

# ASSESSMENT OF THE NESTING POPULATION OF DOUBLE-CRESTED CORMORANTS *PHALACROCORAX AURITUS ALBOCILIIATUS* ON ISLA ALCATRAZ, GULF OF CALIFORNIA, MEXICO

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## SUMMARY

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In the early 1970s, censuses of Double-crested Cormorants *Phalacrocorax auritus albociliatus* on Isla Alcatraz in the Gulf of California suggested that Isla Alcatraz was one of the largest Double-crested Cormorant nesting colonies in the Gulf. To update information on the size of the colony, we counted active nests at Isla Alcatraz during the 2000/01, 2001/02, and 2002/03 seasons. Nesting began in September and continued through April. Peak nesting activity in 2000/01 was in early January, with 1225 active nests. In 2001/02 the peak was recorded in late November (1093 active nests), and in 2002/03 the peak occurred again in late November (1683 active nests). Based on previous population estimates for Pacific coast nesting pairs of Double-crested Cormorants, 30%–40% of the coastal nesting population of *P. a. albociliatus* in the Gulf of California nested on Isla Alcatraz during the three seasons; representing 5%–8% of the overall Pacific coast nesting population. Although Isla Alcatraz is protected under the Gulf of California Island Reserve program, we believe that additional protection should be afforded to Isla Alcatraz to ensure the future success of this important colony.

Key words: Double-crested Cormorant, *Phalacrocorax auritus albociliatus*, Gulf of California, seabird breeding colony, nesting pairs, island management

## RESUMEN

A principios de los 1970s, en la Isla Alcatraz ubicada en el Golfo de California se realizaron censos de Cormorán de Doble Cresta *Phalacrocorax auritus albociliatus*, los cuales indicaron que esta isla contenía una de las colonias de anidación de Cormorán de Doble Cresta más grande del Golfo. En septiembre de 2000, iniciamos un monitoreo de la colonia de anidación en la isla para obtener información sobre el período de anidación y el número de nidos activos en la isla. Se hizo un conteo de los nidos activos durante tres temporadas (2000–2001, 2001–2002, 2002–2003); determinándose que el período de anidación es de septiembre hasta abril. La época de mayor actividad de anidación en la temporada 2000–2001 fue a principios de enero, con 1225 nidos activos. En la siguiente temporada, la época de mayor anidación se registro a finales de noviembre con un total de 1093 nidos activos. Durante la temporada 2002–2003 la mayor anidación ocurrió a finales de noviembre con un máximo de 1,683 nidos activos. En base a estimaciones previas sobre la anidación de la población de Cormorán de Doble Cresta en la Costa del Pacífico, 30–40% de la población costera de anidación de *P. a. albociliatus* en el Golfo de California anidaron en la Isla Alcatraz durante las tres temporadas. Esto representa cerca del 5–8% de la población total de anidación en el Pacífico. Aunque la Isla Alcatraz esta protegida bajo el programa de reserva de las Islas del Golfo de California, creemos que debería de proporcionarse protección adicional a la Isla Alcatraz para asegurar el futuro éxito de esta colonia tan importante.

Palabras clave: Cormorán de Doble Cresta, *Phalacrocorax auritus albociliatus*, Golfo de California, colonia criadora de aves marinas, pares anidando, manejo de la isla.

## INTRODUCTION

In the 1970s, researchers began collecting information and conducting surveys to locate seabird breeding sites along the west coast of the Baja California peninsula and in the Gulf of California. They reported nesting populations of Double-crested Cormorants *Phalacrocorax auritus* on many islands in the Gulf—including Isla

Alcatraz, San Jorge, Gemelos, San José, San Pedro Nolasco, San Luís and San Ildefonso—and along some coastal mangrove areas of Sonora and Sinaloa (Everett & Anderson 1991). At this time, the Double-crested Cormorant population size for the Gulf of California was estimated to be in the “lower tens of thousands” of individuals, with approximately 1500 breeding pairs on Isla Alcatraz (Carter *et al.* 1995; D.W. Anderson, pers. comm.). This estimate suggested

