

Scientific Expeditions to the British Indian Ocean Territory 2016

Project Title	Period	Institutions Involved	Objectives	Outcomes (results, publications, future work)
Pelagic Expedition	2 nd – 29 th February	Zoological Society of London, University of St Andrews, Plymouth University, University of Western Australia, Manta Trust, Stanford University	<p>Overall objective: To document the temporal and spatial patterns of pelagic species in the BIOT MPA.</p> <p>Specific objectives:</p> <ol style="list-style-type: none"> 1. To deploy mid-water stereo baited remote underwater video camera systems to study the ecology and behaviour of pelagic fish assemblages. 2. Collect information on fish and shark prey field distribution, enabling the interpretation of the observed patterns of fish and megafauna distribution and make conclusions on habitat suitability. 3. Measurements of conductivity, temperature, density (CTD) and turbulence to provide information critical to interpret observations resulting from objectives above. 4. Tagging of manta rays to track movements inside and outside the MPA. 5. Monitor the diversity, abundance, movements and distribution of seabirds. 	<p>Post-expedition report provided to the BIOT Administration.</p> <p>One publication resulting from the 2015 pelagic expedition: Letessier, T.B., Bouchet, P. & Meeuwig, J.J. (2015) Sampling mobile oceanic fishes and sharks: implications for fisheries and conservation planning. <i>Biological Reviews</i>, DOI: 10.1111/brv.12246</p> <p>Key achievements:</p> <ol style="list-style-type: none"> 1. 160 mid-water BRUVS deployments with concurrently run acoustics surveys allows the quantification and characterisation of fish populations (including sharks) and mid-water prey fields at six locations in BIOT. 2. First integrated analysis of 3D multibeam documenting fish distribution (particularly sharks) and characterising seamount habitat with mid-water BRUVS. 3. First mapping of the unique ‘manta alley’ habitat and first acoustic observation of manta ray using a 3D multibeam in Egmont atoll. 4. 5178 birds of 17 seabird species were recorded. One species of seabird that had not been previously documented in BIOT was identified and photographed in the Small Boat Basin of Diego Garcia, a Lesser Black-backed Gull <i>Larus fuscus</i>. 5. Deployment and recovery of oceanographic mooring on Swart seamount, and in Egmont Atoll to further enable the characterisation of water masses, and the description of

				interactions between tidal regimes, stratification, and topography on coral islands and seamounts. 6. Tagging of 6 reef mantas using acoustic and miniPAT tags.
Coconut Crab Expedition	2 nd February – 21 st March	Dartmouth University	To assess the behavioural ecology of coconut crabs on Diego Garcia.	TBC .
BIOT Consortium Expedition	20 th March – 17 th April	Stanford University, Zoological Society of London, Swansea University, University of Western Australia, Bangor University, University of Oxford, University College London, and the Natural History Museum	<p>Overall objectives: To use electronic tag technology to study the residency and connectivity of pelagic fish, sharks and mantas, within and around BIOT. To assess levels of coral bleaching. To monitor species ecology, including birds and turtles.</p> <p>Specific objectives:</p> <ol style="list-style-type: none"> 1. Install 40 additional acoustic receivers and undertake routine maintenance on the existing array. 2. Deploy acoustic tags on reef fish, sharks and rays. 3. Sample tissues for isotopic analyses to provide information on the trophic ecology and habitat use of species within BIOT and understand patterns of connectivity of reef fish, sharks and rays across the Indian Ocean. 4. Collect water samples to analyze for environmental DNA (eDNA) signatures, which present a non-invasive method to detect the genetic signature of organisms throughout the MPA 	<p>Post-expedition reports provided to the BIOT Administration.</p> <p>Key achievements:</p> <ol style="list-style-type: none"> 1. Mid-water Baited Remote Underwater Video Systems (BRUVS) deployed in the nearshore (<50-200 m). 2. Over half of the islands surveyed for turtle nesting activities and beach habitat via aerial surveys (30 islands) and coastal surveys (28 islands), providing the most complete nesting data record since surveys in 1999. Turtle satellite tracking data were used to validate existence of a foraging green turtle population on the Great Chagos Bank, revealing an extensive seagrass meadows of <i>Thalassodendron ciliatum</i>. Seagrass samples were preserved in preparation for the first peer-reviewed publication on seagrass in BIOT and to contribute to a regional seagrass health assessment of the Indo-Pacific. 3. The expanding breeding range of both the Red-footed and Brown Booby in Peros Banhos Atoll were documented. The first ever tracking of a seabird in the Archipelago was completed; with a breeding Red-footed booby making a remarkable 425km, 38 hour foraging trip. 4. A total of 248 tags on 153 animals were deployed: (49 grey reef sharks , 69 silvertip reef sharks, 1 blacktip reef shark (1 whitetip reef shark, 26 manta rays and six species of teleosts including yellowfin tuna, kawakawa, black saddled grouper, dogtooth tuna, sailfish and blue marlin). 5. 63 acoustic receivers (VR2, VR4-UWM, and VR4G) in the existing array were serviced and downloaded.

