Combining acoustic and visual survey data to study the distribution of dolphins in Maltese waters

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The LIFE-MIGRATE project aims to identify cetacean and turtle hot-spots in Maltese waters. In 2013 and 2014 we performed cetacean line-transect surveys (5,796 km) with visual observers and a 200 m towed hydrophone array sampling at 96 kHz. Simultaneous visual and acoustic surveys were conducted during 2,860 km of transect lines, with 5,331 surveyed visually and 3,311 km surveyed with acoustics methods. Here we use these data to study dolphin distribution. Integrating acoustic and visual data from an uneven coverage is challenging due to the different probability of detection of both survey methods. To account for this source of bias we obtained a correction factor (CF) for the survey effort, based on the number of acoustic/visual detections not captured by the other survey method, when both methods were at work. Acoustic detections were defined as records of dolphin clicks/whistles separated by at least one hour of silence between consecutive detections. During the simultaneous visual/acoustic survey, acoustic detections were captured visually in 20% of the cases, while 90% of the sightings were recorded acoustically also. Thus, we applied a CF=0.2 to the effort of "visual-only" transect lines and multiplied by a CF=0[U1] .9 the number of km covered in "acoustic only" transects. The corrected survey effort and the number of dolphin detections (visual or acoustic) per cell of a grid of 10x10 km were fed to a Kernel density estimator using ArcMap. The results show a high use area for dolphins to the W-NW of Malta. This result was enabled by obtaining a common outcome for both visual and acoustic survey techniques, increasing the sample size of dolphin detections. This study emphasizes the need to develop methods such as that used here to solve the analytical challenges posed by using mixed techniques in cetacean surveys.