



Figure 3.19. Brandt's Cormorant: maps of seasonal density, high use areas, and breeding colonies.

ABOUT THESE MAPS

Maps a, b and c show the at-sea density (birds/km²) of Brandt's Cormorant (*Phalacrocorax penicillatus*) in three ocean seasons – Upwelling, Oceanic, and Davidson Current, displayed in cells of 5' latitude by 5' longitude. Densities are based on the combined data sets of several

studies; see the Data and Analyses section of this chapter. The color and mapping intervals were selected to show the most structure and highlight significant areas, while allowing comparisons among marine bird species. Cells that were surveyed but in which no Brandt's Cormorants were observed have a density of zero. Areas not surveyed

appear white; no information was available for these areas. Blue lines indicate the boundaries of the National Marine Sanctuaries in the study area: Cordell Bank, Gulf of the Farallones and Monterey Bay. Bathymetric contours for the 200 m and 2,000 m isobaths are shown in light blue.

In order to provide an integrated look at the patterns of a species' spatial and temporal occurrence and abundance in the study area, map d shows seasonal high-use areas, displayed in cells of 10' latitude by 10' longitude, and also breeding colonies (when available). The seasonal high use map provides a further synthesis of densities presented in maps a, b and c, and portrays the relative importance of various areas to the species. Areas with consistently high use are highlighted. See the Data and Analyses section of this chapter for further explanation of high-use areas.

DATA SOURCES AND METHODS

The at-sea data set is referred to as the CDAS central California data set (1980-2001) and was developed using software called Marine Mammal and Seabird Computer Data Analysis System (CDAS), by the R.G. Ford Consulting Co. The data set extends from Pt. Arena to Pt. Sal in the study area, and the surveys used were conducted between 1980 and 2001. See the Data and Analyses section of this chapter for more information on the at-sea survey data sets and methods.

Data on colony sizes were obtained from Carter et al., (1992), McChesney et al., (2000b), and Capitolo et al., (2004a and b, 2006). Data from Capitolo et al., (2004b) were from the last statewide assessment from surveys conducted in 2003.

RESULTS AND DISCUSSION

The Brandt's Cormorant, nearly endemic to the California Current region, is an abundant species within the study area. This region contains a huge part of this species' world population. Surveys in CDAS recorded 2,174 sightings of 10,016 individuals; based on CDAS, abundance of this species within the study area has remained stable between 1985 and 2002.

Densities of Brandt's Cormorants at sea were greatest within the boundaries of the National Marine Sanctuaries; to the north and south abundance dropped. A multiple regression model of nine independent variables explained 28.7% of variation in density; important variables were inverse relationships to distance to colony, distance to the 200 m isobath, and distance to land; see Table 3.8. This species occurred primarily over the shelf (mean depth 81 ± 8 m) and near to land (mean distance from shore was 6.8 ± 0.2 km) and colony. Brandt's cormorants were most abundant during the Upwelling (nesting) Season and were concentrated around the primary nesting colonies.

Also important to this species were the areas of the Farallon Escarpment and Ridge, San Francisco Bay tidal plume and inner Monterey Bay. The population became most concentrated in these areas during the breeding season,

when they occurred in waters having a mean ocean depth of 60 m and a mean distance to land of 6.1 km. During the Oceanic and Davidson Current seasons this species mostly occurred over slightly deeper waters (mean depths of 247 m and 195 m, respectively) and farther offshore (mean distances 8.8 km and 12.4 km, respectively). Relatively speaking, however, these measures indicate that Brandt's cormorants were mostly close to the coast during this time. Brandt's Cormorant occurred in the study area in all three National Marine Sanctuaries and in all three ocean seasons.

Abundance of Brandt's Cormorants at-sea was not affected by ENSO. The decline in numbers at sea after nesting (Upwelling Season) may have been partially due to movement out of the area, as leg band returns from Farallon birds demonstrate a northern movement to Oregon and Washington, primarily of subadults. The decrease in abundance could also have been an artifact of cormorant spending more time roosting, and thus not at sea, during the non-breeding season. When oil spills occur in the study area, Brandt's Cormorant are often impacted by them.

Brandt's Cormorants nest during the Upwelling Season. This species typically nests in dense colonies of hundreds to thousands of birds on offshore rocks, islands, and certain mainland cliffs. It is the second-most abundant nesting species in the study area. The largest colony in the study area (and the world) occurs on the South Farallon Islands. Several other important colonies occur at nearshore colonies within Gulf of the Farallones (e.g., Point Reyes, Devil's Slide Rock and Mainland, Año Nuevo Island). Increases at these nearshore colonies in recent years may indicate an inshore population shift associated with the demise of rockfish (*Sebastes* spp.), an important prey taxon. Beyond the Gulf of the Farallones, this is the most abundant breeding seabird in the study area. Important nesting areas include Fish Rocks, Bodega Rock, Alcatraz Island, Pebble Beach-Point Lobos area, Cape San Martin, Piedras Blancas, and the Point Buchon-Diablo Canyon area. The large colony at Yankee Point was a new occurrence in 2003 (Capitolo et al., 2004) and they also bred there in 2005; this species had not been recorded there in the past (USFWS, unpubl. data). Data from 2003 colony surveys in central California indicated a population decline since 1989 (Capitolo et al., 2004b). A more detailed assessment of Gulf of the Farallones colonies from the mid-1980s to 2002 indicated no long-term trend overall but a substantial increase at nearshore colonies (G.J. McChesney, pers.comm., 2004; USFWS, unpubl. data). In 2003, mild El Niño conditions led to reduced or no nesting efforts at many colonies, and some colonies switched to other nearby sites not typically used. Because numbers at certain colonies were not representative of typical recent patterns (G. J. McChesney, pers. obs.), other recent counts were substituted for 2003 data when available.

Brandt's Cormorants feed principally on fish that they catch by diving close to the sea floor. See Tables 3.5 - 3.11 for related summary information.