery to quantitative information useful for science and policy decisions.

The tool can provide a pathway to generate information at increasingly greater levels of detail over time to understand benthic habitats (from morphology to taxonomy) over time, whilst remaining comparable between sites. Currently used in Australia, but has potential to

be rolled out on a global scale. Reference: Althaus et al., 2015
https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0141039. The application of this classification system can also facilitate the standardization of coral reef map derived from remote sensing application allowing multi-sites and time-series comparison analysis.

Carbonate budgets: *Relevant to Goal A, Target 1, Target 6*

The indicator is used as a proxy for understanding the function of coral reefs and the impacts of climate change by determining if the reef is accreting, eroding or static. This is an example of an ambitious indicator that would be important to have on-line within 10 years.