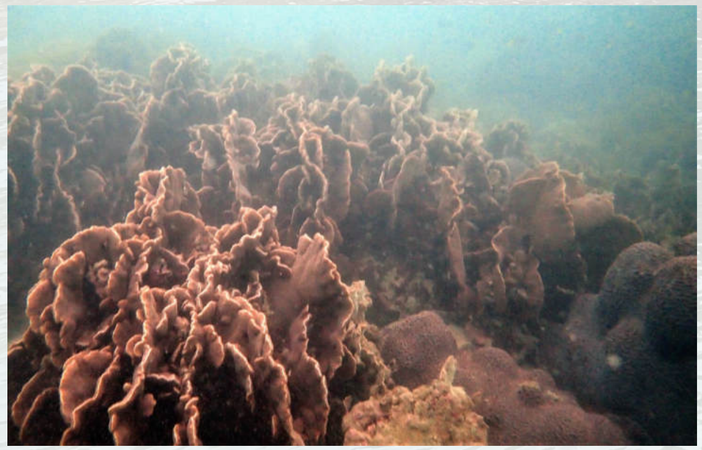
漁農自然護理署
Agriculture, Fisheries and Conservation Department

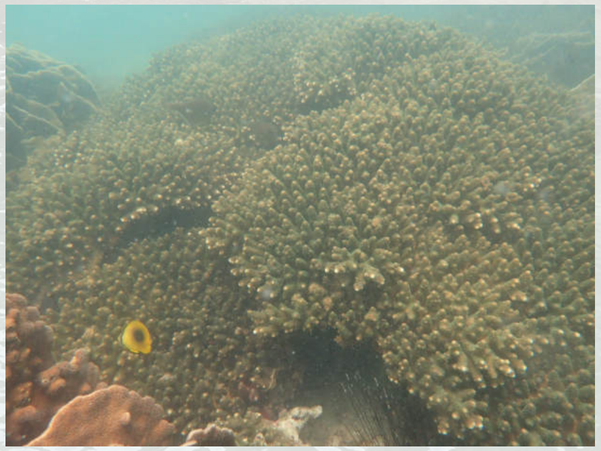
BENTHIC HABITAT MAPPING OF TUNG PING CHAU MARINE PARK

Tung Ping Chau Marine Park (TPCMP) was designated as marine park in 2001 under the Marine Parks Ordinance, protecting a total of 270 hectares of sea area. It was the fourth marine park in Hong Kong. This marine park supports rich and diverse marine habitats and species including 65 species of hard corals, 41 species of octocorals, 6 species of black corals and more than 65 species of macroalgae. It is also home to some rare octocoral species, ***Sansibia*** sp. and ***Elbeenus*** sp. The presence of such a diverse and essential seafloor habitat is home for different fish, invertebrates and is important to living marine resources and ecosystem services.

Despite a wealth of information are available on the ecological setting and features of the TPCMP, the present data does not provide a detailed map of location and the extent/ coverage of all the ecologically important habitats within the boundary of the marine park. Therefore, AFCD aims to produce a benthic habitat map of TPCMP in which important coral and macroalgae habitats and their coverage or any important seafloor features within the marine park would be mapped.



▲ *Pavona*



▲ *Acropora*

Marine Parks Featured Story

OBJECTIVES

The creation of a benthic habitat map will support the following aspects :

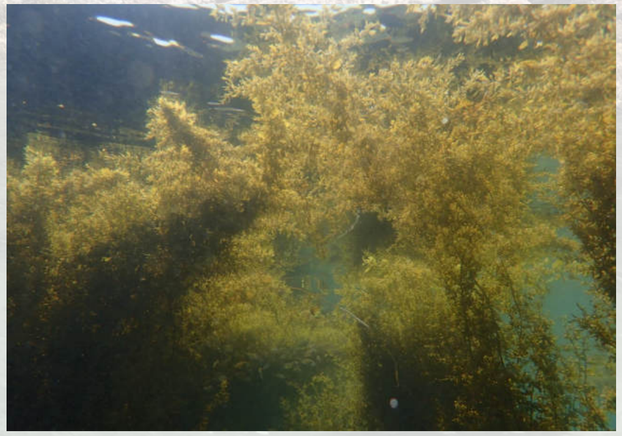
(1) To set priorities in habitat and species conservation and to facilitate the formulation and refining of management measures;

(2) To conduct scientific research programs aimed at generating knowledge of benthic ecosystems and seabed geology; and

(3) To conduct seabed resource assessments for management purposes.

