Konservasi
Alam Nusantara
Untuk Indonesia Lestari

TERM OF REFERENCES (TOR)

Reef Health Monitoring in the Conservation Area Reserve of Lingga Regency and Batam City, Riau Islands.

A. BACKGROUND

Yayasan Konservasi Alam Nusantara (YKAN) and its partners will initiate the KORALESTARI Program funded by the Global Fund for Coral Reef (GFCR) in 2024. KORALESTARI aims to protect and restore coral reefs in Indonesia from destructive fishing, environmentally unfriendly cultivation, unsustainable coastal development, pollution on land and at sea, the impact of climate change, and invasive species. KORALESTARI is also a mixed funding that will support activities and investments in the blue economy that positively impact coral reefs.

The KORALESTARI Program will take place in 2024 - 2029 in three priority areas: (i) Berau, East Kalimantan; (ii) Sawu Sea, East Nusa Tenggara, and (iii) Natuna Sea, Riau Islands. The vision of the KORALESTARI Program is a transformation in coral reef protection and restoration efforts through sustainable financing from Marine Conservation Areas (KKP) and encouraging a blue economy that has a positive impact on coral reef sustainability, which can increase the income of surrounding communities, promote inclusiveness, and increase coastal resilience to climate change.

In 2024, an initial survey was conducted using the manta tow method to map the existing conditions of coral reef ecosystems in the Prospective Coastal and Small Islands Conservation Areas (KKP3K) of Lingga Regency, Riau Islands. The survey covered twenty villages with a total observation route of 325.7 km. This survey showed that the average percentage of live hard coral cover (HCL) in the waters of Lingga Regency was 46.4%, which is included in the moderate damage category. Several coral reef locations with good categories were also successfully identified as indicators for monitoring ecosystem health.

The Batam City KKP3K Reserve, which is geographically directly connected to the Lingga Regency KKP3K, to support the design of the Batam City KKP3K zoning in the process of determining the Batam City KKD, needs to carry out an initial survey phase to determine the health conditions of the coral which are currently still limited. The manta tow method is a coral reef observation technique where observers conduct underwater observations by holding onto a manta board tied to an 18-meter rope and pulled behind a small boat. This technique is easy in large coral reef areas and requires fast time with reasonably accurate observation results. Thus, it can provide a precise picture of the locations of coral reefs that are still good and those that have been damaged.

Furthermore, as one aspect of assessing the effectiveness of conservation area management (EVIKA), repeated monitoring is needed, which can provide essential data and information on

changes in the population of indicator biota in the coral reef ecosystem as a benchmark for the success of the intervention of the resource management and protection program. The collection of coral reef health data and information is carried out in a time series, where the study baseline (T0) is the initial measure for assessing the health of the coral reef ecosystem. In addition, monitoring coral reef health is one aspect of determining the effectiveness of conservation area management.

B. OBJECTIVES OF THE ACTIVITY

1. Carrying out coral reef health monitoring in the Prospective Marine Conservation Area of Lingga Regency.
2. Obtaining data and information on the health status of coral reefs and fish biomass in the Prospective Marine Conservation Area of Lingga Regency.
3. Obtaining data and information on the location of coral reef restoration at the target village locations (Senayang and Laboh) in the Prospective Marine Conservation Area of Lingga Regency.
4. Carrying out coral health monitoring using the Manta Tow method in the Prospective Marine Conservation Area of Batam City.

C. OUTPUT OF THE ACTIVITY

1. Availability of data and information related to the percentage of live coral and megabenthos coverage.
2. Availability of types, sizes, abundance of individuals, and biomass of coral fish.
3. Availability of coordinates for permanent transect locations.
4. Availability of data and information related to the percentage of substrate coverage (live hard coral, dead hard coral, soft coral, sand, rubble/coral fragments, macro algae, and others).
5. Availability of data and information on reef slope angles, coral damage, water clarity, distribution and abundance of marine mammals, turtles, crown-of-thorns starfish, and sizeable marine biota.
6. Availability of coordinates for locations and monitoring routes from GPS.
7. Availability of information on recommendations for coral reef restoration locations at target village locations (Senayang and Laboh).
8. Availability of monitoring result maps and monitoring reports along with documentation of activities.

D. TIME AND PLACE OF IMPLEMENTATION OF ACTIVITIES

Survey activities were carried out in March and April in Lingga Regency with a total of 24 observation points and Batam City with an observation route of 74.6 km, more detailed point locations can be seen in Attachment 1. Activities to be carried out in March - May 2025 include completing the final report.

