

Detection of beaked whales using near surface towed hydrophones: Prospects for survey and mitigation

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Beaked whales remain amongst the most elusive and least known of mammals. Cases in which mass strandings of beaked whales are linked to the use of sonar and possibly other intense anthropogenic activities have increased the need to better understand the biology of the species, the mechanisms that lead to these mortalities and to devise improved mitigation procedures. Beaked whales are extremely difficult to sight at sea and this hampers attempts to study them, and makes real time mitigation difficult. Passive acoustic monitoring could improve detection efficiency. Blainville's beaked whales, (*Mesoplodon densirostris*) are known to produce most of their vocalizations at depth. They are routinely detected on bottom mounted hydrophones arrays but the extent to which they can be detected using near-surface hydrophones is not known.

Continuous recordings were made at a sampling rate of 192 kHz from towed hydrophone arrays during line transect surveys from a 95' motor sailer in the Bahamas in conjunction with teams monitoring bottom-mounted hydrophones at the AUTECH Tongue of the Ocean navy range. A beaked whale click detector and classifier was developed within Rainbow Click and PAMGUARD and this was both run in real time and used to analyze recordings to pick out beaked whale click trains. Detected click trains correlated well with detection of beaked whales on bottom-mounted hydrophones and are being compared to sightings data from the survey.

Work is continuing to improve the beaked whale detector and to develop methods of localizing animals acoustically by time of arrival on long arrays. These early results suggest that passive acoustic monitoring could play an important role in improving the detection of these animals and thus facilitate population survey, photo-id studies and real time detection for mitigation. Work will continue to determine the effect of distance and hydrophone depth on probability of detection.