Starting from 2019, AFCD and their consultant, the State Key Laboratory of Marine Pollution from the City University of Hong Kong, started conducting surveys for mapping benthic habitats in the TPCMP. This story features the major steps taken in this mapping study as at the end of 2019.

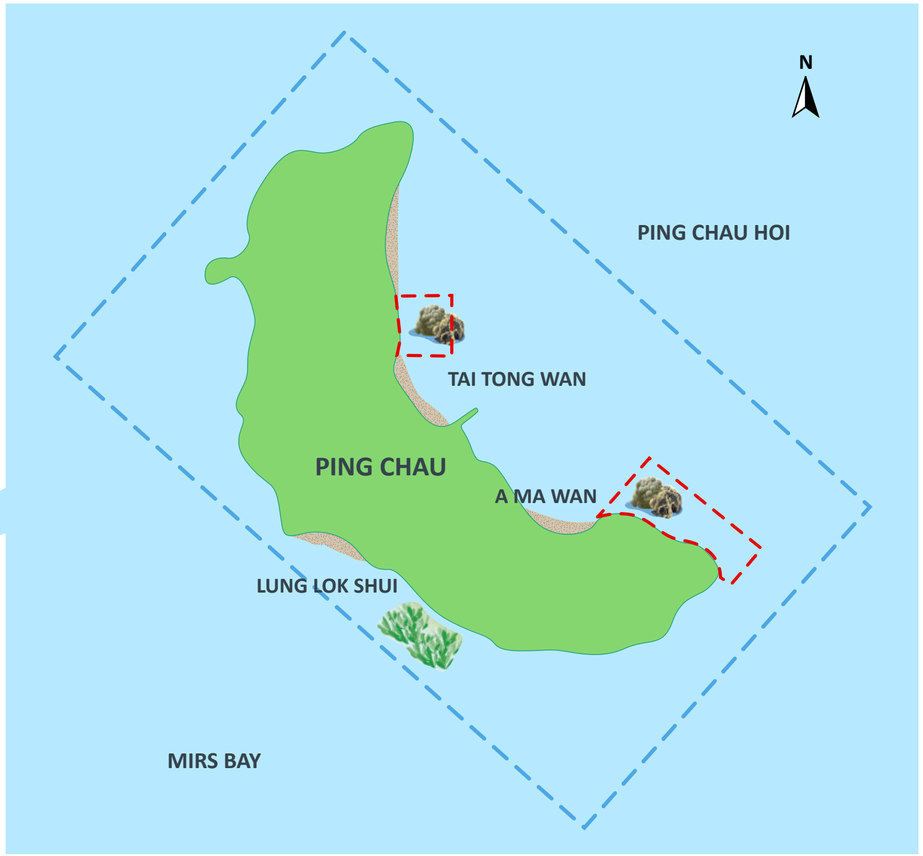
▲ *Turbinaria*



▲ *Sargassum*

LOCATION OF TUNG PING CHAU

TPCMP covers the sea area surrounding Tung Ping Chau Island located in the northeastern part of Hong Kong in the Mirs Bay. It encompasses two core areas, namely Tai Tong Wan and A Ma Wan, where hard coral communities within are protected by more conservation measures.



The boundary of the marine park is demarcated by straight lines joining boundary light buoys which have been installed at the four corners of the marine park, while in general includes the sea area below the high water mark.

