sea locations with our detailed understanding of diving behavior. Using northern fur seals (*Callorhinus ursinus*, n=34) as a model, we examined how fine-scale movements and space use varied when animals used differing foraging strategies. On a single foraging trip a fur seal can display both epipelagic and benthic diving strategies in distinct bouts, which allowed us to test whether fine-scale movements differed between the two strategies. Using principle components and cluster analysis diving bouts were classified into the two strategies based on significant differences in diving parameters (depth, duration, vertical excursions, distance to bottom,etc.). We then compared movement patterns between the strategies, including transit rate, distance travelled, path straightness, and area-restricted search (ARS) zones. While many movement patterns were significantly different (e.g. distance traveled: epipelagic > benthic [$p<0.01$], path straightness: benthic > epipelagic [$p<0.05$]), others showed no difference (e.g. transit rate [$p>0.05$]). When identified, ARS zones were often small and had low intensity, suggesting females do not show the typical slower transit rates expected during foraging periods. This could be due to other slow transit periods, such as during resting and grooming, influencing overall transit rates. Although our study focused on the fine-scale behavior of a marine predator, this type of analysis could also be used to examine prey distribution and behavior, thus providing greater insight into the ecology of both marine predators and their prey.

Using passive acoustics to monitor the presence of odontocete cetaceans during naval exercises in Onslow Bay, NC

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During July 2008, the U.S. Navy performed anti-submarine warfare training exercises in Onslow Bay, NC using mid-frequency tactical sonar (1-10 kHz). The exercises were conducted in one of the potential sites of the proposed east coast Undersea Warfare Training Range (USWTR). As part of the monitoring effort for these exercises, five bottom-mounted passive acoustic recorders were deployed in Onslow Bay. The recorders sampled continuously at 32 kHz from July 6 - July 27, 2008. We analyzed these acoustic recordings for odontocete vocalizations (clicks, whistles and burst-pulse sounds), using Long-Term Spectral Averages (LTSAs), and sonar activity using a spectrogram correlation detector. Sonar activity was detected primarily during July 16-18 with some activity also detected during July 26-27th, resulting in a total of five days with recorded sonar activity and 17 days without sonar present. The recordings contain hundreds of odontocete vocalizations, including pilot whales (*Globicephala* sp.) and sperm whales (*Physeter macrocephalus*), occurring before during and after the sonar events. Sperm whale clicks were detected, almost exclusively at night (from 20:00-06:00), throughout the entire recording period. Pilot whales were detected sporadically throughout the day and night. Unidentified odontocete vocalizations were detected both day and night and on each day of recorder deployment. A review of a subsample of the acoustic data revealed several instances of unidentified odontocetes apparently mimicking sonar signals with frequency modulated whistles of similar frequencies. These recorders yield important information about the presence and vocal activity of odontocetes during these naval sonar exercises in Onslow Bay.

Population dynamics of killer whales (*Orcinus orca*) off northern Norway

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Killer whales (*Orcinus orca*) have been concentrating in northern Norwegian fjords during October-January for 20 years, where their main prey, Norwegian spring spawning herring (*Clupea harengus*), has been overwintering. This has provided a unique possibility to study killer whale behaviour and population biology. We estimated the abundance and survival rates of identifiable animals in this population using mark-recapture analysis of photo-identification data collected during 1986-1993 and 2002-2003. Population size was estimated using simple two-sample estimators on pairs of years and using closed capture models in program MARK within years. In the latter analyses, the best models were selected using AIC; how well the models fitted the data was explored using Goodness of Fit tests in programs RELEASE and MARK. The highest annual estimate of the number of identifiable animals was in 2003: 398 individuals (95% CI = 314-531). The proportion of identifiable individuals in the population was estimated to be 0.556 (SE = 0.052) for 1992-1995 and 0.656 (SE = 0.041) for 2000-2003. Total population size for 2003 was therefore estimated to be 606 individuals (95% CI = 460-800). Survival was estimated for stage/sex specific groups: adult males, adult females, sub-adults, juveniles and calves using Cormack-Jolly-Seber (CJS) models in program MARK. Adult male and adult female survival were estimated as 0.958 (SE = 0.0096, 95% CI = 0.935-0.973) and 0.959 (SE = 0.0142, 95% CI = 0.929-0.980), respectively. Lowest survival was estimated for calves, 0.816 (SE = 0.167, 95% CI = 0.335-0.975). The survival estimates presented here are the first for northern Norwegian killer whales. Calving intervals were calculated from photo-identification data from a total of 14 years (1989-2002) and ranged from 3-14 years (mean = 5.93, SE = 3.087). Results from these and intervening years will be used to investigate the status of the population.

Determining the reproductive rate for a declining species: Trying times for the northern fur seal?

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The northern fur seal (*Callorhinus ursinus*) population in the Alaskan Pribilof Islands has been declining for the past forty years, and the causes for this decline remain unexplained. Current studies show that there has been a steady decline in northern fur seal pup production since the early 1970's, although reproductive rate is unknown. Reproductive rate, the ratio of females to offspring produced, has been estimated with this study. We observed a sample of radio-marked individuals to determine attendance patterns during the pupping period and, if possible, the presence of absence of a pup with each female. In November 2007, 94 female fur seals were instrumented with VHF radio transmitters to record attendance patterns during the 2008 breeding season at Polovina Cliffs rookery on Saint Paul Island. Observational analysis was coupled with automated monitoring of VHF radio signals to determine pupping of the marked females. Initial results show that 79 females returned and exhibited attendance patterns typical of nursing mothers. 13 females were either not observed and had poor telemetry signals, or not detected with telemetry scans. 2 females were seen less than four days each, and were not detected with telemetry scans. Further analysis will be conducted on maternal attendance patterns for a retrospective comparison. Results likely provide a best-case estimate of current reproductive rates in this population, and crucial information to better understand the decline of the Pribilof Islands fur seal population.

Stereotypy in the whistles of captive bottlenose dolphins (*Tursiops truncatus*)

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Although stereotyped phonations have been identified, it is unknown how bottlenose dolphins use their whistles for communication. In terrestrial species, stereotyped calls are used for transmitting information in well-defined contexts. Five dolphins housed in two aquaria in Mexico City were