

# Charting shallow water and long-term environment changes

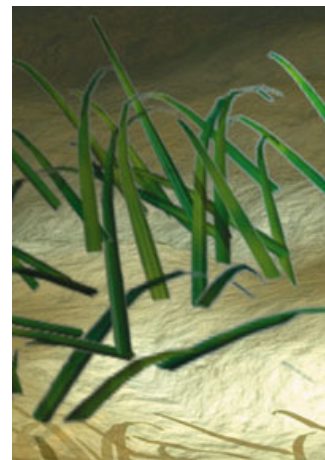
By Airborne Hydrography AB

Interest is now turning towards near coastline surveying and shallow waters and a new group of users are cities and regional planners, marine biologists and government agencies protecting wildlife. Historically merchant shipping has been the primary user of survey data along the seaways and harbours but the effect of global warming is affecting the shallow water conditions and the near coastline environment. The effects of even slight increases in temperature have been clearly noticeable on coral reefs, an issue being addressed by biologists around the world. Thawing of polar ice and increasing water levels are causing erosion and sea floor vegetation changes. In particular, these changes are happening in the near coastline and shallow water areas that historically have not been surveyed.

Surveying the coastline is multidisciplinary since it involves both land (topographic data) and water (hydrographic data). The objective is cost-efficient and accurate data acquisition using state-of-the-art technology. The Hawk Eye II™ system is an airborne laser bathymetry and topography system developed to fulfil the surveying needs in the coastal zone. The system simultaneously collects accurate geodic referenced digital elevation data both above and below surface.

The typical use for this data, apart from the above mentioned, are:

- Environmental surveying – Shore erosion, marine life habitat protection
- Natural catastrophes mitigation – Mitigation of effects of tsunamis, hurricanes
- Tourism – natural harbours for leisure boating, sand beaches, diving areas
- Urban expansion along the coastline
- Inland water area expansion – housing, leisure areas, wildlife



## *Submersed vegetation surveying*

The HawkEye system is the only surveying system adopted for shallow water environment surveys. Using airborne laser scanning for classification of vegetation, such as eelgrass beds (*Zostera marina*) have been done in southern Sweden and have shown results, reaching >80% overall accuracy (Tulldahl et al. 2007, 2008a). Eelgrass beds in shallow water areas are the natural habitat for fish and in particular out-migrating juvenile salmon and pacific herring. It is also breeding ground for crabs and other marine wildlife. Eelgrass will not grow below < 2.5 m mean low water. In a study from the Danish and United States coastal waters it has been concluded that eelgrass is a basic source of nutrition for animals. The loss of eelgrass habitats has been cited to be a contributing factor the decline in the fish industry (Philips

1984). During the past 70 years major areas along the American Atlantic coastline (according to some estimates up to 90%) have been destroyed.

*Cost-efficient large area surveying*

Historically, multibeam sensors, hyperspectral cameras and aerial photographs have been successfully used. The limit being that these technologies are not adopted for mapping the marine environment on a large scale. The HawkEye LiDAR system will penetrate a similar depth range as the depth of interest, ie the euphotic zone. This is the depth within which sufficient sunlight penetrates the watercolumn and where photosynthesis occur. The shallow water area, protruding out from land to the approx 30 m depth curve is presently the region given priority for conservation (Naturvårdsverket 2007).

The use of airborne LiDAR technology will allow the users to survey and cost-efficiently plan and monitor large coastal regions and collect relevant data on key species and ecological habitats. During the next decade, we will see new and major changes in the use of shallow water data and the HawkEye system is developed to meet that demand.