E. IMPLEMENTATION METHODS

Coral reef health monitoring using the underwater photo transect (UPT) method refers to Giyanto et al. (2017), which was carried out by a survey team with time allocation in appendix 2. Briefly, the monitoring stages are carried out with the following stages:

Coral Reef Monitoring

1. Name the permanent transect station and record its coordinates using GPS. If it is an old location (repeat location for monitoring), ensure the transect position at the research location matches the coordinates of the previously recorded observation transect position.
2. Write the station's name on the board (slate) where data will be collected soon.
3. Determine the starting point of the transect, then install iron stakes and buoys, two units each, as permanent transect markers.
4. Install the sausage buoy at the starting point until it rises to the water's surface so that people on the boat can determine the transect's starting point.
5. People on the boat take pictures of the land view from the transect location without using zoom (enlargement) or using zoom. Taking photos without zoom can provide an idea of how far the transect position is from the mainland, while taking photos with zoom can give an idea of the general picture of the beach/land, including the vegetation on the beach.
6. The diver in charge of drawing the transect line begins to place the transect line with.
7. Using a 50-meter roll meter (scaled tape) at a depth of about 7-8 m parallel to the coastline, starting from the starting point as meter 0.
8. Take pictures or videos with the same camera of habitat conditions around the transect line to get a general picture or description of the bottom of the waters around the transect line.
9. Take data by taking underwater photos, where the angle of the photo is perpendicular to the substrate base. The minimum area of the photo field is 2552 cm2 or (58 x 44) cm. So, the data taker only takes pictures of the substrate that are as wide as the size of the iron frame. The frame is painted with bright and easily visible colors (contrasting with the substrate color), where the four corners are painted with different colors from the colors on the sides of the frame, the shooting starts from the 1st meter on the left side of the transect line (the part closer to the land) as "Frame 1", continued with taking photos at the 2nd meter on the right side of the transect line (the part further from the land) as "Frame 2", and so on until the end of the transect. So, frames with odd numbers (1, 3, 5, ...) are taken on the left side of the transect line, while frames with even numbers (2, 4, 6, ...) are taken on the right side of the transect line.
10. For hard corals that are small or in a somewhat hidden place, so that it is thought to be challenging to identify from the photo, another photo can be taken at a closer distance as an aid photo to specify the name of the species.
11. After all the photos are finished, write the name of the station where the photo was taken on the slate and "Done." This will make it easier for us to manage the photo files that were taken earlier.
12. Next, the photos stored in the camera memory are ready to be managed to be more organized before photo analysis.

Photo Data Analysis

Photo frame data analysis used CPCe (coral point count with excel extensions) software. The number of random points used was 30 for each frame, which was representative for estimating the percentage of category and substrate cover (Appendices 5 and 6).

Reef Fish Monitoring

Accurate fish monitoring was carried out using the Underwater Visual Census (UVC) method which refers to Edrus et al. (2017). Briefly, the monitoring stages were carried out with the following stages:

1. Complete the basic information on the coral fish observation data sheet before diving (Appendix 2).
2. Stretch a 70-meter roll tape in the coral reef area at a depth of 7-8 m (constant depth) with a stretch pattern parallel to the coastline. The island's position is to the left of the tape measure calculated from the zero meter point.
3. After the meter roller is installed, wait around 5 – 10 minutes for the fish that had left to avoid returning to their original place, record each type (species name) and abundance of coral fish (corallivorous, herbivorous and carnivorous fish) (Appendix 3) found along the 70 m transect line with the right and left boundaries each 2.5 m apart. So the observation area covers 350 m2. Fish outside the transect area do not need to be recorded.
4. Apart from corallivorous, herbivorous, and carnivorous fish, coral fish are endangered or protected, and other essential notes need to be recorded if they are found during monitoring (Table 1).
5. Record the estimated total body length of herbivorous and carnivorous fish along with the number of individual fish within the length range (for example, there are six individuals of fish with a length of 20 cm. Size is not required for corallivorous fish; only the number of individuals is recorded according to their respective types.
6. Documentation (photos and videos) of monitoring activities and fish that are difficult to identify directly.
7. Re-identification of certain types of fish through photos/videos using literature books.