IDENTIFYING HARD BOTTOM HABITAT

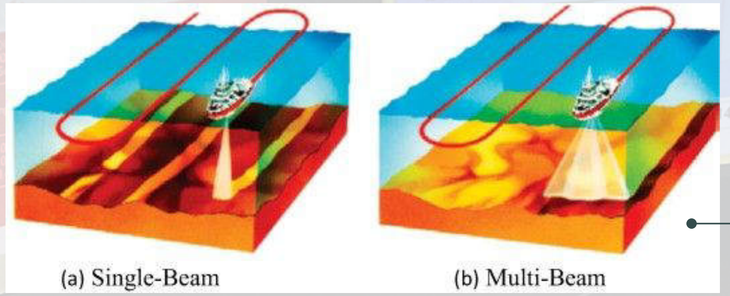
The project team collected data using rapid and non-invasive multiple acoustic imaging techniques and Unmanned Aerial Vehicle (UAV) to visualize an extensive area of seafloor to identify hard bottom habitats. Hard bottom habitats provide structure for macroalgae, octocoral and black coral species, while it can also mean an extensive formation of hard coral habitat on seafloor. The above are the target key ecological habitats to be mapped in this study.

IDENTIFYING HARD BOTTOM HABITAT

ACOUSTIC SURVEYS

1 Multibeam Echosounders (MBES)

It is a type of sonar technology from which shaded-relief topographic maps, bathymetric maps and backscattering maps can be generated which is vital for the planning of the proceeding sampling surveys for acquiring biological information in the same area. It gives information on depth (bathymetry) and texture (backscatter) of the seafloor.



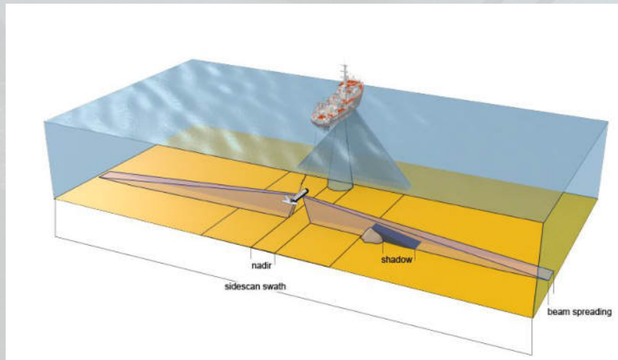
Multibeam Echo Sounder (MBES) vs. Singlebeam Echo Sounder (SBES)

2 Single-beam Echosounders (SBES)

SBES has relatively narrow beam width as compared with MBES, thus making it impracticable to do a full area search in shallow water. However, since SBES can be run on smaller vessels which have shallower draught, it can be used to acquire bathymetric data in very shallow water. It is an independent system to the MBES, and therefore by comparing results from both systems, SBES can be an excellent quality control tool.

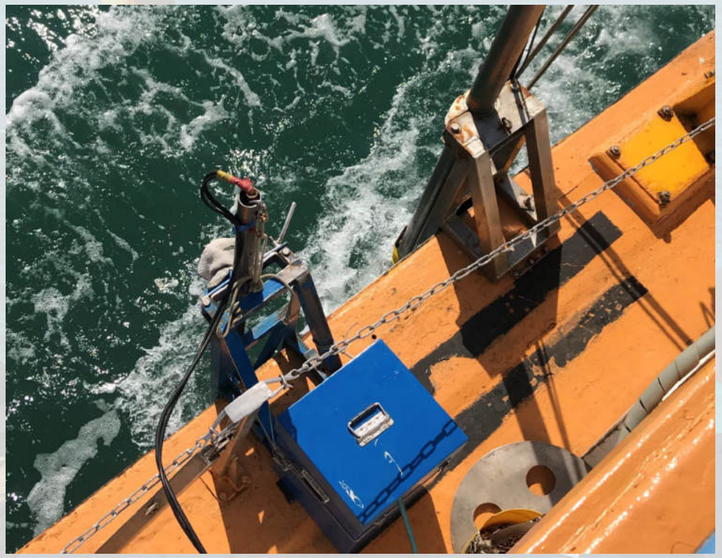
3 Side Scan Sonars (SSS)

SSS is commonly used to detect debris items, other obstructions on the seabed, such as pipelines, wrecks, or any other features and to map sediment types on the seafloor.

