SUCCESSFUL NESTING BY BROWN PELICANS *PELECANUS OCCIDENTALIS* ON SAN CLEMENTE ISLAND, CALIFORNIA, IN 2011

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In 2011, we documented the first known nesting by the California Brown Pelican *Pelecanus occidentalis californicus* (hereafter, pelican) at San Clemente Island (SCI), an active US Navy base and the southernmost of the California Channel Islands in the Southern California Bight (SCB). Pelicans had been federally and California state-listed as endangered since 1970 and 1971, respectively (Gress & Anderson 1983), and were delisted in 2009 (USFWS 2009). In 2006, the world population size of this subspecies was estimated at 70 680 SD 2 640 breeding pairs and 195 900 SD 7 225 individuals, with nearly 80% of the breeding population occurring in the Gulf of California, Mexico, or farther south, and about 17% in the SCB (Anderson *et al*. 2013).

Fig. 1. Aerial view of the extent of the California Brown Pelican colony at Seal Cove (outlined in black), San Clemente Island, California, 23 May 2011 (photo by P.J. Capitolo). The dashed line separates the western and eastern halves of the colony.

Fig. 2. Incubating adult California Brown Pelicans at Seal Cove, San Clemente Island, 2 February 2011 (photo by J.T. Stahl). Nests were built on top of gray-green Nevin's Woolly Sunflower and located beside stands of darker green *Opuntia* and *Cholla* cactus.

The pelican is a common migrant and visitor to SCI (Sullivan & Kershner 2005). Surveys of seabirds or pinnipeds had been conducted at SCI during most years since 1975, with no evidence of pelican breeding before 2011 (Hunt *et al.* 1979, Carter *et al.* 1992, Gress 1995, Anderson *et al.* 2013; M.S. Lowry, H.R. Carter & P.J. Capitolo, unpubl. data). During ground-based pinniped surveys on 27 January 2011 (M.S. Lowry, unpubl. data), "several hundred" pelican nests were first observed on steep, south-facing slopes at Seal Cove, on the western side of SCI (32°54′25″N, 118°32′4″W; Fig. 1).

We (mainly J.T.S.) then conducted ground-based observations intermittently from 2 February to 6 May. On 2 February, we estimated approximately 200 nests and confirmed egg-laying. Visible nests were built atop Nevin's Woolly Sunflower *Constancea nevinii* and located on gentle to steep slopes between dense stands of prickly-pear cactus *Opuntia littoralis*, coast cholla cactus *Cylindropuntia prolifera* and boxthorn *Lycium californicum* (Fig. 2). On 27 March, "hundreds" of nestlings (3–6 weeks old; Fig. 3) were being actively fed by adults and, on 6 May, 197 juveniles were counted in the nest area.

Fig. 3. Adult California Brown Pelicans with 3–6 week old chicks at Seal Cove, San Clemente Island, 27 March 2011 (photo by J.J. Carrero).

However, our best estimates of colony size and productivity were determined from aerial photographic surveys (P.J.C., F.G.), conducted on 31 March and 23 May. Aerial photographs provided complete viewing of all nests, which were distributed over about 0.05 km^2. Using the best photos from 23 May, we counted 449 nests (67% no longer attended by adults or juveniles) and 325 juveniles (about 11–13 weeks old, most within 1 m of a nest), including one with chick plumage still evident (about 8 weeks old). The colony contained 208 nests and 157 juveniles in its eastern half and 241 nests and 168 juveniles in its western half (Fig. 1). Only 15 adults were counted within the colony, including four in possible incubation posture. A few small roost sites around the island were also photographed (67 birds total), and no juveniles were seen. Overall, we estimated 0.72 juveniles produced per nest, similar to average productivity during 1985–2005 for Anacapa Island (0.63; F. Gress, in USFWS 2009).

The following year, there was no sign of pelican breeding activity. We (F.G., H.R.C.) conducted a walk-through on 21 April 2012. The size and composition of nests and the condition of chick carcasses compared with those at other colonies in the SCB indicated that all nests had been constructed in 2011. No further evidence of nesting was observed through 2014, although 655 pelicans were counted roosting around the island in May 2012 (H.R.C., P.J.C.).