Table 1. Types of data collected in the coral fish monitoring process

Katagori	Famili	Data yang dicatat
Corallivorous	Chaetodontidae	1. Jumlah jenis 2. Kelimpahan individu setiap jenis
Herbivorous	Scaridae Siganidae Acanthuridae	1. Jumlah jenis 2. Kelimpahan individu setiap jenis 3. Estimasi ukuran panjang total
Ikan target	Serranidae Lutjanidae Haemulidae Lethrinidae	1. Jumlah jenis 2. Kelimpahan individu setiap jenis 3. Estimasi ukuran panjang total
Endanger species	E.g : *Cheilinus undulatus*, *Pterapogon kauderni*, beberapa spesies hiu & pari	1. Jumlah jenis 2. Kelimpahan individu setiap jenis 3. Estimasi ukuran panjang total
Catatan penting		1. *Spawning agregation spesies* tertentu 2. Hadirnya *massive species*. 3. dll

Data Analysis

Data analysis and presentation include:

1. Diversity of species and abundance of corallivorous fish (Chaetodontidae)
2. Diversity of species, abundance of individuals, size, and biomass of herbivorous fish (Scaridae, Acanthuridae, and Siganidae). Abundance values are converted into units of individuals/ha and biomass is converted into units of kg/ha,
3. Diversity of species, abundance of individuals, size, and biomass of target fish or consumption fish (Serranidae, Lutjanidae, Haemulidae, and Lethrinidae). Abundance values are converted into units of individuals/ha and biomass is converted into units of kg/ha,
4. Notes on the discovery of endangered species and other important notes.

Coral Reef Monitoring using the Manta Tow method

Coral reef monitoring using the manta tow method in KKP3K Batam City is carried out by a survey team with route allocation in Appendix 1. The monitoring method refers to Fajariyanto (2012). In short, the stages of manta tow monitoring are carried out with the following stages:

1. Determining the location and route of the manta tow, in this activity to represent the distance traveled on the Batam City KKD of 74.6 km (Attachment I)
2. The work plan and timeline for manta tow monitoring are prepared with the involvement of related parties. Weather and tidal data from the manta tow location are collected.
3. A base map of the location and route of the manta tow is made with a scale of 1:150,000. Other equipment is prepared, and the manta tow route is uploaded to GPS
4. Coordination with local stakeholders before the survey to ensure the smooth implementation of manta tow monitoring. The survey team visits the location with assistance from local stakeholders.
5. Manta tow monitoring is carried out by:
    - Collecting information on weather conditions, tides, and descriptions of water conditions from fishermen or residents before conducting a manta tow,
    - Preparing equipment, surveyors who act as observers fill in the data table for monitoring manta tow in Appendix 7
    - Surveyors who act as guides and GPS fill in the data sheet for the coordinates of the location and time of the manta tow and the incidental monitoring data sheet for marine mammals/extensive marine biota (Appendix 6) when seeing marine mammals/extensive marine biota,
    - Observers document the underwater conditions with the underwater camera positioned perpendicular to the bottom, and try to get one point with the location coordinates.
    - Documentation is also carried out when seeing marine mammals (whales, dolphins and dugongs), turtles, sharks, manta rays, napoleon wrasse, schooling snapper/grouper, bumphead parrotfish, or other sizeable marine biota.

- Observers are pulled between the coral reef flats and the reef crest, at a constant speed of between 3-5 km/hour,
- Coral reef observations are carried out for 2 minutes, then stopped for a while to record data,
- Observers take turns every 10 pulls/towing to maintain data quality and avoid fatigue factors,

6. Observation standardization is carried out to minimize data bias between observers.
7. Data is entered into a database and arranged in Excel format.
8. a map of the manta tow monitoring results is created using information from the database and GIS software.
9. Data analysis is carried out to assess the condition of the coral reef, according to the established assessment categories, and the results are compiled in a report.

Reporting

Reporting on coral reef health monitoring activities and Manta Tow at least consists of:

1. Introduction
2. Methodology
3. Results and discussion
4. Conclusions and Recommendations
5. Bibliography
6. Attachments

F. PARTICIPANTS OF THE ACTIVITIES

Coordination Team of the Nusantara Nature Conservation Foundation:

1. Rizya Ardiwijaya
2. Evi Nurul Ihsan
3. Dhika Rino Pratama

RHM Team:

1. Surveyor Team as Roll Master
2. Surveyor Team as Observer UPT 1
3. Surveyor Team as Fish Observer

Manta Tow Team:

