Using acoustic and lidar acquisitions for mapping soft and hard bottom communities in the bay of Morlaix (North Brittany french coast)

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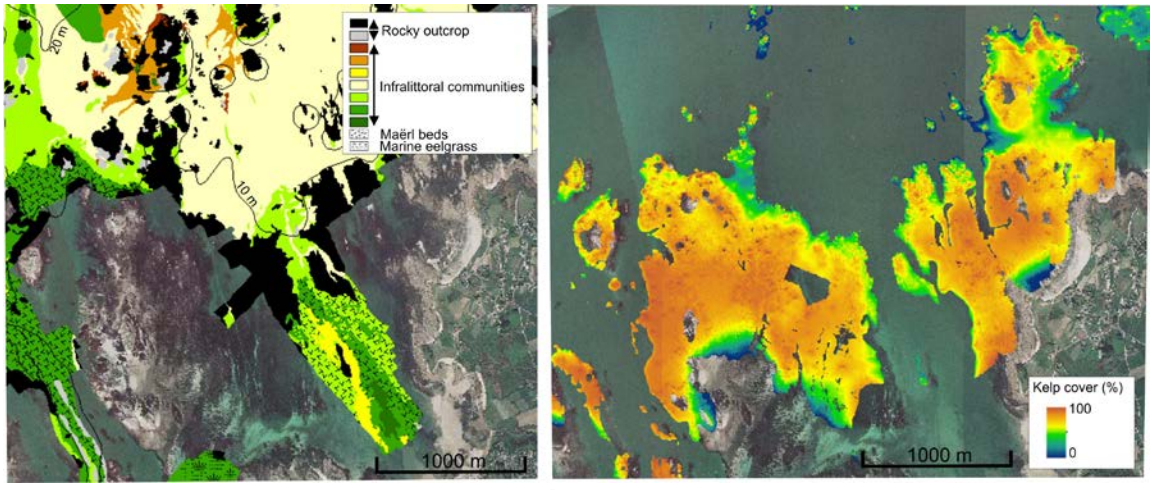
The bay of Morlaix is one of the sites monitored by the regional REBENT network. The aim of which is to define a reference state and to provide regular monitoring of the marine coastal fauna and flora from the intertidal area to water depths of about 60 meters (www.rebent.org). This sector has been a good example to develop a specific survey strategy combining submarine and aerial tools and predictive modelisation. Geomorphological and sedimentological aspects, infralittoral communities of macrofauna and kelp forests distribution were the focus of this study.
Between 2008 and 2010, 940 km of acoustic profiles were collected in the deeper part of the bay, using towed sidescan sonar combined to a multibeam echosounder and in shallow waters, an interferometric sidescan sonar coupled with a roxann AGDS. Seabed substrate was interpreted from the backscatter imagery and roxann results. Acoustic data were calibrated from direct observations using shipek (sediment) and hamon grabs (macrofauna), video sequences and diver acquisitions, to produce a geomorphological and sedimentological pattern and ultimately habitat maps (fig. 1a). The seabed in this bay is very heterogeneous in terms of sediment and macrofauna distribution and subject to a strong hydrodynamic gradient. Rocky bottoms are scattered throughout the bay and are playing a major role in explaining the distribution of some benthic communities.
To better understand, protect and manage habitats such as kelp forest, species distribution modelling approach was applied. The principle of kelp forest prediction is based on the use of in situ biological data derived from video and subtidal surveys along with high resolution environmental data (abiotic variables) to predict the distribution, relative cover (fig. 1b) and biomass of kelp forests. The rock layer was extracted by combining acoustic data with two others sources: lidar surveys and photo-interpretation of aerial imagery. Acoustic signature of vegetation has been used and validated by biological data. Empirical relationships between predictor and response variables were integrated into a geographic information system to produce high accuracy maps (5 metre horizontal resolution) for *Laminaria digitata* and *Laminaria hyperborea*, the main kelp species present on the site.



a b

Figure 1 : Example of habitat map (a) and kelp cover prediction (b) in a part of the Morlaix bay