			<p>5. To collect previously deployed sensor instruments (temperature and oxygen), and redeploy additional units for collecting environmental data that will complement the on-going research activities.</p>	<p>Downloads of the receivers resulted in 99,814 detections from 92 animals. We deployed 30 new receivers to expand the array to cover additional habitats and regions of the archipelago. The array now includes a total of 93 acoustic receivers deployed across the archipelago.</p> <p>6. To study reef processes and seawater chemistry - 117 water samples taken across the archipelago.</p> <p>7. The first SeaFet long-term pH logger was installed in BIOT to track changes in ocean chemistry and help detect and quantify ocean acidification.</p> <p>8. Instruments are designed to record data on environmental physics and chemistry for a full year were installed, including 13 temperature sensors, 2 pressure sensors, 1 salinity/temperature sensor, a pH logger, and an Acoustic Doppler Current Profiler (ADCP).</p> <p>9. 17 key reef sites surveyed, covering c.2000 m2 of reef, using a mixture of photography and videography to allow analysis of the 3D structural complexity, composition and function of the shallow reefs.</p> <p>10. Detailed data were collected from 14 coral reef sites across the archipelago to record the incidence of bleaching and disease on reef-forming coral communities.</p> <p>11. First twilight reef surveys (reefs slopes deeper than 30m) conducted in BIOT since the 1980s.</p>
Pangaea Expedition	4 th – 12 th May	University of Western Australia, Plymouth University	<p>Overall objective: To document the status of reef fish assemblages within BIOT MPA, in particular the status and ecological function of reef sharks. Additional work to assess the intertidal ecology of reef flats of Diego Garcia using towed underwater sleds.</p> <p>Specific objectives:</p> <p>1) Baited underwater video systems (and diver operated (DOV)) to determine abundance, size structure</p>	<p>Post-expedition report provided to the BIOT Administration</p> <p>Key achievements:</p> <p>1. 160 BRUVS deployments with 90 in the southern half of the lagoon and 70 in the northern half of the lagoon</p> <p>2. At each Maestro station (n=12), a vertical profile was obtained with respect to salinity, temperature, depth, oxygen and fluorescence (as a proxy for chlorophyll containing algae).</p> <p>3. Two conventional Conductivity (salinity), Temperature and Depth (CTD) profilers in vertical tandem, at the seabed and at the surface for a period of 24 hours. Finally,</p>

			<p>and condition of the shark and fish assemblage.</p> <p>2) Acoustic tagging to determine animal residency and behavior.</p> <p>3) Tissue sampling to determine variation in diet and genetic structure.</p> <p>4) Benthic monitoring of the intertidal flats to quantify biodiversity levels.</p>	<p>sediment cores were obtained at 4 locations with 3 replicates at each to determine particle sizes, organic matter content and infauna diversity.</p> <p>4. 101 fish sampled at approximately 35 sites within Diego Garcia. These individuals represented 25 species and 8 families, and on average 14.4 fish sampled per day, to assess condition of fish with respect to individual weight at a given length.</p>
Seabird Ecology on Diego Garcia	21 st June – 13 th July	Zoological Society of London	<p>Overall objective: To understand the breeding ecology of red-footed, masked and brown booby and their spatial use of the BIOT MPA.</p> <p>Specific objectives:</p> <p>1. To test field methodologies, including; red-footed booby (RFB) nest monitoring, RFB capture/restraint and tail-mounted GPS loggers.</p> <p>2. Document at-sea movement patterns and foraging grounds of breeding RFBs from Barton Point and Cust Point colonies during the SE monsoon season.</p> <p>3. To explore if RFB morphometric measurements in the field can be used to determine sex.</p>	<p>Post-expedition report provided to the BIOT Administration.</p> <p>90 adult RFBs were caught and marked (with individually numbered alloy British Trust for Ornithology issued leg rings) and a set of morphometric measurements taken along with breast feathers for DNA sexing. Of these, 46 were classed as breeding birds and caught on a nest, while the remainder were non-breeding birds. 39 of the breeding birds were fitted with tail-mounted GPS loggers (IGotU GT-120, Mobile Action Technology Inc.) to track their at-sea movements. These tags were deployed for between three and 10 days before being recovered. Thirty-eight of the 39 tagged RFBs were recaptured and 35 viable tags were recovered. Preliminary examination of the tracking data revealed that RFBs were typically conducting foraging trips of one to three days, covering 100-600km, to the North-East of Barton Point. None of the tracked birds entered or crossed the Great Chagos Bank. These are the first tracking data from any seabird species from BIOT. The next step will be to repeat this fieldwork in December 2016 during the NW monsoon season.</p>
Indigo Expedition	10 th – 27 th July	University of New South Wales	<p>Objectives:</p> <p>1. Environmental toxicology studies on harmful algal blooms.</p> <p>2. Virology studies inside/outside atoll lagoons.</p>	TBC.

			<ol style="list-style-type: none">3. Collect plastic particles in the water.4. Measure ocean pH for acidification studies.5. Photo-quadrats of coral condition post-bleaching.	
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