1. Surveyor Team as Observer 1
2. Surveyor Team as Observer 2
3. Surveyor Team as Observer 3

G. ANGGARAN

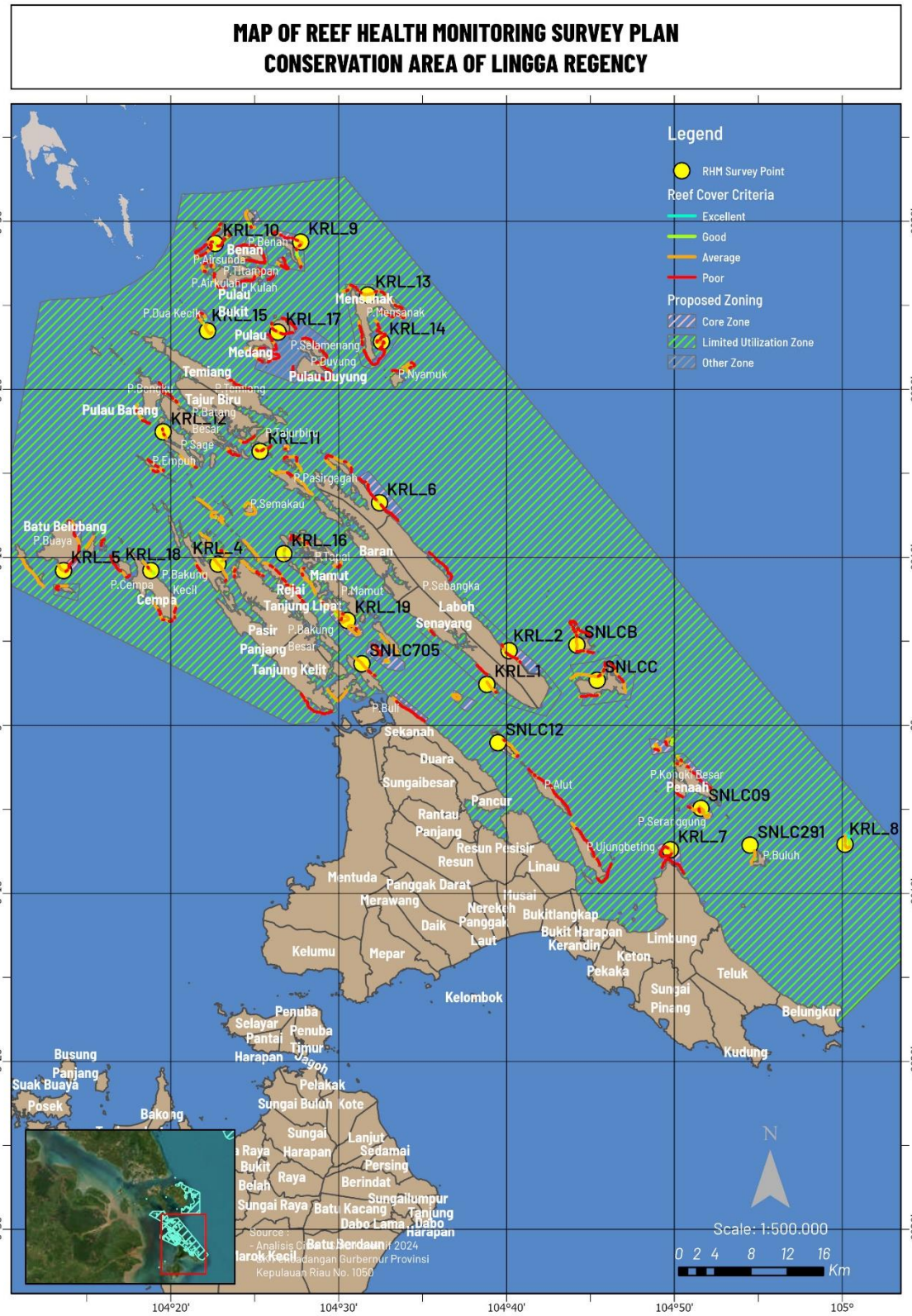
The budget for this activity comes from the KORALESTARI Program of the *Yayasan Konservasi Alam Nusantara*. It is used by applicable provisions and policies with the aim of the plan activities.