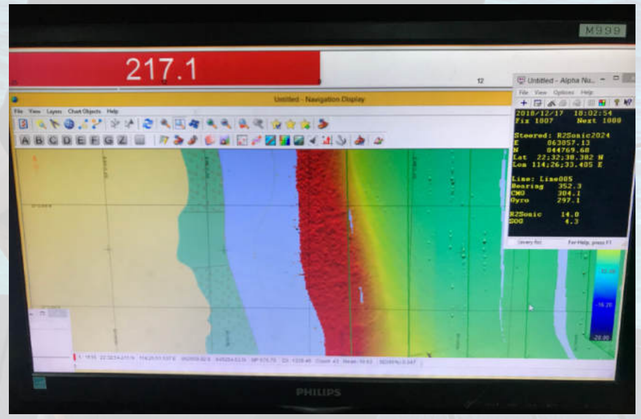


Side Scan Sonar (SSS)

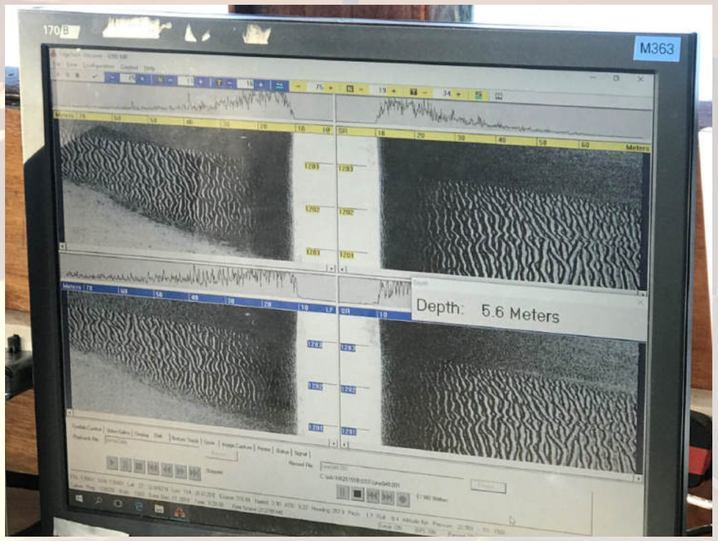
ACOUSTIC SURVEY – MULTIBEAM ECHO SOUNDER, SINGLEBEAM ECHO SOUNDER AND SIDE SCAN SONAR



▲ The deployment of Multi-beam Echo Sounder and Single-beam Echo Sounder



▲ In the process of Multi-beam Echo Sounder scanning on seafloor in Tung Ping Chau Marine Park



▲ Side Scan Sonar image showing sand riffles on seabed

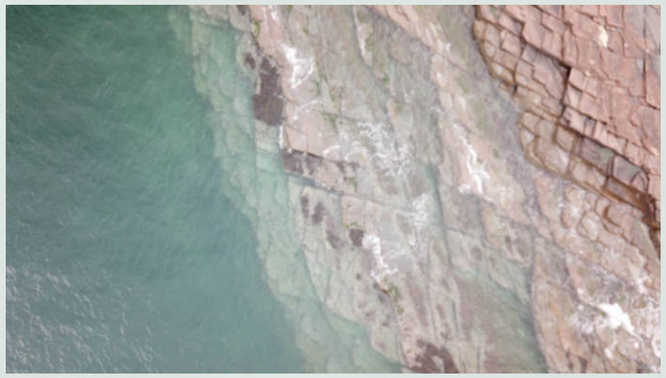
▲ In the process of Single-beam Echo Sounder scanning

