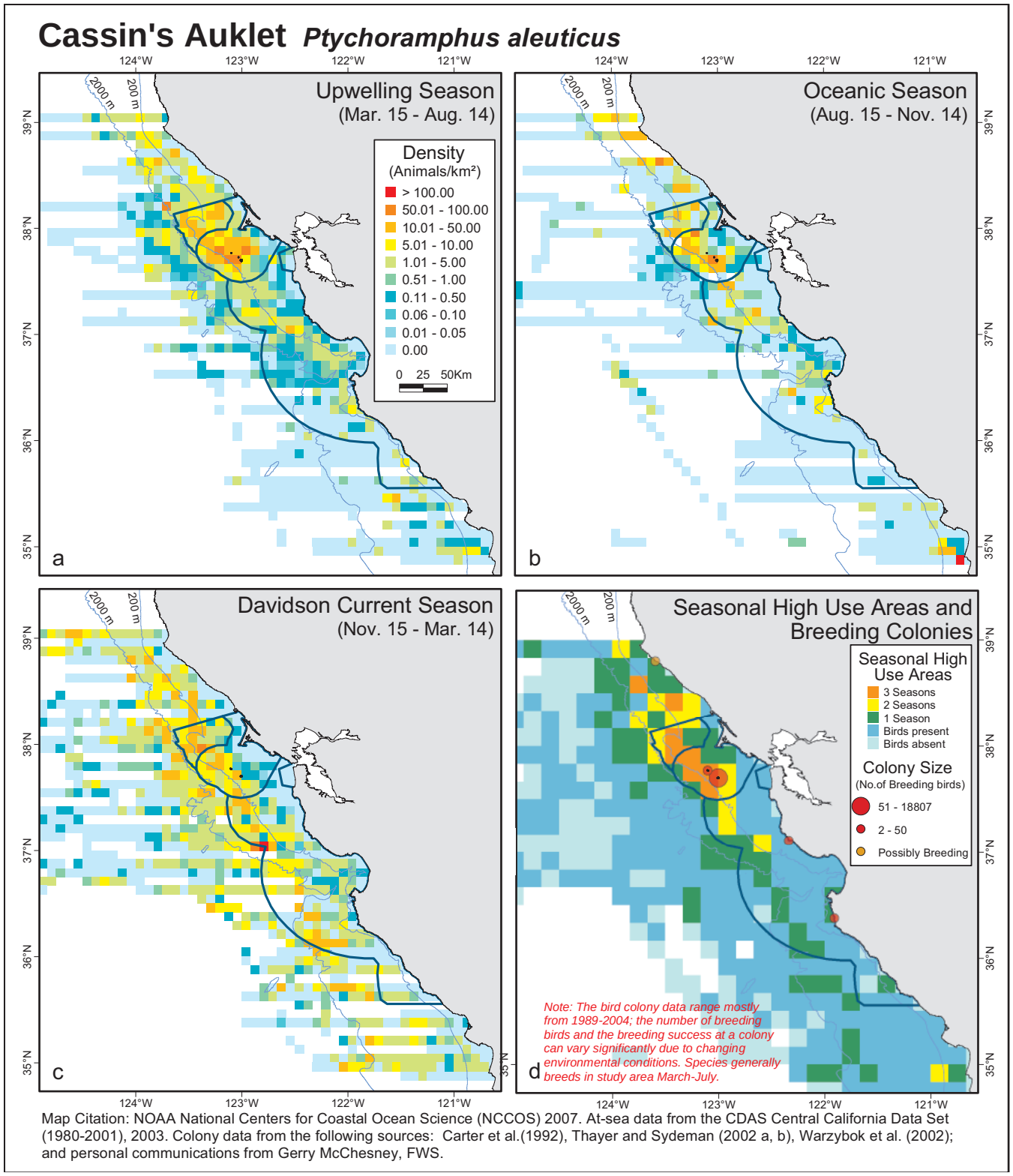

Figure 3.34. Cassin's Auklet: maps of seasonal density, high use areas, and breeding colonies.

ABOUT THESE MAPS

Maps a, b and c show the at-sea density (birds/km^2) of Cassin's Auklets (*Ptychoramphus aleuticus*) 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 Cassin's Auklets 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), Thayer and Sydeman (2002a, b), Warzybok *et al.,* (2002), and McChesney *et al.,* (2000a), and McChesney (pers. comm.).

RESULTS AND DISCUSSION

Despite being listed by the state of California as a "Species of Special Concern" because of recent declines, Cassin's Auklet is abundant and widely distributed in the study area. Surveys in CDAS recorded 11,661 sightings of 69,733 birds.

Cassin's Auklets mainly frequent waters of the outer shelf and inner slope, both inside and outside marine sanctuary boundaries (mean depth of water where the species occurred was 354 ± 13 m), depending on season. A multiple regression model of nine independent variables explained 25.8% of variation in density. The top three variables included negative relationships with distance to land and distance to the colony, as well as with year; see Table 3.8. The decrease in density with year was very abrupt between 1984 and 1997. However, for the entire study period, 1985-2002, the relationship was curvilinear indicating that the population later stabilized and had possibly begun to increase with the switch to a cool water period that began in 1999. Should the population increase further, its distribution likely will expand in the waters around the Farallones, thus mimicking the "halo" of foraging individuals exhibited by other Farallon breeding species.

Cassin's Auklets were most abundant during the Upwelling (nesting) Season (mean density 462 birds per 100 km^2) compared to the Oceanic and Davidson Current seasons (188 and 132 birds per 100 km^2, respectively). This pattern is likely the result of individuals moving out of the study area after breeding. During the Davidson Current Season these auklets occurred farther offshore (mean depth was 1,338 m and mean distance from land was 35 km) than they did during the other two seasons. During the Upwelling Season, the primary occupied habitat shrank mostly to the slope and outer shelf (mean depth was 262 m, mean distance was from land (Farallones) 12.4 km) as the population became more centered around the Farallones colony, where the primary nesting population exists. These auklets visit colonies only at night and do so throughout most of the Davidson Current and Upwelling seasons. During the Oceanic Season, the Cassin's Auklet population moved northward toward Cape Mendocino, although it remained close to the shelf break (mean depth 385 m). Cordell Bank, Fanny Shoal and Farallon Escarpment were important foraging areas. During the Upwelling Season, the Cordell and Gulf of the Farallones National Marine Sanctuaries, plus the northern part of Monterey Bay National Marine Sanctuary, contained a sizeable proportion of the region's auklets. The species occurred in all three National Marine Sanctuaries during all three ocean seasons.

In the study area, Cassin's Auklets breed almost entirely at the South Farallon Islands; see also Appendix 1A, the bird colony data table. Recent discoveries of scattered small colonies indicate the species may be more widespread than previously known. The large Farallon colony has decreased in numbers markedly since the early 1970s (Carter *et al.*, 1992; Warzybok *et al.,* 2002), possibly due to declines in its favorite prey.

Cassin's Auklets feed by diving to shallow depths in deep waters, where it feeds on invertebrates (especially krill, amphipods and crab megalops) and larval fish. See Tables 3.5, 3.7, 3.8, 3.9, 3.10 and 3.11 for related summary information.