‘Coastal-eye’ – monitoring coastal waters using a lightweight UAV

Supervisors:
Dr Karen Anderson (Environment and Sustainability Institute, University of Exeter) – Main supervisor
Dr Jamie Shutler (Plymouth Marine Laboratory)
Dr Peter Land (Plymouth Marine Laboratory)
Host institution: University of Exeter

Project description: Coastal margins equate to just 8% of the world’s surface, yet they host over two thirds of the world’s cities and fisheries. As global populations continue to rise, the need for cost-effective methods for monitoring the health of coastal zones increases. Current methods for monitoring coastal water quality involve point sampling and/or visual inspections, so an automated method capable of easily monitoring a wide area would be advantageous. Lightweight Unmanned Aerial Vehicles (UAVs) are radio-controlled aircraft that can carry imaging payloads, capable of flying under the command of a remote pilot. Low-cost avionics systems have recently put UAVs within reach of the general public and these aircraft are emerging as valuable scientific tools for environmental monitoring applications (Anderson and Gaston, 2013). UAVs are uniquely placed to assist in operational monitoring as they can be launched, operated and the data accessed and analysed within hours. Within the University of Exeter's Environment and Sustainability Institute (ESI) there is a new facility for low-cost, lightweight UAVs – a nationally unique facility, to which the successful student will have access.

The successful PhD student will undertake a unique programme of research aimed at developing, testing and deploying a lightweight UAV system (‘coastal-eye’), for collecting fine spatial resolution data for monitoring near-shore water quality. The student will work with Dr Karen Anderson (ESI) who is leading the development of the UAV facility and with Drs Jamie Shutler and Peter Land (PML) who are experts in coastal and marine remote sensing. The project’s primary aim is to develop a monitoring system that can be cheaply and easily used by aquaculture businesses (e.g. pelagic fish and shellfish farms) and by coastal environmental managers (e.g. UK Environment Agency) to easily and repeatably monitor near-shore water quality. The cross-disciplinary nature of this research means that the student will develop expertise in i) coastal and marine optical remote sensing and field work, ii) the design, development, maintenance and operation of lightweight UAV systems and iii) methods, techniques and issues related to coastal and water quality monitoring. They will also have opportunities to present their work at international conferences and will interact with marine and coastal stakeholders. The resultant technology developed by the PhD student is likely to have a range of potential uses beyond those envisaged for the project, e.g. in coastal population ecology (e.g.mammal surveys), coastal risk assessment (e.g. flooding) or studying biogeochemical cycles (e.g. gas exchange) for climate studies.

Anderson and Gaston (2013) Lightweight unmanned aerial vehicles will revolutionize spatial ecology. *Frontiers in Ecology and the Environment* **11**: 138–146