

Detecting small marine mammals in the Belgian part of the North Sea using high resolution satellite imagery

Janssen Tom¹, Jan Haelters² and Kevin Ruddick³

¹ Master of Marine and Lacustrine Science and Management, Faculty of Sciences of VUB, UAntwerpen and UGent, Pleinlaan 2, 1050 Elsene, Belgium
E-mail: jjanssentom@gmail.com

² Ecologie en Beheer van de Zee (MARECO), Operational Direction Natural Environment (OD Nature), RBINS, 3 And 23th Linieregimentsplein, 8400 Oostende, Belgium

³ Remote Sensing and Ecosystem Modelling (REMSEM) team, Operational Direction Natural Environment (OD Nature), RBINS, 100 Gulledele, 1200 Brussels, Belgium

With the reduction in cost of high resolution satellite optical imagery come new possibilities for remote sensing of larger aquatic animals. Using images retrieved from sensors such as Pleiades, with a 2m multispectral and 50cm panchromatic resolution, megafauna can be detected, traced or tracked on a low-cost basis in comparison to aerial or ship surveys. The objective of this master thesis is to assess the possibilities and limitations of these current high resolution satellite sensors for the detection of aquatic animals.

Practically the feasibility will be tested by processing and analyzing images on the detection of harbour porpoises. Satellite images will be selected covering 100 km² of the Belgian part of the North Sea each. With a distribution shift to the southern North Sea, this cetacean is the most abundant marine mammal in Belgian waters. Aerial surveys in April 2008 yielded a number of more than 4000 animals present with a density of 1,2 animals per kilometer. However, detection can be observer biased and surveys can be time-consuming. This implies that for long and/or multiple stretches of line surveys more days of observation need to be taken into account.

Before processing can take place a measuring of optical properties of skin samples is needed to give more insight into the spectral reflectance of these animals. By considering the differences in spectral reflectance between these animals and the ambient waters it may be possible to define an optimal selection of spectral bands or a combination of bands, for reliable and automated detection of the harbour porpoises in satellite imagery. Different factors that can interfere with the performance of detection, such as depth below the surface, turbidity and surface features such as waves and sunglint, will need to be taken into account.

Given that some other authors studied the detection of bigger megafauna, e.g. southern right whales, this is the first study being carried out on one of the smallest cetaceans in a rapidly changing turbid sea as the North Sea. This pushes using the technology to the limit and can give a clear idea whether the current sensors are sufficient in terms of spatial and spectral resolution for surveying small cetacean populations from space.

Keywords: harbour porpoise; marine mammals; satellite imagery; optical remote sensing; North Sea; spectral reflectance