▲ Bird eye view from air drone survey

UNMANNED AERIAL VEHICLE (UAV) SURVEY

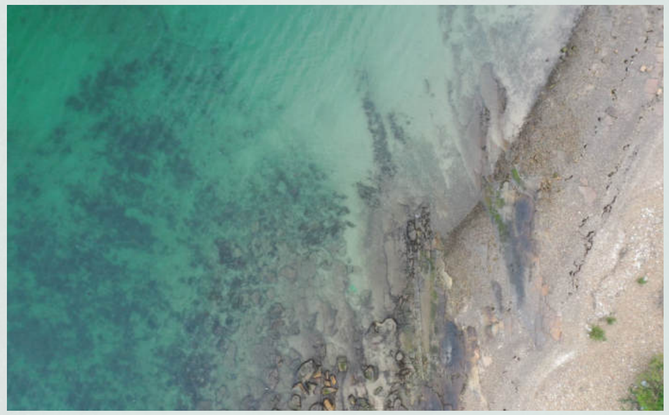
Unmanned Aerial Vehicle (UAV) Survey - UAV (aka air drone) survey is used to cover the shallow coastal areas which cannot be covered by any acoustic survey. Its aim is to look for suspected hard bottom substrate or any seabed features through aerial imagery.

▲ Aerial view of *Sargassum* patch on water surface



▲ Aerial imagery showing shallow area of Tung Ping Chau Marine Park

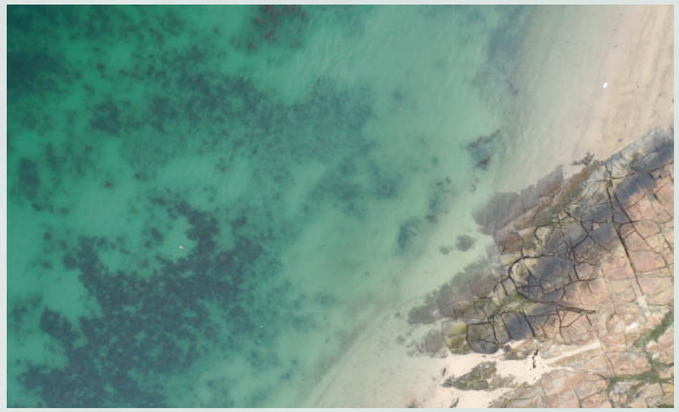
▲ The aerial view of A Ma Wan at an altitude of 60m



▲ The aerial view of A Ma Wan at an altitude of 60m

A sea turtle was spotted during the UAV survey in Tung Ping Chau Marine Park

UNMANNED AERIAL VEHICLE (UAV) SURVEY



▲ The aerial view of A Ye Wan at an altitude of 60m

▲ The aerial view of A Ye Wan at an altitude of 60m

▲ The aerial view of Cheung Sha Wan at an altitude of 60m

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▲ The aerial view of Chau Mei Kok at an altitude of 60m

