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Seabird Observations During Cetacean Surveys In Santa Monica Bay, California

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Abstract.—Seabird occurrence, distribution and behavior were assessed during cetacean surveys conducted between 2006–2007 in Santa Monica Bay, California. Gulls were most sighted year-round (55.63%), followed by brown pelicans (*Pelecanus occidentalis*; 19.0%), terns (6.61%) and Western grebes (*Aechmophorus occidentalis*; 6.53%). Gulls, shearwaters, and pelicans were often found foraging with short-beaked and long-beaked common dolphins (*Delphinus delphis*, *D. capensis*), and California sea lions (*Zalophus californianus*) near underwater canyons. Behavioral budget showed a predominance of *passing by* and *floating* activities. *Feeding* was observed in 6.5% of the sightings. This study provides baseline data for future seabird monitoring, conservation and management in the study area.

Over two million seabirds of almost thirty species nest along the California, Oregon, and Washington coasts, including three species listed as threatened and endangered: the brown pelican (*Pelecanus occidentalis*), the California least tern (*Sterna antillarum browni*), and the marbled murrelet (*Brachyramphus marmoratus*) (Bonnell and Dailey 1993). The Southern California Bight (SCB) also supports a large presence of seabirds, including 43 species (Bonnell and Dailey 1993) many of which move in and out of Santa Monica Bay. Species of gulls, terns, shearwaters and storm-petrels are the most numerous and all breed in the SCB (with the exception of shearwaters), many on the Channel Islands (Hunt et al. 1981, Carter et al. 1995, Schmitt and Bonnell 2003).

This study, conducted between 2006–2007, describes the occurrence, seasonal presence, distribution and behavior of seabirds occurring in the bay, and provides baseline data for future investigations and monitoring as well as for conservation and management of seabirds in Santa Monica Bay, currently considered as a potential Marine Protected Area.

Methods

Study Area

The Santa Monica Bay study area (approximately 460 km², Fig. 1) is a shallow shelf bounded by the Palos Verdes Peninsula to the South (33°45' N, 118°24' W), Point Dume to the North (33°59' N, 118°48' W) and the edge of the continental shelf to the West. The bay contains three submarine canyons: Dume and Redondo canyons head in shallow water, whereas Santa Monica Canyon begins at a depth of about 100 m at the edge of the continental shelf. The mean depth is about 55 m and the maximum depth 450 m. A shallow shelf between Santa Monica Canyon and Redondo Canyon extends as a plateau from the 50 m contour. Mild temperatures, short rainy winters and long, dry summers are usual weather conditions for the bay. Normal water surface temperatures range from 11 to 22 °C. During the 1997–98 El Niño, three peaks of sea surface temperature (SST)

