Natural and anthropogenic halogenated organic compounds in two ecotypes of Southern California bottlenose dolphins

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Searching for unknown chemicals that are outside of the standard list of pollutants (i.e., PCBs, PBDEs, pesticides, etc.) requires a non-targeted analytical approach. Blubber samples (2 g) from mature male bottlenose dolphins (Tursiops truncatus) corresponding to coastal and offshore ecotypes were extracted and analyzed by two dimensional gas chromatography and time of flight mass spectrometry (GCxGC/TOF-MS). A library was created using R statistical computing software from the exported mass spectra and related identification information for the 361 unique halogenated organic compounds in the 8 samples. The majority of compounds belong to well-known classes of persistent organic pollutants (POPs), including pesticides and brominated flame retardants and several interesting contaminants such as terphenyls and DDT degradation products. An initial comparison across samples suggests that there are fewer POPs in offshore ecotypes. We were also able to identify several classes of brominated and mixed halogenated compounds that are suspected to be of natural origin, and of these compounds the brominated dimethyl bipyrroles had the most diverse profile (21 congeners), followed by brominated methyl bipyrroles (7 congeners) and methoxy PBDEs (5 congeners). The semi-quantitative abundances of each compound relative to an internal standard were catalogued for the individual samples and for each habitat, and selected compounds will be quantified using authentic standards to see if any differences exist in the HOC profile between the 2 ecotypes. The reference library resulting from this work will be used to identify and compare bioaccumulative contaminants in other environmental samples, including sediments, fish, and other marine mammal species.

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Comparisons of the behavioral ecology of three delphinid and three baleen whale species: RISKS and REWARDS of group living

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The behavioral ecology of offshore delphinids and baleen whales is poorly known. A comparative approach was used to assess group size and behavior versus risks/rewards of group living in the Southern California Bight, U.S. Scan sampling/photographs/video documented first-observed group size, behavior state, and group cohesion (i.e., maximum nearest-neighbor distance (MNND - in body lengths[BL]), during 72,467 km of aerial surveys between 2008-2013. Regression modeling analyses involved 566 common, 293 Risso's and 96 bottlenose dolphin groups and 115 fin, 78 gray and 62 blue whale groups. Species body size, group size, and MNND were correlated. Group size, MNND and behavior state were significantly influenced by species, sub-region, calf presence, time of day/year, water depth, and/or slope/aspect. Group size was significantly larger for common dolphin sp. (combined) (277.1) vs. bottlenose (19.2) and Risso's (18.4) and with calf presence. MNND was significantly less for commons (5.1 BL) vs. Risso's (6.7). Group size was larger for grays (2.2) vs. fins (1.6) and blues (1.7). Gray MNND (1.5) was significantly closer than fins (5.1) and blues (12.6). Risso's groups were observed resting 13 times more often (38%) than commons (3%). Smaller group size and more daytime resting of Risso's match presumed nocturnal foraging patterns of this species. Larger tighter groups and frequent daytime foraging of commons match clumped, high-density schooling fish distribution. Larger tighter common and gray whale groups match presumed higher predation pressure associated with smaller relative body size. Results indicate species ecological diversion in the same habitat in response to differing predation pressure and food resource availability as predicted by terrestrial mammal group-living patterns. Data lend insight into baseline behavior and ecological triggers influencing behavior. This information is needed to differentiate potential impacts of anthropogenic sources. Larger group size benefits include reduced predation pressure and improved prey detection/mate access, at the risk of increased resource competition.

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SOUTHERN CALIFORNIA MARINE MAMMAL WORKSHOP

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