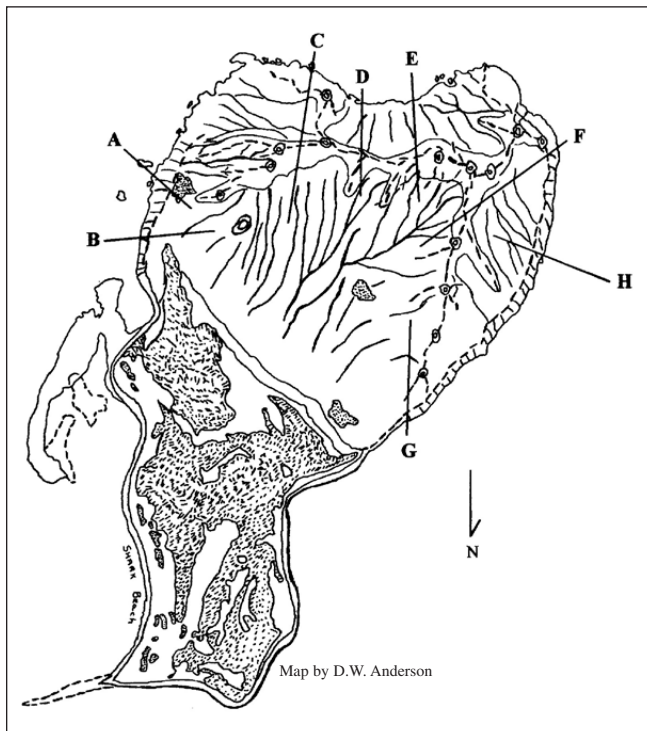
that the Isla Alcatraz Double-crested Cormorant colony was the largest in the Gulf of California (Anderson *et al.* 1976).

Recent evidence suggests that the west coast subspecies of the Double-crested Cormorant *Phalacrocorax auritus albociliatus* may be in decline over much of its range, which includes the Gulf of California (Gress *et al.* 1973, Everett & Anderson 1991, Velarde & Anderson 1994, Anderson *et al.* 2004). Anderson's census of the Isla Alcatraz cormorant colony in the 1970s was the last census conducted before we began monitoring in 2000 in an effort to update information on the size of the Alcatraz colony. The goals of our study were to

- determine the seasonal use of the colony.
- record the total number of active nests occupied throughout the season.
- establish a long-term monitoring program.
- use the results of the study to make management recommendations.
- contribute to the demographic data available for the west coast population of Double-crested Cormorants.

## STUDY AREA

Isla Alcatraz (28°59'00"N, 111°58'00"W, Fig. 1) is located 1.4 km from the mainland coast of Sonora, Mexico, in the Gulf of California. The island is situated in Bahía de Kino, a shallow bay with a mangrove lagoon (Laguna La Cruz) located along its eastern margin. The island is approximately 1.44 km<sup>2</sup>, and the basement rock is volcanic in origin (Carreño & Helenes 2002). The island is characterized by steep cliffs that reach a maximum of 130 m in elevation, and by gentle slopes along the north and northeastern sides of the island (Fig. 1). At the



**Fig. 1.** Map of the Double-crested Cormorant *Phalacrocorax auritus albociliatus* colony on Isla Alcatraz, Sonora, Mexico, illustrating the eight sections of the colony (A–H), redrawn with permission (D.W. Anderson, pers. comm.).

base of the slope are several stands of Cardon *Pachycereus pringlei*, Teddy Bear Cholla *Opuntia bigelovii* and coastal desert shrubs such as desert wolfberry *Lycium* spp. The eastern slope meets an extensive saline flat that is covered in halophytic plants, predominantly Iodine Bush *Allenrolfea occidentalis*. The salt flat ends at the coast in a long sandy beach that is flanked by rocky reefs on either side. These reefs create a natural lagoon that is sheltered from the prevailing winds (see Fig. 1).