H. KONTAK

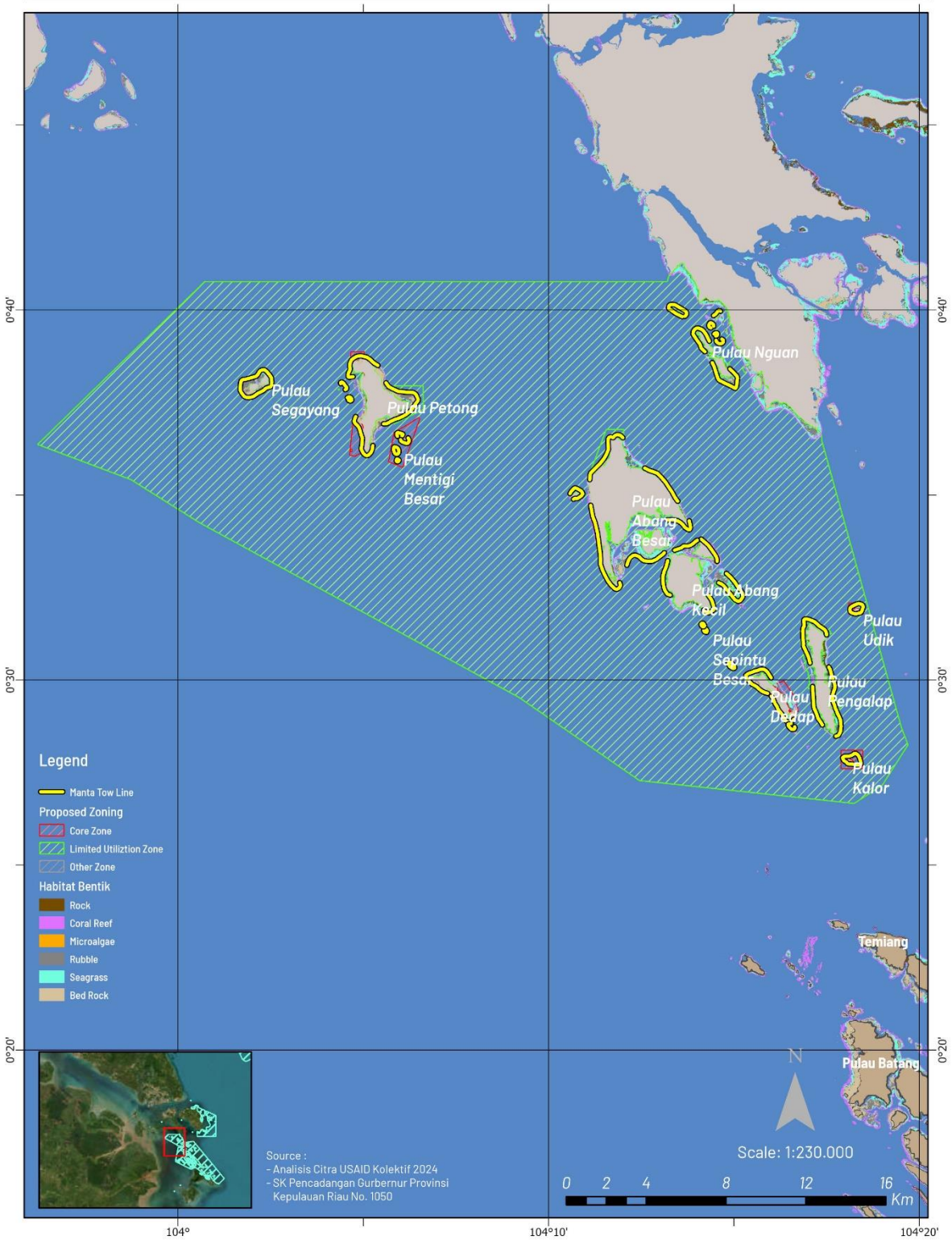
For further information, please contact

1. Evi Nurul Ihsan/ (*Yayasan Konservasi Alam Nusantara* - MPA Coordinator) evi.ihsan@ykan.or.id – 0813-2897-6003
2. Dhika Rino Pratama/ (*Yayasan Konservasi Alam Nusantara* - Conservation and Monitoring Coordinator Kepulauan Riau) dhika.pratama@ykan.or.id - 0813-7584-0385

Annexes 1. Coral Reef Health Survey Plan Map of KKD Lingga Regency and Batam City.



MAP OF MANTA TOW METHOD CORAL REEF MONITORING SURVEY PLAN CONSERVATION AREA OF BATAM CITY



Annexes 2. Identification of benthic categories and coral reef substrates

Acropora (AC)

Acropora Branching (ACB)
Karang Acropora bentuk koloni bercabang

Acropora Tabulate (ACT)
Karang Acropora bentuk koloni datar seperti meja

Acropora Digitata (ACD)
Karang Acropora bentuk koloni menjari

Acropora Submassive (ACS)
Karang Acropora bentuk koloni sub masif

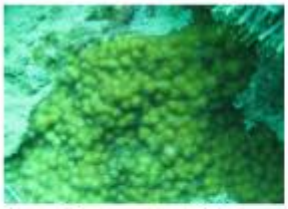
Acropora Encrusting (ACE)
Karang Acropora bentuk koloni mengerak/merayap

