

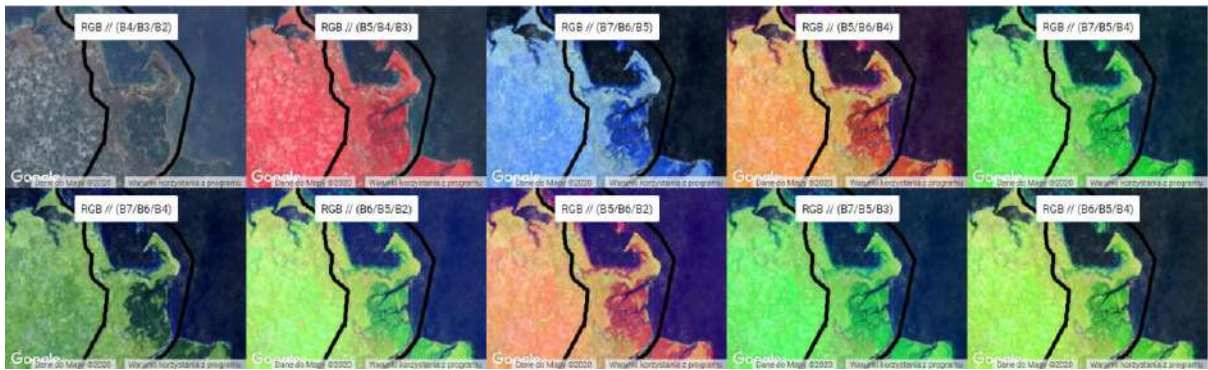
## Understanding the social-ecological outcomes of Tanzanian marine protected areas



*Drone Mission Planning*



*Drone view of MBREMP Corals*



*MBREMP - Different band combinations of Landsat 8 OLI - Cloud free images 2019*



*MBREMP Office orthomosaic*

OVERVIEW	
<b>Flying Labs</b>	Tanzania Flying Labs
<b>Geographic area</b>	Mnazi Bay-Ruvuma Estuary Marine Park (MBREMP), Mtwara Rural District, Tanzania
<b>Date</b>	June - August 2019
<b>Sector program</b>	EcoRobotics

SCOPE	
<b>Stakeholders (clients)</b>	Duke University Marine Lab World Wildlife Fund (WWF) Tanzania Tanzania Marine Parks and Reserves Unit
<b>Challenge</b>	The Mnazi Bay-Ruvuma Estuary Marine Park, Tanzania's biggest marine protected area (MPA), home to hundreds of species, is also inhabited by around 40,000 people. This biodiverse system includes 70 sqkm of mangrove forest (as of 2000), which accounts for over 10% of Tanzania's remaining mangrove habitat. MPAs play a big role in reducing widespread poverty while conserving biodiversity and protecting critical habitat. Making them effective, however, requires knowledge of biological and socio-economic aspects, including the extent and use of resources and how these are related to community well-being. Yet, the capacity to generate and act on that knowledge is often lacking at local levels.
<b>Scope</b>	Building the local capacity of local communities and introducing the drone technology in marine conservation and ecosystem management. The goal of the project was to characterize the spatial extent of critical habitat of MBREMP, describe the occurrence of endangered marine species, characterize the use of resources and understand the current socio-economic situation inside the MPA.
<b>Outcome</b>	A 3-day participatory mapping workshop was organized at the MBREMP office. The participants took part in hands-on training on how to capture, process and make use of drone data, e.g. identifying and characterising different species.  The most important outcomes of the drone workshop included: 1) a select number of maps of identified critical habitat extent and distribution (and determining overlapping areas), 2) strengthening management and technical capacity for using drones in marine biodiversity conservation, 3) creation of shared data platform of all raw imagery,

	<p>4) strong professional network between all project partners and participants, which can be leveraged for future work,</p> <p>5) a better understanding of community activity, well-being and conflict areas, finding overlapping,</p> <p>6) policy recommendations at local and national levels.</p>
<b>Next steps</b>	<p>Further collaboration between the project stakeholders, including further data analysis to produce baseline habitat maps of the selected areas mapped during the workshop.</p> <p>Drone procurement and building inhouse drone research program by WWF Tanzania.</p> <p>Planning future missions to build baseline habitat maps of other priority areas.</p> <p>Exploring funding opportunities for drone procurement by MBREMP, as well as for building a drone facility at the University of Dodoma.</p> <p>Further actions (such as qualitative interviews in and around MBREMP) towards understanding relationships between small scale fishermen and the marine.</p>

<b>DATA ACQUISITION</b>	
<b>Size of area</b>	673.5 ha (6.735 km <sup>2</sup> )
<b>Drone</b>	DJI Phantom 4 Pro, eBee Classic
<b>Sensor(s)</b>	Phantom RGB camera, S.O.D.A
<b>Flight plan software</b>	eMotion
<b>Flight height</b>	max 310m above ground level
<b>Number of images acquired</b>	1710
<b>Number of flights</b>	32
<b>Time invested in data acquisition</b>	5 days (05h16 of flight time)
<b>Georeferencing</b>	Onboard GPS

<b>DATA PROCESSING &amp; ANALYSIS</b>	
<b>Processing software</b>	Pix4Dmapper
<b>Processing time</b>	24.5h
<b>Data products</b>	Orthomosaic
<b>Analysis tools</b>	ArcGIS Pro, Picterra
<b>Analysis outputs</b>	Habitat map
<b>Final outputs shared with stakeholders</b>	<p>Shared google drive of photos, data, final map products, mission plans for other key areas of interest in MBREMP</p> <p>Hard copies of all maps and associated project reports</p>
<b>Data sharing</b>	<p>ArcGIS Online Story Map</p> <p><a href="https://storymaps.arcgis.com/stories/d6d5aa61021f4ab28d08752d6e314ff0">https://storymaps.arcgis.com/stories/d6d5aa61021f4ab28d08752d6e314ff0</a></p>