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PRELIMINARY SURVEY RESULTS FROM ACOUSTIC SURVEY

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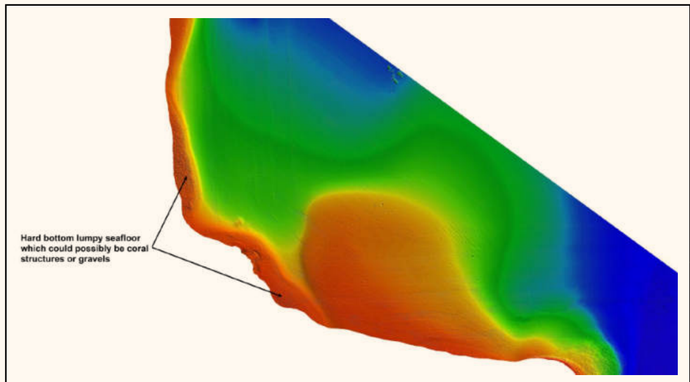
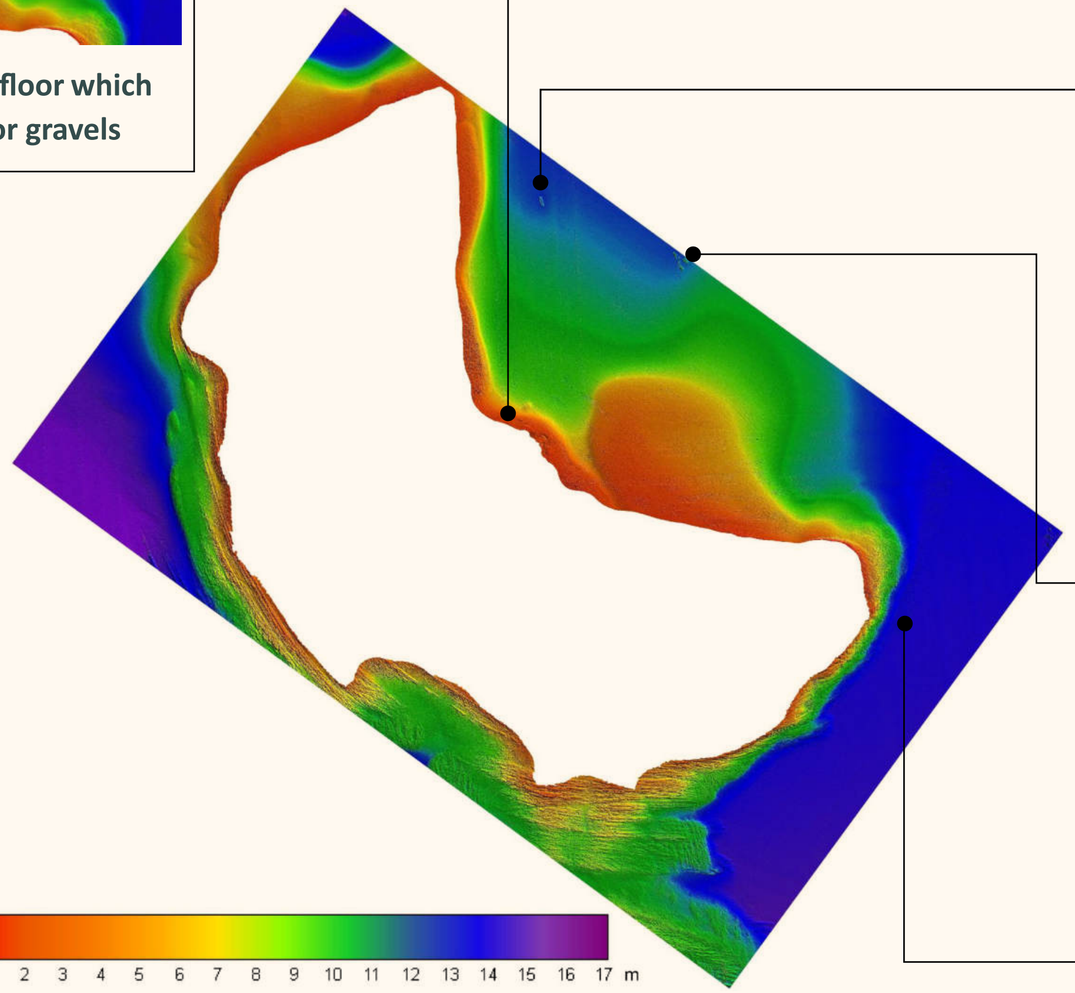
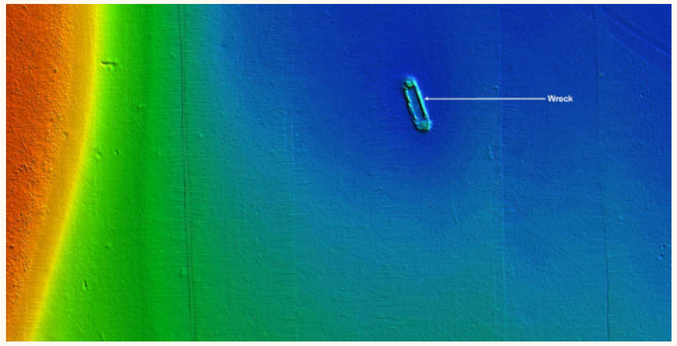


