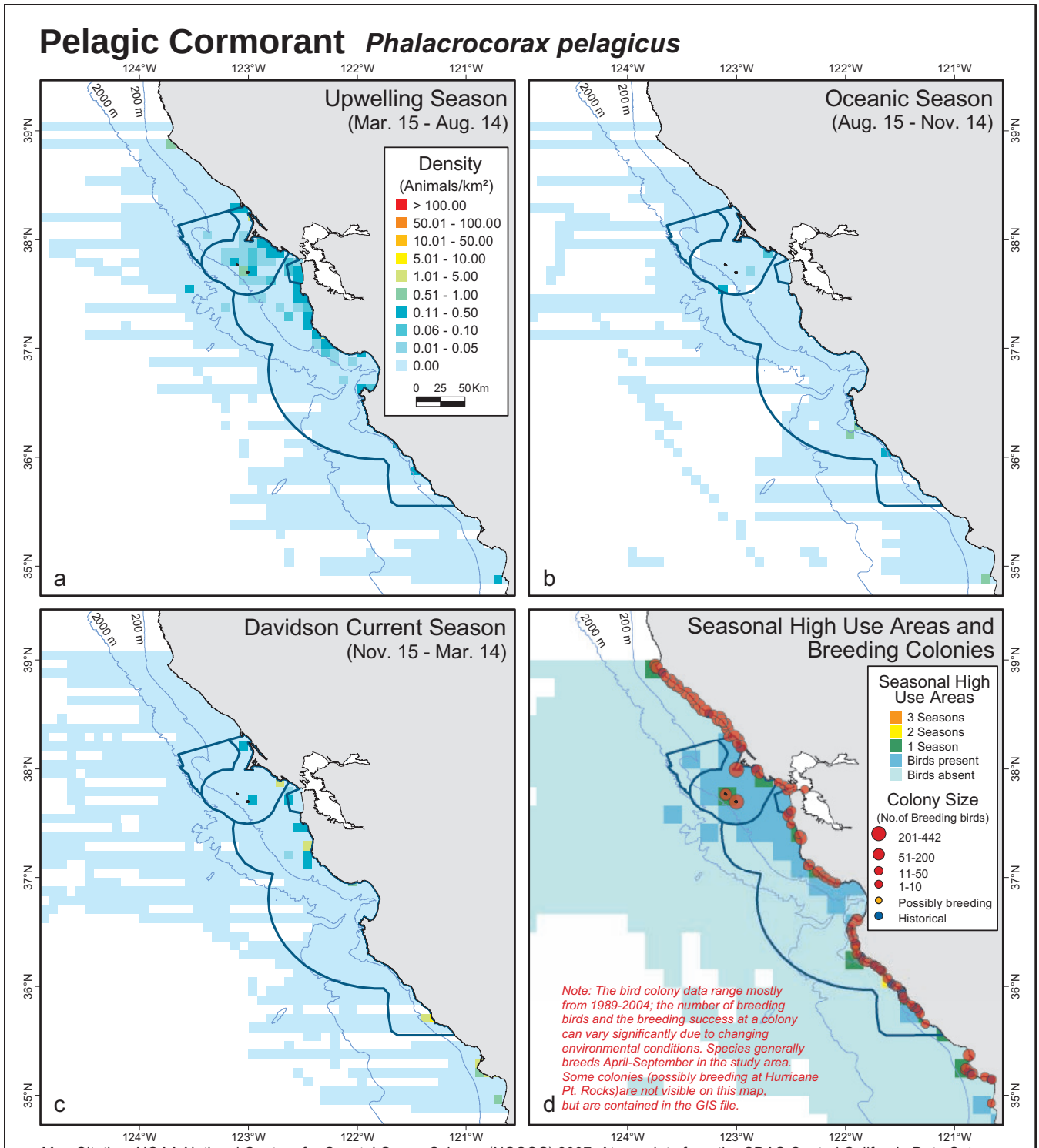

Figure 3.21. Pelagic Cormorant: maps of seasonal density, high use areas, and breeding colonies.

ABOUT THESE MAPS

Maps a, b and c show the at-sea density (birds/km^2) of Pelagic Cormorant (*Phalacrocorax pelagicus*) 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 Pelagic 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 primarily from Carter *et al.,* (1992), with additional updates from Warzybok *et al.,* (2002) for the South Farallon Islands and from McChesney *et al.,* (2005) for colonies at San Pedro Rock and Devil's Slide and Mainland. Pelagic Cormorants typically nest in relatively small colonies (<100 pairs) on steep island and mainland cliffs. Most estimates are based on direct counts of nests; occasionally, bird counts are used. Carter *et al.,* (1992) adjusted nest or bird counts with correction factors to account for nests that had failed and nests that had not been built at the time of the survey.

RESULTS AND DISCUSSION

The Pelagic Cormorant is uncommon in the study area. At-sea surveys in CDAS recorded 265 sightings of 434 individuals, a ratio indicating that its tendency to form flocks is much less than that of other cormorants. In the study area, greatest densities occurred within the Sanctuary boundaries; to the north and south, at-sea sightings for this species were sparse.

A multiple regression model of nine independent variables explained only 6.1% of variation in density, principally through inverse relationships to distance to colony, distance to the 200 m isobath, and distance to land; see Table 3.8. Similar to the Marbled Murrelet and scoters, this species occurs in waters of shallow depths (mean depth 57 ± 9 m) and close to land (mean distance to land 5.4 ± 0.4 km). These reported average depths and distances are likely biased deeper and farther from shore than the species true habitat pattern, because most research vessels approached only to about 1.5 km from shore and thus the species' preferred habitat is under-sampled. Many individuals of this species forage over rocky reefs immediately adjacent to the coastline.

Like Brandt's Cormorant, the Pelagic Cormorant was most abundant during the Upwelling (nesting) Season, and numbers appeared to be unaffected by interannual climatic variation. This species occurred in the study area during all three ocean seasons. The species was found close inshore during the Davidson Current Season (mean depth 40 m, mean distance to shore 6.0 km), farthest offshore during the Oceanic Season (mean depth 311 m, mean distance to shore 11.2 km), and generally in habitats of intermediate measures during the Upwelling Season (mean depth 59 m, mean distance to shore 5.2 km). Highest at-sea densities during the Upwelling (nesting) Season were likely an artifact of individuals spending more time in the water foraging then than they do during the non-breeding period. In the latter, they spend a lot of time roosting. Thus, like the Brandt's Cormorant, their abundance along the central California coast probably does not decrease as much as comparison of the seasonal maps might suggest.

Pelagic Cormorants colonies are widely distributed. The largest breeding colony in the study area is on the South Farallon Islands (see also Appendix 1A). Within the study area, abundances are greater north of Monterey. Other important nesting sites include the Point Arena area, Russian Gulch, Point Reyes, Seal Rock Cliffs/Martin's Beach area, Punta del Año Nuevo, and Cannery Row.

Pelagic Cormorants feed principally on benthic fish (e.g., rockfish, blennies, sculpins) and invertebrates (e.g., grass shrimp), which they catch by diving. See Tables 3.5, 3.7, 3.8, 3.9, 3.10 and 3.11 for related summary information.