Non Acropora (NA)

Coral Branching (CB)
Karang Non Acropora bentuk koloni bercabang

Coral Massive (CM)
Karang Non Acropora bentuk koloni masif

Coral Submassive (CS)
Karang Non Acropora bentuk koloni submasif



Coral Encrusting (CE)
Karang Non Acropora bentuk koloni merayap/mengerak mengikuti bentuk substrat di bawahnya, bagian pinggir koloni menempel rapat dengan substratnya

Coral Foliosa (CF)
Karang Non Acropora bentuk koloni lembaran atau seperti daun, bagian pinggir koloni tidak menempel pada sub-stratnya.

Coral Mushroom (CMR)
Karang Non Acropora bentuk seperti jamur, koloni tidak menempel pada substrat dasar

Coral Millepora (CME)
Termasuk kelompok karang lunak berkapur, bentuk koloni bercabang, lembaran dan merayap/mengerak, dikenal juga dengan karang api, jika disentuh akan terasa panas di kulit

Coral Heliopora (CHL)
Termasuk kelompok karang lunak berkapur, bentuk koloni lembaran, jika bagian koloni dipatahkan akan terlihat bagian biru di dalamnya, sehingga dikenal juga dengan nama karang biru

Coral Tubifora (CTU)
Termasuk kelompok karang lunak dengan rangka seperti pipa tersusun bertingkat, warna merah

Sumber: www.aims.org

Death Coral With Algae (DCA)
Karang mati telah ditumbuhi algae, terutama dari turf algae dan filamentous algae, bentuk koloni masih kelihatan jelas.



Soft Coral (SC)

Kelompok karang lunak dari Kelas Anthoza Subkelas Octocoralia, koloni lunak dengan rangka spikula, bentuk koloni beragam

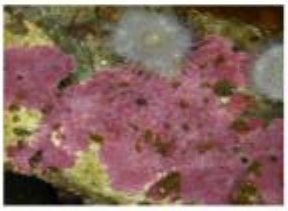

Sumber: www.whittenfamily.com


Sumber: www.accessmaa.noaa.gov


Sumber: www.reefatlas.ws

Sponge (SP)

Semua kelompok sponge laut, dari Filum Porifera, bentuk koloni bergama, dari lunak, keras atau kasar, terdiri dari rangka spikula

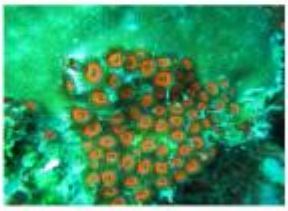


Coraline Algae (CA)

Kelompok algae berkapur, bentuk pipih merayap, warna merah bata, coklat

Algae Hallimeda (HA)

Kelompok algae berkapur dengan thalus berwarna hijau, bentuk plate tersusun vertikal, terkadang ditemukan melimpah dan membentuk pasir kapur Halimeda,



Zooanthid (ZO)

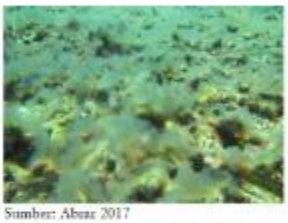
Kelompok benthos terumbu dari Philum Cnidaria kelas Anthozoa, sub kelas Hexacoralia, ordo Zoantharia, umumnya berkoloni terdiri dari banyak individu polyp. Tubuh lunak tidak memiliki rangka, stolon adalah bagian jaringan yang menghubungkan masing-masing polyp dalam koloni. Ciri utama dari zooanthid adalah semua tentakelnya persis berada di bagian pinggir lempeng mulut (coenosarc).

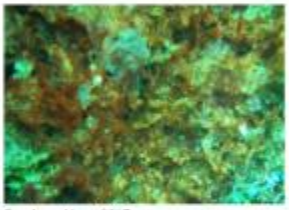

Sumber: Abrar 2007

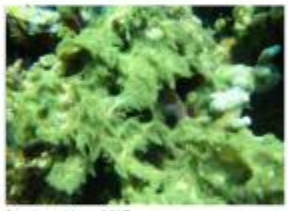

Sumber: www.biology.unm.edu

Macro Algae (MA)

Semua kelompok algae berthalus dari famili Clorophyta, Rhodophyta dan ....


Sumber: Abrar 2017


Sumber: Abrar 2017


Sumber: Abrar 2017

Turf Algae (TA)

Kelompok algae dengan thalus seperti lembaran halus (filamentous) bentuk thalus seperti benang-benang halus, lumut atau rambut.