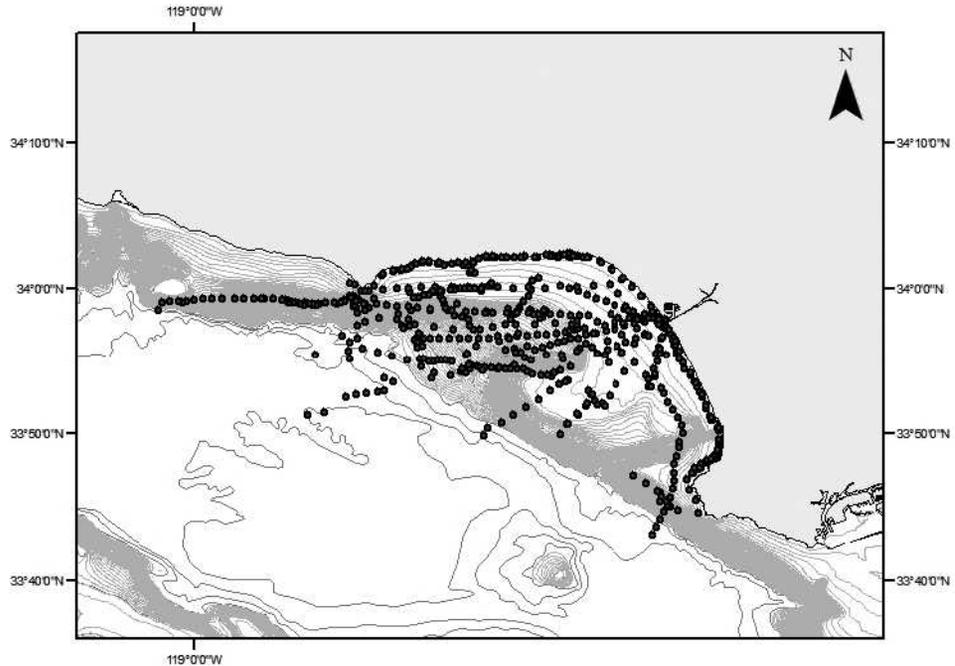


Fig. 1. Study area and distribution of seabird groups during 2006–2007.

anomalies were evident: May–June 1997, September–October 1997 and August 1998, with an increase in temperature of +2 °C (Nezlin *et al.*, 2003).

Data Collection and Analyses

Seabird observations were conducted during cetacean surveys from January 2006 to July 2007. Inshore (distance from shore < 500 m) and offshore (distance from shore > 500 m) routes were carried out in the morning and early afternoon with Beaufort scale 2 or less, sea state 0 and visibility > 300 m. Routes, planned for an even coverage of the bay throughout the entire study period (Bearzi *et al.* 2008), were covered from a 17-m sailboat (2006) and a 10-m powerboat (2007), at an average speed of 18 km/h.

Data were recorded with a hand-held, PDA based system for seabird data collection specifically designed for this study (Bearzi and Saylan 2008). A total of 17 different groups of seabirds were taken into account, including: loons, grebes, fulmars and petrels, shearwaters, pelicans, cormorants, shorebirds, gulls and kittawakes, terns, skimmers, and alcids. When species were uncertain and/or categorized as threatened/endangered, their presence (and possibly identification) was also recorded in the database (Bearzi and Saylan 2008).

When seabirds were sighted, species/family, an estimate of total number of individuals, estimated distance from the boat, and behavior (e.g., passing by, inspecting, landing, floating, feeding) in presence or absence of cetaceans were recorded at five-minute intervals throughout the entire survey. Data analyses were performed using Statview 5.02, Statistica 6.0 and Microsoft Excel 2003; data on species distribution were plotted with Arcview GIS 9.2.

Note: Seabirds considered in this study include birds residing or spending a portion of their lives on or near coastal or offshore habitats. This study also includes all shorebirds

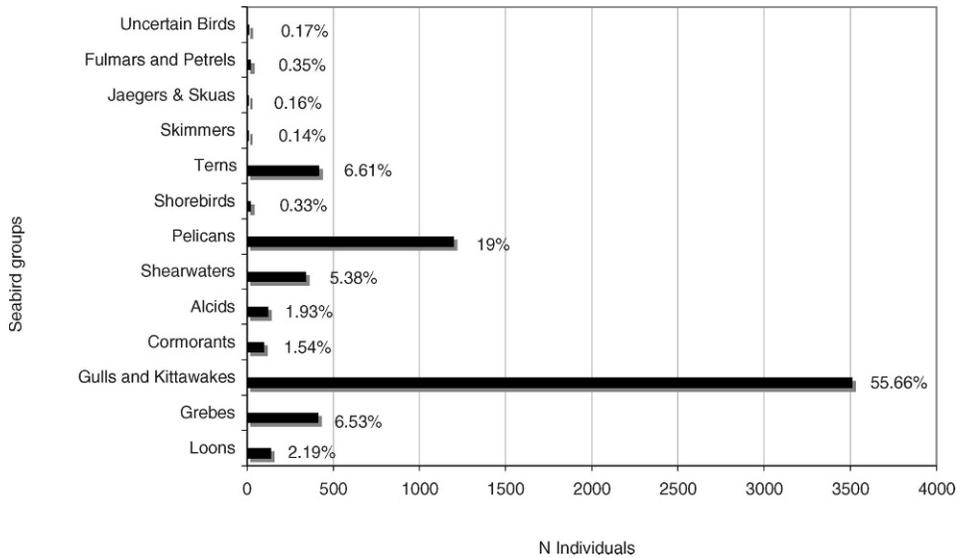


Fig. 2. Cumulative data for seabird groups observed for the entire study period.

observed during surveys conducted at sea; red and red-necked phalaropes (*Phalaropus fulicarius* and *P. lobatus*, respectively) are shorebirds that routinely spend portions of their non-breeding seasons at sea off Southern California (Garrett and Dunn 1981).

