PROJECT TITLE: Untangling the origin and movement of ghost nets in the Indian Ocean to aid management and mitigation

DTP Research Theme(s): Living World, Changing Planet

Lead Institution: Bristol

Main Supervisor: Dr Erica Hendy, Earth Sciences, Bristol
Co-Supervisor: Dr Sally Wood, Earth Sciences, Bristol
Co-Supervisor: Dr Michael Sweet, Biosciences, Derby
Co-Supervisor: Martin Stelfox, Olive Ridley Project (potential CASE)
Co-Supervisor: Dr Andrey Kurekin, Plymouth Marine Laboratory

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Image Caption: Dispersal model output for particles in the Indian Ocean (Image: Wood)

Project Background
Now familiar images of turtles, fish, seabirds and other creatures entangled amongst lost or discarded fishing nets attest to the deadly nature of this marine debris. Modern fishing nets are so durable that they can remain intact for decades, continuing to ‘ghost fish’ commercially valuable fish stocks and entangle a wide variety of marine life. The Olive Ridley Project in the Maldives (http://oliveridleyproject.org/) has recovered more than 700 ghost nets between 2013-2017, confirming that this local environmental issue has an international source. Addressing the problem at its source would seem the most prudent action. However, pinpointing the origin of ghost nets is difficult because the Indian Ocean is a very active region for commercial fishing, as well as illegal and unreported fishing activities, and contains a large number of low-income countries [1].

Project Aims and Methods
The student will employ state-of-the-art biophysical modelling using Bristol University’s supercomputing facilities (BlueCrystal) to simulate the dispersal of discarded fishing gear across the Indian Ocean, in order to identify likely sources and accumulation zones. This will involve adapting the approach used by Bristol co-supervisors, Wood and Hendy, to identify the pathways that microscopic coral larvae take from one reef to another across thousands of miles [2, 3]. The model output will be combined with observational datasets including; a decade of tracked FAD (Fish Aggregating Devices) paths, records of recovered ghost nets from citizen science projects run by the Olive Ridley Project (with co-supervisors Sweet and Stelfox) and satellite monitoring of fishing activity (with co-supervisor Kurekin) to backtrack the likely source of this marine debris within the Indian Ocean. The project aims to:

(1) simulate the journeys of fishing gear that is discarded and lost from a diversity of Indian Ocean fishing grounds.

(2) identify the international fishing grounds likely responsible for ghost nets arriving at citizen science monitored sites in the Maldives, Pakistan, Oman, Thailand, India and Sri Lanka.
identify where oceanographic conditions within the Indian Ocean act to accumulate ghost nets. And (4) identify the high risk areas for net entanglement of marine species of conservation-concern status, i.e. where do accumulations of ghost nets coincide with migratory pathways of turtles or biodiversity hotspots within the Indian Ocean?

Candidate
This project would ideally suit a candidate with very strong quantitative and computing skills, a passion for marine science and a flair for data visualisation. The student will employ High Performance Computing to run large model simulations, and use a programming language such as Matlab or similar combined with GIS to analyse and visualise model output. This is an interdisciplinary project requiring strong networking and communication skills.

Case Award Description
There is broad cross-disciplinary and cross-societal motivation for the results of the student’s proposed research – from marine scientists to conservation-based charities, indigenous fishers and coastal communities to international regulators. The model visualisations will be the key output and will provide the information needed by the NGO Olive Ridley Project to focus education and provide evidence for enforcement efforts including future MPA (Marine Protected Area) designations.

Training
The student will gain expertise in the use of high performance computer modelling, the handling of large data sets, and quantitative and visualisation techniques. The project will have guaranteed access to one of the fastest and most advanced supercomputing facilities in the UK with the launch of the latest BlueCrystal Phase 4 supercomputer in May 2017 (>15,000 Lenovo cores, theoretical peak performance of 600 Teraflops). The student will be working with an NGO actively working in the field of conservation through local citizen science initiatives, lobbying and engagement with governments in Indian Ocean countries and commercial industrial organisations.

References / Reading List

Links
School URL – please delete as appropriate
http://www.bristol.ac.uk/earthsciences/courses/postgraduate/

NERC GW4+ DTP Website: http://nercgw4plus.ac.uk/

Bristol NERC GW4+ DTP Prospectus:
http://www.bristol.ac.uk/study/postgraduate/2017/doctoral/phd-great-western-four-dtp/

Application deadline: 23.59 GMT, Sunday 7 January 2018
How to apply to the University of Bristol:
http://www.bristol.ac.uk/study/postgraduate/apply/

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