Death Coral (DC)

Karang mati, ditandai dengan koloni berwarna putih dari rangka kapur, tanpa jaringan polip karang



Foto Abun 2016



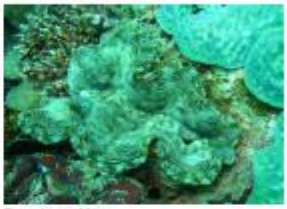


Foto Abun 2016 Foto Abun 2016 Foto Abun 2016

Others (OT)

Kelompok biota benthos lain yang berassosiasi dengan terumbu karang, antara lain moluska, ekhinodermata, crustacea, tunicata, bryozoa dan anemon

Silt (SI)

Dasar perairan berlumpur, butiran lebih halus dan lembut, jika disentuh air akan keruh dan lama kembali jernihnya

Sand (S)

Dasar berpasir, butiran lebih kasar, jika disentuh akancepat mengendap kembali dan biasanya tidak membuat air keruh



Ruble (R)

Endapan patahan karang mati dengan ukuran 10-15 cm, terpisah satu sama lain , tidak ditumbuh algae dan coraline algae


Sumber: www.mariculturetechnology.com

Rock (RCK)

Dasar perairan berbatu, dari batuan beku, batuan vulkanis ditandai dengan pantai berbatu atau cadas

Annexes 3. Reef fish observation data sheet.

Site.ID:	
Transect No:	Coordinat:
Dates:	Depth:
Time:	Tides:
Observer:	Visibility:
Weather:	Location description:
Reef (L/R):	Zone:

Family/Spesies	Number	Size (Cm)	Family/Spesies	Number	Size (Cm)
1. Chaetodontidae			***5. Siganidae***		
2. Scaridae			***6. Lutjanidae***		
3. Achanthuridae			***7. Haemulidae***		
4. Siganidae			***8. Lethrinidae***		
ETP Species			**Other**		

Others Notes:

Annexes 4. Scientific name and images of each species of reef fishes

1. Chaetodontidae

Chaetodon adiergastos

Chaetodon auriga

Chaetodon baronessa

Chaetodon bennetti

Chaetodon citrinellus

Chaetodon collare

Chaetodon decussatus

Chaetodon ephippium

Chaetodon guttatissimus

Chaetodon kleinii

Chaetodon lineolatus

Chaetodon lunula

Chaetodon lunulatus

Chaetodon melannotus

Chaetodon mertensii

Chaetodon meyeri

Chaetodon ocellicaudus

Chaetodon octofasciatus

Chaetodon ornatissimus

Chaetodon oxycephalus

Chaetodon punctatofasciatus

Forcipiger longirostris

Hemitaurichthys polylepis

Heniochus acuminatus

Heniochus chrysostomus

Heniochus pleurotaenia

Heniochus singularius

Heniochus varius

Chaetodon triangulum

Chaetodon falcula

Chaetodon rafflesii

Chaetodon trifasciatus

Chaetodon ulietensis

Chaetodon unimaculatus

Chaetodon vagabundus

Chaetodon xanthocephalus

Chaetodon ornatissimus

Chaetodon oxycephalus

Chaetodon punctatofasciatus

Chelmon rostratus

Coradion chrysozonus

Forcipiger flavissimus

2. Scaridae


Cetoscarus bicolor
Chlorurus bowersi
Chlorurus gibbus
Chlorurus microrhinos
Chlorurus strongilocephalus
Chlorurus troschelii
Chlorurus capistratoides
Clhororus longiceps
Clhororus sordidus
Scarus bleekeri
Scarus dimidiatus
Scarus flavipectoralis
Scarus forsteni
Scarus frenatus
Scarus ghobban


Scarus globiceps
Scarus hypselopterus
Scarus longiceps
Scarus microrhinos
Scarus niger
Scarus oviceps
Scarus prasiognathos
Scarus rivulatus
Scarus schlegeli
Scarus spinus
Scarus tricolor
Scarus bleekeri