Among the California Channel Islands, nesting colonies of pelicans have been documented annually since 1970 on Anacapa Island and 1980 on Santa Barbara Island, and small colonies have been noted sporadically on islets off San Miguel Island (Prince Island) and Santa Cruz Island (Scorpion Rock; Willett 1910, Anderson & Anderson 1976, Gress & Anderson 1983, Gress 1995, Anderson *et al*. 2013). Since the 1860s, no breeding has been reported for San Clemente, San Nicolas (despite roosting birds year-round; Capitolo *et al*. 2012), Santa Catalina or Santa Rosa islands, or for the main islands of San Miguel or Santa Cruz (Cooper 1870, Grinnell 1897, Willett 1910, 1933; Howell 1917; Hunt *et al*. 1979; Carter *et al.* 1992; Gress 1995). Lack of prior breeding at these six islands may be related in part to the presence of Island Foxes *Urocyon littoralis*, which do not occur at the other locations where pelicans have bred in the SCB (Hunt *et al.* 1979). Although foxes pose little predation risk to adult pelicans, substantial predation of Brandt's Cormorant *Phalacrocorax penicillatus* and Western Gull *Larus occidentalis* eggs has been well documented at San Nicolas Island (McChesney 1997; H.R. Carter, unpubl. data). In addition, human impacts have been extensive in some coastal areas of these islands, especially ranching in the 19th and 20th centuries; naval use of SCI, San Nicolas and San Miguel islands since the early to mid-20th century; and private development of parts of Santa Catalina Island since the late 19th century.

Given the lack of documentation of past breeding and the presence of foxes, pelican breeding at SCI in 2011 was unexpected. However, pelicans selected nesting habitat at Seal Cove that was similar to nesting habitat at other SCB colonies, with steep to moderate slopes and availability of shrubs for building and placing nests (Gress & Anderson 1983). The colony also was adjacent to offshore rocks where pelicans regularly roost. Protection from foxes may have been afforded by dense patches of cactus, which are mostly absent at other pelican colonies in California. Access by foxes to the bottom of the colony is likely prevented by coastal bluffs. Furthermore, potential for anthropogenic disturbance to breeding pelicans at Seal Cove is low. The upper slope and coastal areas of Seal Cove are located within a land-based naval training area, but this portion of the training area experiences little military activity. Because of naval activities and unexploded ordnance on SCI, on-island public visitation is prohibited.

The SCI breeding event in 2011 and a similar event at Prince Island in 2006 (P.J. Capitolo, unpubl. data) did not result in subsequent breeding through 2014, even though successful breeding occurred and neither human disturbance nor extensive predation were noted. These recent, one-year breeding events may have reflected: (1) population growth since the 1980s, after heavy impacts from various anthropogenic factors were mitigated (Gress 1995), (2) extensive annual roosting at SCI and Prince Island, (3) possible increased availability of prey in late winter and early spring near SCI and Prince Island (Anderson *et al*. 1982), and (4) temporary shifting of nesting from nearby established colonies by some pelicans. Timing of colony initiation at SCI coincided with the re-initiation in January–February 2011 of breeding at Santa Barbara and Anacapa islands, where nesting that had begun in November 2010 failed completely owing to poor weather and low prey availability (F. Gress, unpubl. data). Following initial colony failures, some pelicans foraging away from established colonies may have encountered abundant Northern Anchovies *Engraulis mordax*, an important food source (Anderson *et al*. 1982), near SCI and remained to breed at Seal Cove. While seabird population dynamics are often strongly affected by strong El Niño–Southern Oscillation (ENSO) conditions (Ainley *et al*. 1988, Anderson *et al*. 2013), the winter of 2010/11 was ENSO-neutral, and large-scale climatic factors did not appear to play a direct role in encouraging breeding at SCI (Bjorkstedt *et al*. 2011).

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