PEREGRINE FALCON MONITORING ON THE CALIFORNIA CHANNEL ISLANDS, CALIFORNIA, 2015

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EXECUTIVE SUMMARY

American peregrine falcons (*Falco peregrinus anatum*) historically were common residents on all the California Channel Islands, with an estimated 15-30 pairs. Peregrine numbers plummeted across much of the northern hemisphere starting in the late 1940s and the peregrine population on the Channel Islands was drastically reduced or extirpated by 1955, likely as a result of the effects of DDE on egg hatchability.

The Santa Cruz Predatory Bird Research Group began peregrine falcon restoration on the Channel Islands in 1983, releasing 37 peregrine falcons on the islands through 1998. The first known successful hatching occurred on Anacapa Island in 1989. There were 9 occupied territories on the islands in 1992, 27 in 2007, 45 in 2013, and 48 in 2014.

In 2015, the Institute for Wildlife Studies surveyed 49 historic peregrine territories on the Channel Islands using a combination of passive and call-broadcast surveys. A total of 48 territories (98%) were occupied, with at least 2 occupied territories on each island. There were 9 occupied territories on San Miguel Island, 12 on Santa Rosa Island, 14 on Santa Cruz Island, 4 on Anacapa Island, 2 on San Nicolas Island, 3 on Santa Barbara Island, 2 on Santa Catalina Island, and 2 on San Clemente Island. The northern Channel Islands appear to be the stronghold for Channel Island peregrine falcons, likely due to more suitable nesting habitat and a larger prey base as compared to the southern Channel Islands.

A minimum of 74 chicks are known to have hatched on the Channel Islands in 2015, of which 65 are known to have survived to ~28 days of age. The earliest and latest dates for the start of incubation of a first clutch were 19 January (MC72 North Signal Peak, Santa Barbara Island) and 20 April (MC77 East Smuggler's, Santa Cruz Island), respectively, a span of 91 days. However, all but the North Signal Peak pair laid during the 1-month period from 20 March to 20 April. Nest success and productivity in occupied territories with known outcomes was 74% and 1.63 chicks/occupied territory, similar to the 2014 results of 78% and 1.67 chicks/occupied territory.

Measurements on eggshell fragments collected from 10 peregrine territories on 3 islands had average thinning of 10%, which is a decrease from the 14.4% recorded in 2014. Eggshell thinning in 2015 ranged from -3.8% (thicker than the pre-1947 mean) to 18.5% and was generally higher on Santa Cruz Island.

We collected prey remains from 11 territories on 4 islands. Ninety-eight prey items (88%) were identified to the species level, representing 36 different species. The most common species identified were House Finch (*n*=15), Eurasian Collared Dove (*n*=8), Horned Lark (*n*=7) Cassin's Auklet (*n*=7), Western Meadowlark (*n*=6), and California Gull (*n*=6).

The peregrine population on the California Channel Islands has recovered to a level that is above predicted historic levels and current productivity appears sufficient to at least maintain the population. However, more study into basic population parameters, such as survival, emigration and immigration rates on the islands is required, as well as continued monitoring of the potential effects of DDE contamination on eggshell thickness and hatching success.

ACKNOWLEDGMENTS

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INTRODUCTION

American peregrine falcons (*Falco peregrinus anatum*; hereafter peregrines) historically were common residents on all the California Channel Islands (Willett 1912, Howell 1917, Kiff 1980), although the highest number of reported nests in a single year was 15 (Kiff 1980, 2000). Because peregrines and their nests are less conspicuous to casual observers than are other raptors historically found on the Channel Islands, such as bald eagles (*Haliaeetus leucocephalus*) and osprey (*Pandion haliaetus*), historical estimates of the number of peregrines on the islands were almost certainly too low (Kiff 1980) and could have been 30 or more pairs (Hunt 1994).

Peregrine numbers plummeted across much of the northern hemisphere starting in the late 1940s (Hickey and Anderson 1969). Peregrines were at their lowest numbers in the 1960s and early 1970s, at which time they were extirpated from the eastern United States and across the Midwest and reduced to a few hundred pairs in the western United States and Mexico (USFWS 2003). Approximately 100 peregrine eyries in California were producing young each year until at least the mid-1940s, with more than a third of the verified or suspected peregrine nest sites occurring within 10 miles of the ocean, including the Channel Islands (Herman et al. 1970). By 1970, the number of breeding peregrines had dropped by at least 95% in California (Herman et al. 1970, Herman 1971). It appears that nests along the southern coast suffered the earliest reductions and the peregrine population on the Channel Islands was drastically reduced or extirpated by 1955 (Herman et al. 1970), with the last reported sighting of a probable Channel Islands breeding adult occurring on Anacapa Island in 1949 (Kiff 1980).

