



## Improving the management and sustainable use and protection of coastal habitats

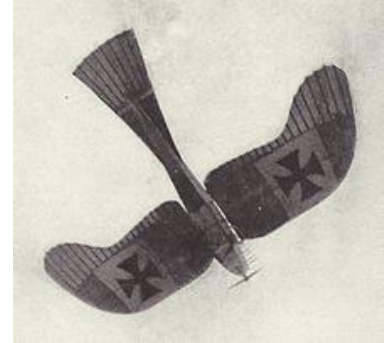


A demonstration of UAV Photo-Surveying principles carried out at Torquay on the 19th March 2015 for the delegates of the VALMER and PANACHE final conference.



The pyramids of Giza by Eduard Spelterini, 1904

Photographs of the ground from the air was a technique initiated over 100 years ago - their military worth was such that by the end of the Great War it's recorded that over half a million photographs had been taken by both sides. Fortunately, more benign applications are now routinely supported by aerial photography made possible by rapid miniaturisation and technological cost reductions.



Rumpler-Taube surveillance monoplane 1918

The demonstration (subject to weather conditions) is an example of a small, simple 3-axis gimbal stabilised camera-carrying Unmanned Aerial Vehicle (UAV) in this case a QuadCopter (4 horizontal rotors). Whilst of limited capability it demonstrates the basic principles of manual and autonomous flight and the acquisition of high resolution stills and video. Field surveys are normally carried out by larger HexaCopter (6 rotor) or OctoCopter (8 rotor) UAVs of greater lifting capability involving more sophisticated photographic equipment, a pilot operator to manouver and position the UAV and a photographer to direct camera operations.

### **Jargon Buster**

#### **UAV - Unmanned Aerial Vehicle**

Remotely Piloted Vehicles (**RPVs**) often referred to as **DRONES** but unfortunately these have become synonymous with the weaponised variety used by the Military. Either fixed wing or multi-rotor (e.g. QuadCopter, HexaCopter or OctoCopter with 4,6 or 8 horizontal rotors respectively) are deployed as camera platforms in the field for surveying purposes.

#### **GeoTagging**

The process of adding latitude and longitude data (GPS coordinates) to camera image metadata. Geotagged images can then be accurately superposed on maps and other GIS imagery (e.g. GoogleEarth)

#### **Ortho-photograph**

An aerial photograph geometrically corrected ("**Orthorectified**") such that the scale has the same uniformity as a map. They are commonly used in the creation of a **Geographic Information System (GIS)**.

#### **Photo-Grammetry**

The science of making measurements from photographs, especially for recovering the exact positions of surface points.

#### **Photo-Mapping**

Involves the process of drawing a map from a photographic base, mostly composite ground images (**Orthophotos**) assembled to make an **Orthomosaic**.

# Improving the management and sustainable use and protection of coastal habitats

## CASE Study - Intertidal Aerial Surveying of an Estuary Mussel Bed



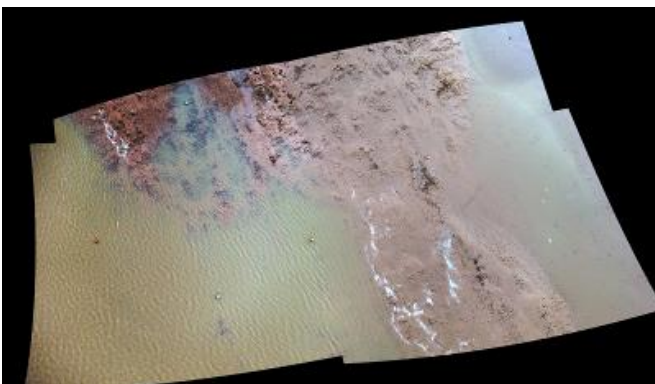
Establishing the extent and proportion of live biomass and dead shell in estuary mussel beds is a management requirement routinely met during short intertidal periods at low water springs. Thus estimations of biomass vs shell have necessarily to be done on a sampling basis to cover sufficient ground.

'Traditional' sampling is carried out on foot using a 1M Quadrat. Mapping is carried out by walking a regular pattern back and forth across the survey site at regular intervals. As this is done the presence or absence of mussels is noted, thus building up a picture with each pass across the site

Significant sampling errors are likely given the limited time available and patchy and non-uniform nature of the ground. Also, such foot mapping may need to extend over several tides, extending the project both in terms of time and cost



A mussel bed of 100m x 300m (3 Ha) was surveyed by UAV, the mission being flown autonomously through a series of pre-programmed waypoints at each of which a photograph was taken. At the end of the mission the digital images were downloaded and processed. Optimum flight parameters in this case required that the mission be flown at an altitude of 65 Meters, completing in a flying time of 6 minutes and yielding 40 images with a ground resolution of about 1 cm. (see 3D representation of flight path on GoogleEarth image)



This sample false colour mosaic consists of 4 stitched camera images.. Further 2D image processing of all images yielded an approximation of the mussel density and with other manually collected ground truthing data, the total biomass. Whilst not a complete replacement for 'traditional' surveying methods UAV photo-surveying can significantly reduce time on site and contribute to improved overall accuracy of result. It is anticipated that 3D modelling at much reduced altitude can further contribute to the quality of result.