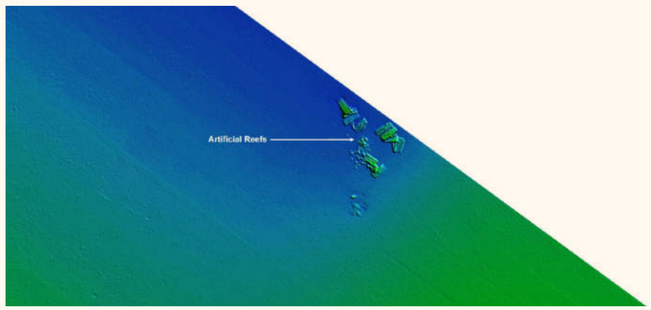
PICTURE 2: Hard bottom lumpy seafloor which could possibly be coral structures or gravels



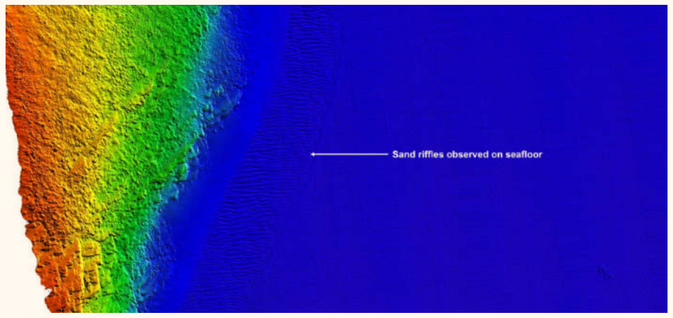
PICTURE 1: Bathymetry data from multi-beam survey



PICTURE 5: Wreck



PICTURE 4: Artificial reefs

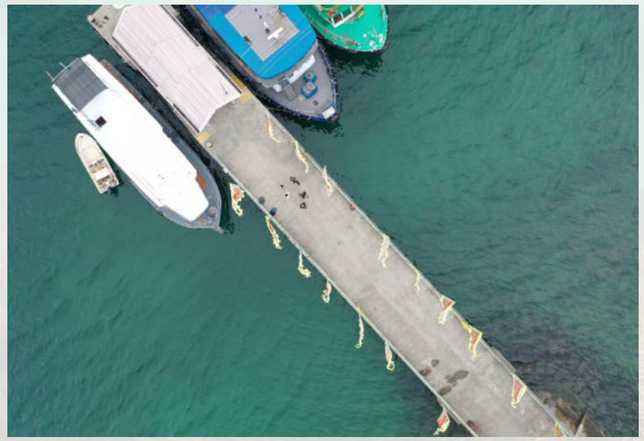


PICTURE 3: Sand riffles observed on seafloor

OPTICAL SURVEYS OF HARD BOTTOM HABITATS FOR VERIFICATION

Hard bottom habitats including wrecks have been selected from the acoustic and UAV imagery and would be surveyed using various methods, including UAV, water drone, drop camera and SCUBA diving to verify and quantify the presence/ absence and coverage of the ecologically important habitats i.e. coral and macroalgae.