3. Acanthuridae

Acanthurus *auranticavus*

Acanthurus grammoptilus

Acanthurus nigrofuscus

Acanthurus leucosternon

Acanthurus lineatus

Acanthurus nigricans

Acanthurus pyroferus

Acanthurus tristis

Acanthurus mata

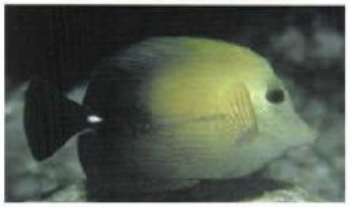
Acanthurus triostegus

Ctenochaetus tominiensis

Ctenochaetus striatus

Naso hexacanthus

Naso lituratus



Zebrasoma scopas

5. Serranidae


Aethaloperca rogaa


Anyperodon leucogrammicus


Cephalopholis argus


Cephalopholis boenak


Cephalopholis cyanostigma


Cephalopholis formosa


Cephalopholis leopardus


Cephalopholis microprion


Cephalopholis miniata


Cephalopholis urodeta


Epinephelus caeruleopunctatus


Epinephelus fasciatus


Cromileptes altivelis


Epinephelus lanceolatus


Epinephelus merra

Epinephelus ongus

Epinephelus sexfasciatus

Epinephelus tauvina

Epinephelus polyphekadion

Gracila albomarginata

Plectopomus leopardus

Plectropomus areolatus

Plectropomus laevis

Plectropomus maculatus

Plectropomus pessuliferus

Variola albimarginata

Variola louti

6. Lutjanidae


Aphareus furca


Lutjanus decussatus


Diagramma pictum


Lutjanus biguttatus


Lutjanus bohar


Lutjanus carponotatus


Lutjanus ehrenbergi


Lutjanus fulviflamma


Lutjanus fulvus


Lutjanus gibbus


Lutjanus johnii


Lutjanus lutjanus


Lutjanus lutjanus


Lutjanus quinquelineatus


Lutjanus rivulatus


Lutjanus russelli


Lutjanus semicinctus


Lutjanus vitta


Lutjanus kasmira


Macolor macularis


Macolor niger

7. Haemulidae


Plectorhinchus albovittatus


Plectorhinchus chaetodontoides


Plectorhinchus chrysotaenia


Plectorhinchus flavomaculatus


Plectorhinchus gibbosus


Plectorhinchus lessonii


Plectorhinchus lineatus


Plectorhinchus obscurus


Plectorhinchus pictus


Plectorhinchus picus


Plectorhinchus vittatus


Diagramma melanacrum

8. Lethrinidae


Gnatodentex aurolineatus


Lethrinus erythracanthus


Lethrinus erythropterus

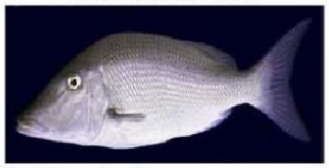

Lethrinus harax


Lethrinus olivaceus


Lethrinus ornatus


lethrinus lentjan


Monotaxis grandoculis


lethrinus lentjan

Annexes 5. Water quality data in RHM KKP3K Lingga Regency activities

Island/SiteName :	**SiteID :**
Date (dd/mm/yyyy) :	**Zone :**
Time :	**Observer :**
Temp (^{0}C)	
Salinity (ppt)	
pH	
DO (mg/liter)	
Visibility (meter)	
Current speed (m/detik)	
Others Notes	

Annexes 6. Data sheet/data table for monitoring manta tow

Tanggal :
Waktu :
Lokasi (Desa, Kec., Kab) :

Pengamat :
Swim ID :
Survey ID :

Tow ID	Sudut kemiringan terumbu	Kerusakan	Kecerahan (m)	Tutupan Substrat (Persen)								HC Growth	Penyu	Mamalia Laut	CoT	Large Fauna	Keterangan
				HCL	HCD	SC	MA	RB	RO	SA	OT						
1																	
2																	
3																	
4																	
5																	
6																	
7																	
8																	
9																	
10																	
11																	
12																	
13																	
14																	
15																	

Kerusakan :		Kecerahan :		Substrat :			
0	: No	1	: < 6m	HCL	: Hard Coral Live	MA	: Macro Algae
1	: Low	2	: 6 - 12m	HCD	: Hard Coral Dead	RO	: Rock
2	: Moderate	3	: 13 - 18m	SC	: Soft Coral	SA	: Sand
3	: High	4	: >18m	RB	: Rubble	OT	: Other

HC Growth :			
B	: Branching	S	: Sub-Massive
E	: Encrusting	T	: Tabulate
F	: Foliose	Mr	: Mushroom
M	: Massive	Mx	: Mixed

Annexes 7. Fill in the data sheet coordinates of the location and the time of the manta tow.

Swim_ID	**:**	**Tanggal**	**:**
Survey_ID	**:**	**Lokasi (Desa, Kec., Kab)**	**:**
Team Leader	**:**		

Tow ID	Koordinat		WP	Waktu		Photo ID	Keterangan
	Lintang	Bujur		Mulai	Selesai		
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							
11							
12							
13							
14							
15							
end							