Results

Field Effort

Data were collected during 15 inshore and offshore surveys. Over 70 hours were spent searching for seabirds in good weather conditions (Beaufort scale ≤ 2), with similar effort in the two study years (2006: 36 hours; 2007: 34 hours). The majority of seabirds were recorded at a distance from the research boat of 0–50 m (36.5%), followed by those observed at 51–100 m (32.5%), 101–200 m (17.0%) and 201–300 m (14.0%).

Occurrence, Seasonal Presence and Distribution

On a total of 6306 individuals observed, gulls (family *Laridae*, genus *Larus*) were the most frequently sighted seabirds year-round in Santa Monica Bay (55.63%, $n = 3508$). The majority of gulls were Western gulls (*Larus occidentalis*), California gulls (*L. californicus*), ring-billed gulls (*L. delawarensis*), Heermann's gulls (*L. heermanni*), and Bonaparte gulls (*L. philadelphia*). Pelicans - all belonging to the species *P. occidentalis* - were the second group most often recorded (19.0%, $n = 1736$), followed by terns (6.61%, $n = 616$) and Western grebes (*Aechmophorus occidentalis*; 6.53%, $n = 412$; Fig. 2). While elegant terns (*Sterna elegans*) were observed both in coastal waters and offshore, the endangered California least terns (*S. a. browni*) were recorded typically during coastal surveys in the summer months. Shearwaters - mostly sooty shearwaters (*Puffinus griseus*) - were observed primarily during the summer months in the offshore waters of the bay (5.37%, $n = 339$). The presence of the Xantus's murrelet (*Synthliboramphus hypoleucus*) - a vulnerable species listed in the IUCN Red List of threatened species and a California Fish and Game Species of Special Concern - was also recorded during surveys in offshore waters. The seasonal presence of the different groups is illustrated in Figure 3.

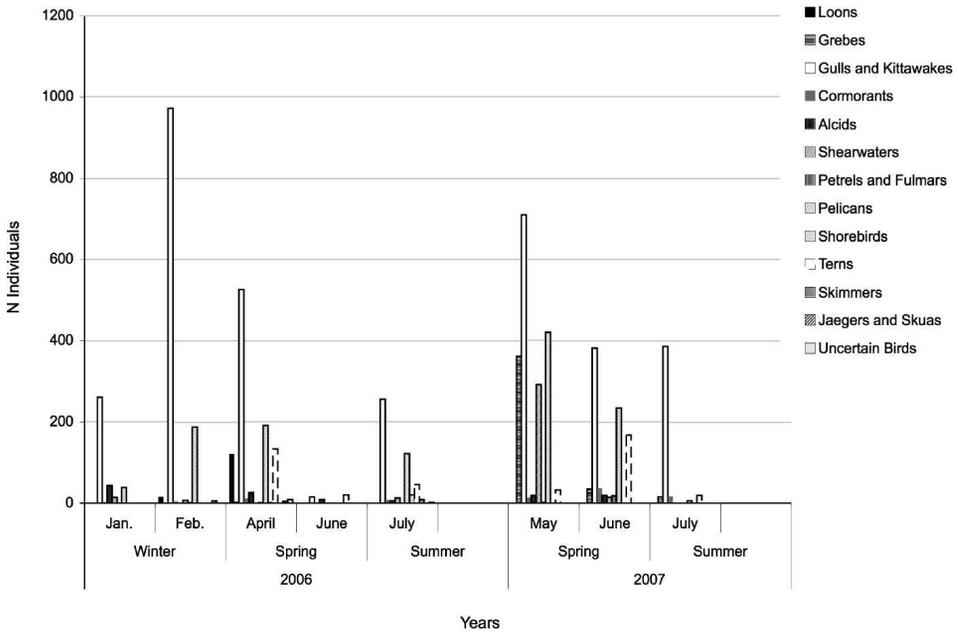


Fig. 3. Seasonal presence of seabird groups observed in Santa Monica Bay.