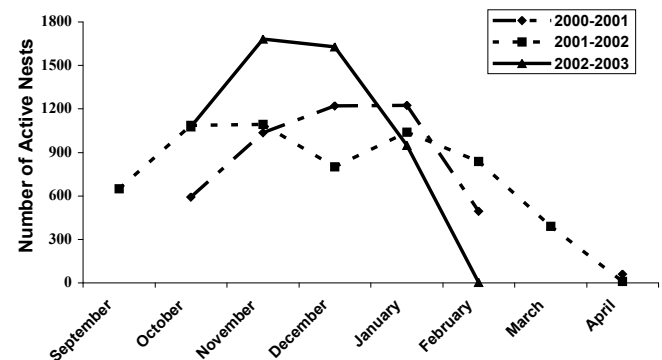
The cormorant colony is distributed throughout the mid-section of the island along the cliffs and slopes of the east, north and west sides of the island. There are also several clusters of nests located in the stands of Cardon.

Other species of seabirds and wading birds that nest on the island include the Brown Pelican *Pelecanus occidentalis*, Yellow-footed Gull *Larus livens*, Black-crowned Night-Heron *Nycticorax nycticorax*, Yellow-crowned Night-Heron *Nyctanassa violacea*, Snowy Egret *Egretta thula*, Reddish Egret *Egretta rufescens*, Cattle Egret *Bubulcus ibis*, Great Blue Heron *Ardea herodias*, Tricolored Heron *Egretta tricolor* and White Ibis *Eudocimus albus*.

The island is located close to the rural fishing community of Bahía de Kino, with a population of approximately 5000, some of who are known users of the island (Prescott College, unpubl. data). In addition to the local users, many shrimp trawlers and a few sardine ships anchor in the lee of the island from September until late April.

## METHODS

Each year of the study, we made preliminary trips to the island in late August and early September to check on the status of the colony. Once the colony started to become established, we counted the number of active nests (any nest that was occupied by one or more adults; one active nest = one breeding pair) on the island throughout the breeding season from early October to the end of April, or when only 50 active nests remained. Only one or two counts were conducted during the month of December. Individuals that were crouched on nests were presumed to be incubating eggs. Two to three researchers conducted surveys using 10×50-, 8×20- or 8×42-power binoculars. We conducted surveys of approximately three hours each, once per week, between 08h00 and 12h00. We divided the study area into eight zones (A–H) that were demarcated by dominant Cardon and large boulders (Fig. 1). Sections A and H were surveyed from a 7.6-m open fiberglass skiff powered by an outboard motor; the other sections were surveyed from land. We surveyed all sections from a



**Fig. 2.** Monthly peak nesting counts for Double-crested Cormorants *Phalacrocorax auritus albociliatus* during the three breeding seasons 2000/01, 2001/02 and 2002/03.

vantage point at a distance of 100 m to avoid disturbance. The final count for the survey was determined by adding the averages for all sections. In 2000/01, we conducted 11 counts between 5 October and 7 April; in 2001/02, 19 counts between 12 September and 1 April; and in 2002/03, nine counts between 27 October and 22 February.

## RESULTS

Each year, during late August and early September, we observed birds carrying nesting material to nests and engaging in courtship displays, and pairs beginning to establish themselves on nests. By mid-September, we observed some adults incubating eggs and by early to mid-October, the number of active nests gradually began to increase. The maximum number of nests was sustained in December and January and then the colony began to rapidly decline between February and March. By mid- to late April, we could no longer locate active nests (Fig. 2).

The 2002/03 breeding season differed from the other two seasons in that it had an overall higher number of nesting birds during the peak (1683 vs. 1225 and 1093), and the season ended approximately a month and a half earlier. In January 2003, the number of breeding pairs began to decline rapidly (263 active nests observed on the 29th), and large numbers of fledglings were observed around the island. On 22 February 2003, we recorded only four active nests, marking the end of our study season. The average number of active nests throughout the three-year study was 1334.