▲ Conducting SCUBA diving survey

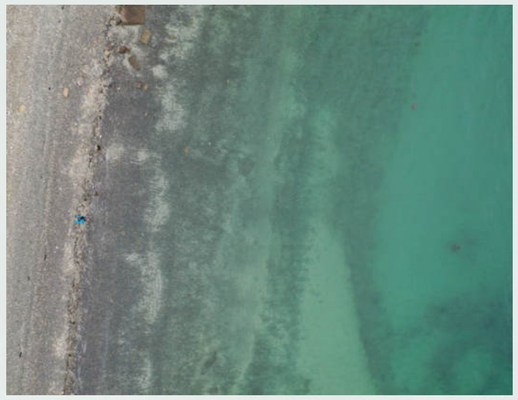


▲ Deploying UAV for air drone survey

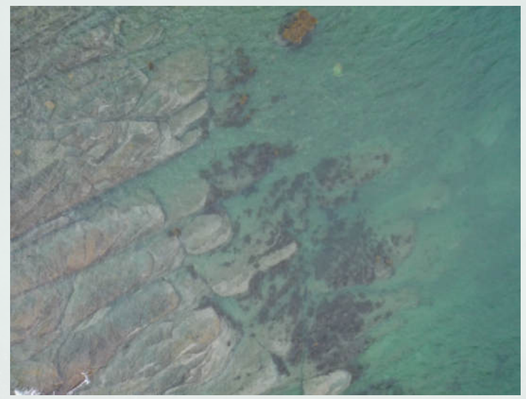
▲ Conducting shallow water survey by water drone

▲ Conducting drop camera survey

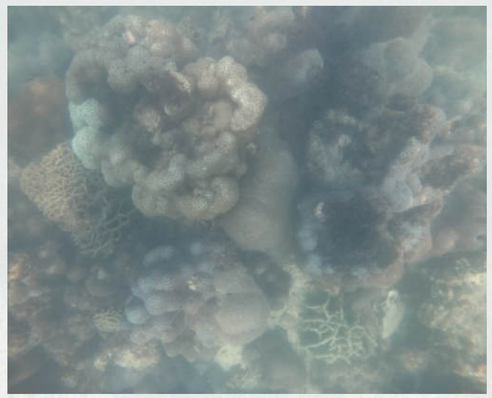
OPTICAL SURVEY IMAGES



▲ UAV flying at an altitude of 40m

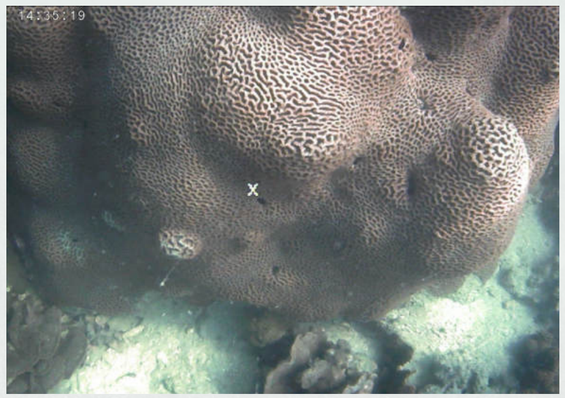


▲ Suspected macroalgae patches captured by UAV flying at an altitude of 40m

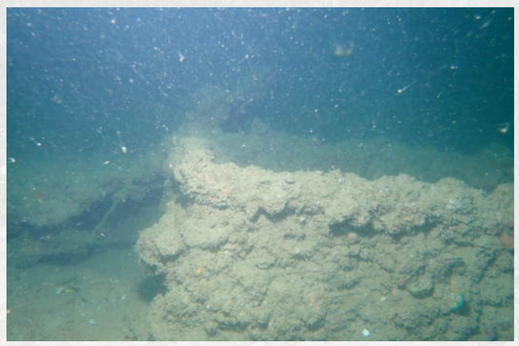


▲ Image of hard coral captured by water drone

▲ Image of *Sargassum* captured by water drone



▲ Image of hard coral captured by drop camera



▲ Survey image of wreck taken by SCUBA diver

▲ Black coral (*Antipathes* sp.) growing on the wreck

WAY FORWARD

The project team has finished conducting qualitative scanning of the seafloor from which key ecological habitats have been identified and will be verified during further quantitative survey in the coming year. By means of Geographic Information System (GIS), it can help converting the surveyed information from acoustic, UAV and optical survey data into a database and eventually into a benthic habitat map showing the extent and coverage of ecologically important habitats and different substrate types. Stay tuned to our next featured story.