Resource Selection Function analyses: Assessing habitat use relative to behavior and resource characteristics/availability for five common marine mammal species in the Southern California Bight

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In 2008-2012, fifteen aerial surveys of systematic line-transects were conducted in the Southern California Bight to monitor and obtain baseline data on occurrence, distribution, density, abundance and behavior of marine mammals. Site characteristics at marine mammal locations were analyzed by estimating Resource Selection Functions (RSF) which quantified and described baseline habitat use as a precursor to assessing potential changes in these patterns relative to anthropogenic activities, including Navy exercises. For RSF analyses, characteristics at marine mammal locations were contrasted to characteristics at 35,167 randomly selected "available" locations in the study area. RSFs were estimated via the use-availability approach and predicted probability of species occurrence at all locations in the study area as a function of seven covariate habitat variables. Models for five species (n = 60 fin and 40 gray whale groups, 135 Risso's and 31 bottlenose dolphin groups, 157 California sea lion groups) were fit for three behavior states (mill, rest/slow travel, medium/fast travel) and all behavior combined to document behavior and habitat associations. Species differed in habitat use and corresponding habitat associations. For example, medium-fast traveling fin whales were significantly associated with deep water over relatively flat basins/plateaus (p=0.0017). Fin whales also had significantly higher probability of using the San Nicolas Basin (p=0.0517). For Risso's dolphins, rest/slow travel was associated with deeper water (i.e., steep ridges) (p=0.0803). These patterns suggest fast movement across basins and rest/slow travel over ridges. The RSF approach has been successfully implemented for terrestrial systems, quantitatively documenting changes in habitat-use patterns in response to human activities. Results herein illustrate successful application of RSF to pelagic marine mammals, quantitatively considering the role of behavior in habitat selection. Data provide an important 5-year baseline for little-known species to compare potential future changes in habitat selection patterns, assisting in conservation/management decisions in a relatively high-anthropogenic use area.

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The call of the wily: Using acoustics to identify delphinid species not visually confirmed in the waters around Guam and the Northern Mariana Islands

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During a combined visual and acoustic cetacean abundance survey that took place in the waters around Guam and the Northern Mariana Islands, delphinid whistles were frequently detected, but were not always coupled with visual observations. As a result, many acoustic detections were not identified to species. Very little data exist on the occurrence and distribution of delphinids in this study area, so the ability to acoustically identify species that were not sighted can provide important information regarding the occurrence and distribution of delphinid species in these waters. In this study, a random forest classification model was created using a database of 1,864 whistles recorded in the tropical Pacific Ocean and the waters surrounding the Hawaiian Islands. This model was trained to be used with Real-time Odontocete Call Classification Algorithm (ROCCA), a module within the acoustic processing software platform PAMGuard that allows acousti c-based identification of delphinid whistles. Based on a list of species expected to occur in waters off Guam and the Mariana Islands, eight species were included in the random forest model (false killer whale [Pseudorca crassidens], short-finned pilot whale [Globicephala macroryhnchus], bottlenose dolphin [Tursiops truncatus], pantropical spotted dolphin [Stenella attenuata], spinner dolphin [S. longirostris], striped dolphin [S. coeruleoalba], short-beaked common dolphin [Delphinus delphis], and rough-toothed dolphins [Steno bredanensis]). The model classified whistles to one of four classes: large delphinids (false killer whale and short-finned pilot whale), medium-sized delphinids (bottlenose dolphin and pantropical spotted dolphin) small delphinids (spinner dolphin, striped dolphin, and short-beaked common dolphin), and rough-toothed dolphins. When the acoustic encounters that were coupled with visual observations were run through the random forest model, correct classi fication scores for individual whistles were high (large delphinid = 91%, medium-sized delphinid = 62%, small delphinid = 62%, rough-toothed dolphin = 71%). Using the four-class random forest model, more than half of the non-sighted acoustic encounters were classified as large delphinid (56%). Small delphinids made up 22% of the encounters classified, followed by medium delphinids (9%), and rough-toothed dolphins (9%). The remainder of the encounters (4%) could not be classified and were labeled as 'ambiguous'. This study has provided new and important information that is useful in understanding the occurrence and distribution of cetaceans in the Northern Mariana Islands.

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