## DISCUSSION

Cormorant breeding effort was distributed somewhat differently during each of the three seasons in which we conducted our study (Fig. 2). However, the 2001/02 season was the only one in which we observed a dramatic change in breeding pairs during the middle of the season. This observed decline at the end of October was due to observer error caused by an overgrowth of amaranth *Amaranthus watsonii* and *A. fimbriatus* region on the island after tropical depression Juliette affected the Kino region on 25 September, instead of an actual decrease in the number of breeding pairs. Our data suggest that the colony continued to steadily increase after the storm; in fact, there was an increase of 442 nesting pairs the following week. Given that the increase in breeding pairs in late November corresponded to the dying down of the amaranth, we believe that the cormorants could have sustained more than 1000 breeding pairs from October until mid-January.

The results of our study show that although numbers of breeding pairs fluctuate each season, the overall size of the Isla Alcatraz colony of Double-crested Cormorants (mean: 1334) has remained similar to Anderson's early 1970s estimate of 1500 breeding pairs. Isla Alcatraz is a critical breeding area for the cormorant, because numbers of breeding pairs have declined at many other important nesting areas in northwestern Mexico and some colonies have been abandoned (Everett & Anderson 1991, Velarde & Anderson 1994, Anderson *et al.* 2004). Based on the most recent census data for Double-crested Cormorants in the Gulf of California, we estimated that, from 2000 to 2003, the number of breeding pairs of Double-crested Cormorants on Isla Alcatraz represented 5%–8% of the total population of breeding pairs on the Pacific Coast of North America and 30%–40% of the total population of breeding pairs in the Gulf of California (Carter *et al.* 1995).

The results of this study were incorporated into a draft management plan that Prescott College recently submitted to the Gulf Islands Reserve office (Area de Protección de Flora y Fauna Islas del Golfo de California). Special concern for the important seabird colonies was addressed and management recommendations were made (Prescott College 2005).

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## REFERENCES

- ANDERSON, C.D., ROBY, D.D. & COLLIS, K. 2004. Conservation implications of the large colony of Double-crested Cormorants on East Sand Island, Columbia River Estuary, Oregon, USA. *Waterbirds* 27: 155–160.
- ANDERSON, D.W., MENDOZA, J.E. & KEITH, J.O. 1976. Seabirds in the Gulf of California: a vulnerable, international resource. *Natural Resource Journal* 16: 483–505.
- CARREÑO, A.L. & HELENES, J. 2002. Geology and ages of the islands. In: Case, T.J., Cody, M.L. & Ezcurra, E. (Eds). A new island biogeography of the Sea of Cortés. Oxford: Oxford University Press. pp. 14–40.
- CARTER, H.R., SOWLS, A.L., RODWAY, M.S., WILSON, U.W., LOWE, R.W., MCCHESENEY, G.J., GRESS, F. & ANDERSON, D.W. 1995. Population size, trends and conservation problems of the Double-crested Cormorant on the Pacific Coast of North America. In: Nettleship, D.N. & Duffy, D.C. (Eds). The Double-crested Cormorant: biology, conservation and management. *Colonial Waterbirds* 18(Special Publication 1): 189–215.
- EVERETT, W.T. & ANDERSON, D.W. 1991. Status and conservation of the breeding seabirds on offshore Pacific islands of Baja California and the Gulf of California. [ICBP Technical Publication No. 11.] In: Croxall, J.P. (Ed). Seabird status and conservation: a supplement. Cambridge, UK: International Council for Bird Preservation. pp. 115–139.
- GRESS, F., RISEBROUGH, R.W., ANDERSON, D.W., KIFF, L.F. & JEHL, J.R. Jr. 1973. Reproductive failures of Double-crested Cormorants in southern California and Baja California. *Wilson Bulletin* 85: 197–208.
- PRESCOTT COLLEGE. 2005. Programa de Conservación y Manejo Área de Protección de Flora y Fauna de Isla Alcatraz, Isla Alcatraz conservation and management program: protected area for flora and fauna (Spanish, draft). Bahía de Kino, Sonora, México: Prescott College Center for Cultural and Ecological Studies, A.C.
- VELARDE, E. & ANDERSON, D.W. 1994. Conservation and management of seabird islands in the Gulf of California: setbacks and successes. *Birdlife Conservation Series* 1: 229–243.