Seabirds were always recorded during inshore surveys (< 500 m from shore) but they were also observed during offshore surveys, with the exception of two days spent at sea (Fig. 1). In offshore waters and primarily along the Santa Monica canyon, seabirds like gulls, shearwaters, and brown pelicans were often found in aggregations with cetaceans (mostly short-beaked common dolphins, *Delphinus delphis*, and long-beaked common dolphins, *D. capensis*) and California sea lions (*Zalophus californianus*) during foraging and feeding activities.

Behavioral Patterns

On a total of 674 5-min samples, the behavioral budget recorded for different seabird groups showed a predominance of *passing by* (62.6%; *n* 5-min sample = 422), followed by *floating* (22.3%, *n* = 150) activities. *Feeding* was observed in 6.5% of the sightings (*n*=44), *boat inspecting* in 5.0% of the sightings (*n* = 34) and *landing* in 3.6% of the sightings (*n* = 24). The different behaviors displayed by the seabird groups are illustrated in Figure 4.

During cetacean sightings, on a total of 217 5-min samples, the behavioral budget recorded for different seabird groups showed a predominance of *inspecting cetaceans* (18.9%; *n* 5-min sample = 41), followed by *floating near cetaceans* (17.0%, *n* = 370) activities. *Feeding near cetaceans* was observed in 16.1% of the sightings (*n* = 35), and *landing near cetaceans* was recorded in 9.2% of the sightings (*n* = 20). Seabirds were also observed *stealing fish* from cetaceans in 6.9% of the sightings (*n* = 15). The different behaviors displayed by the seabird groups during cetacean sightings are illustrated in Figure 5. Preliminary observations also show seabirds usually approaching (and separating from) cetacean schools - and not *viceversa*; more data, however, is necessary to validate this hypothesis.

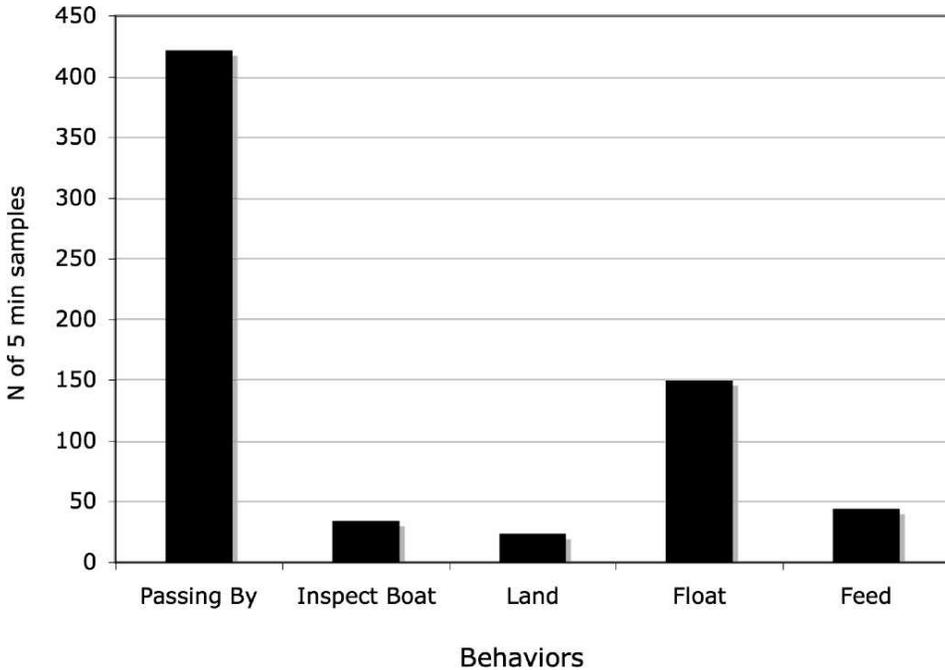


Fig. 4. Behaviors of seabird groups observed during 5-min intervals ($n = 674$).

