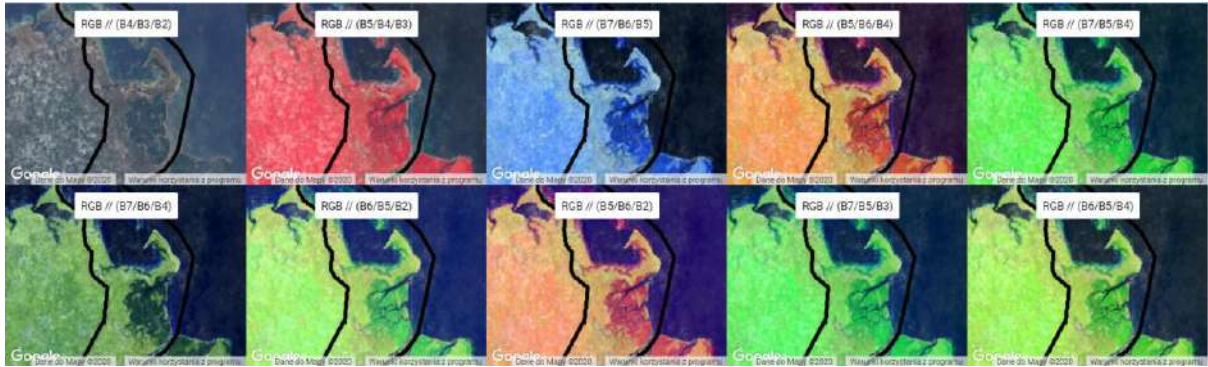# Understanding the social-ecological outcomes of Tanzanian marine protected areas

Drone Mission Planning   *Drone view of MBREMP Corals*

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

MBREMP Office orthomosaic

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

SCOPE	
Stakeholders (clients)	Duke University Marine Lab World Wildlife Fund (WWF) Tanzania Tanzania Marine Parks and Reserves Unit
Challenge	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.
Scope	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.
Outcome	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,

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

DATA ACQUISITION	
Size of area	673.5 ha (6.735 km2)
Drone	DJI Phantom 4 Pro, eBee Classic
Sensor(s)	Phantom RGB camera, S.O.D.A
Flight plan software	eMotion
Flight height	max 310m above ground level
Number of images acquired	1710
Number of flights	32
Time invested in data acquisition	5 days (05h16 of flight time)
Georeferencing	Onboard GPS

DATA PROCESSING & ANALYSIS	
Processing software	Pix4Dmapper
Processing time	24.5h
Data products	Orthomosaic
Analysis tools	ArcGIS Pro, Picterra
Analysis outputs	Habitat map
Final outputs shared with stakeholders	Shared google drive of photos, data, final map products, mission plans for other key areas of interest in MBREMP Hard copies of all maps and associated project reports
Data sharing	ArcGIS Online Story Map https://storymaps.arcgis.com/stories/d6d5aa61021f4ab28d0875 2d6e314ff0