Discussion

Although seabirds are mobile species and do not restrict their presence to a specific area (Bonnell and Dailey 1993), this preliminary study attempts to provide an overview of seabird occurrence, distribution and behavior in Santa Monica Bay, both in presence and absence of cetaceans.

Of the seabirds inhabiting Santa Monica Bay, gulls (family Laridae, genus *Larus*) were the most often observed year-round and during the two-year study period, followed by brown pelicans, terns, grebes and shearwaters. This data is in accordance with other studies conducted at a larger scale in the SCB (Garrett and Dunn 1981, Carter et al. 1995; Bonnell and Dailey 1993 for a general overview). The presence of brown pelicans, least terns and Xantus's murrelets, listed as vulnerable, threatened and endangered species and all recorded during on-the-water surveys, also reflects, in general and at smaller scale, the occurrence of these species as reported by other authors for the SCB (Bonnell and Dailey, 1993, Schmitt and Bonnell, 2003).

The occurrence of seabirds in the study area was recorded both within 500 m of shore and in the offshore waters of the bay with a high presence of birds near the Santa Monica canyon. Seabirds, like other top predators, are known to concentrate where ocean productivity is high (Bonnell and Dailey 1993); the canyons of the bay represent areas of upwelling - where the cold and nutrient-rich waters of the depth mix with surface waters - representing optimal foraging ground for different species (Evans 1980, Bearzi 2005, 2006).

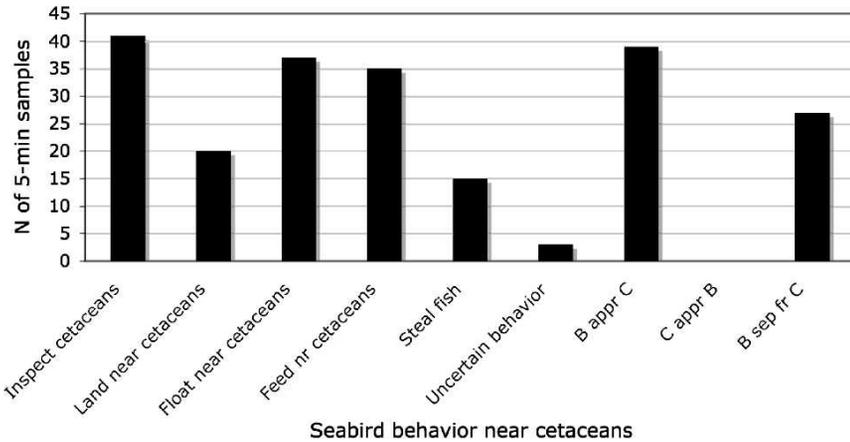


Fig. 5. Seabird behaviors displayed during cetacean sightings (B = birds; C = cetaceans).

Seabirds were often observed passing by, but feeding activities were also often recorded, especially along the Santa Monica submarine canyon and/or along fronts or slicks, usually in the presence of cetaceans and California sea lions, as also previously recorded by the author (Bearzi 2006). Many of the prey types eaten by seabirds are, in fact, the same species consumed by marine mammals (e.g., anchovies, sardines, mackerels, rockfish; Bonnell and Dailey 1993, Bearzi 2005, 2006).

Conclusion

Many seabird species use the bay on a year-round or seasonal basis; several of them are threatened, endangered, have a limited range or show a decline in their populations (Bonnell and Dailey 1993). Further, this study illustrates how seabirds – as well as cetaceans and sea lions - frequently occur along submarine canyons, areas where preys are usually abundant for top predators. These areas also tend to accumulate man-made pollutants like plastic, well known to be consumed by seabirds and occasionally causing the death of these animals (Fry 1987, Day 1979, Ryan 1990).

This preliminary study provides a baseline of data on seabird species and suggests the need to 1) gain a better understanding of linkages between different species (e.g., marine mammals, seabirds, fish populations) present in Santa Monica Bay; 2) utilize a precautionary approach toward these species; and 3) conduct continuous monitoring of seabirds and marine mammal species for their protection and management in Santa Monica Bay.

Acknowledgements

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