Overwhelming evidence indicated that declines in peregrines and other bird species feeding higher on the food chain were a result of the effects of DDE, a metabolite of DDT, on egg hatchability (Kiff 1980, Mesta 1999, Kiff 2000). The apparent source of the DDT pollution in the Southern California Bight was eventually traced to the Montrose Chemical Corporation's manufacturing plant in Torrance, California. Between 1947 and 1961, an estimated 37 to 53 million liters of DDT-contaminated acid sludge, containing 348-696 metric tons of DDT, was disposed at an ocean dump site 16 km northwest of Catalina Island (Chartrand et al. 1985). In addition, an estimated 1800 metric tons of DDT was discharged from the Joint Water Pollution Control Plant outfall, 3.3 km offshore of Palos Verdes Peninsula (Chartrand et al. 1985).

Peregrines were listed as endangered in 1970 under the Endangered Species Conservation Act of 1969, and later under the Endangered Species Act of 1973 (Mesta 1999). Populations

rebounded following restrictions on the use of organochlorine pesticides in Canada and the United States (banned in 1970 and 1972, respectively) and successful management activities, including the reintroduction of captive-bred and relocated peregrines (Mesta 1999). Between 1983 and 1998, the Santa Cruz Predatory Bird Research Group (SCPBRG) released 37 peregrines on the Channel Islands (12 on San Miguel, 17 on Catalina, 4 on Santa Rosa, and 4 on Santa Cruz; Latta 2012). The first pairs with young were seen on Anacapa and Santa Cruz islands in 1989 and 1990, respectively (Hunt 1994). During a 1992 survey, Hunt (1994) located 9 active eyries on 4 of the Channel Islands. Peregrines were removed from the Endangered Species list in 1999, at which time breeding targets for the Channel Islands (5 pairs) and the Pacific Coast (185 pairs) had been greatly exceeded (Mesta 1999). Ten years later, peregrines were removed from the State of California's list of Endangered and Threatened Animals (California Department of Fish and Game 2011).

After a successful lawsuit against Montrose Chemical et al. for damage caused by the release of DDTs and PCBs into the Southern California Bight, the Montrose Settlements Restoration Program (MSRP) was created to implement restoration projects aimed at restoring natural resources that were directly or indirectly harmed by DDT and PCB contamination. The final consent decree for the Montrose case stated that "the Trustees will use the damages for restoration of injured natural resources, including bald eagles, peregrines and other marine birds, fish and the habitats upon which they depend" (Montrose Settlements Restoration Program 2012). The Montrose Settlements Trustee Council (MSTC) that was created to oversee the settlement monies is composed of representatives of Federal and State agencies that have interests in the Southern California Bight: the National Oceanic and Atmospheric Administration (NOAA), U.S. Fish and Wildlife Service (FWS), National Park Service (NPS), California Department of Fish and Wildlife (CDFW), California State Lands Commission, and the California Department of Parks and Recreation.

Since the conclusion of peregrine survey efforts in the early 1990s, there were limited surveys conducted on the Channel Islands and the distribution and extent of breeding pairs was not known. Under Phase 1 of MSRP's Restoration Plan, the MSTC contracted with the SCPBRG to conduct a peregrine falcon survey and monitoring project in 2007. The goal of that monitoring effort was to assess the current status of peregrines on the Channel Islands and determine whether their recovery was still being affected by on-going contamination in the local food web

(Montrose Settlements Restoration Program 2005). The 2007 survey located 27 occupied territories on 5 of the 8 islands, but also found that DDE contamination still appeared to be reducing the reproductive success (Latta 2012).

Under Phase 2 of the MSRP Restoration Plan, peregrine surveys were to be conducted at 5-year intervals (Montrose Settlements Restoration Program 2012), although the survey scheduled for 2012 was delayed until 2013. After the Institute for Wildlife Studies (IWS) conducted surveys on all 8 Channel Islands in 2013, the Montrose Settlements Trustee Council agreed to our proposal to institute annual surveys through 2017 in order to gain more information on population demography and important population parameters, such as survival, immigration and emigration. As part of that effort, IWS located 45 occupied territories in 2013 and 48 in 2014, with at least 2 territories on each island in 2014. This report summarizes the results of the 2015 field season.

STUDY AREA

The California Channel Islands are composed of eight islands located off the coast of southern California (Fig. 1). All of the Channel Islands are subject to a Mediterranean climate

Figure 1. California Channel Islands located off the coast of southern California, USA.

regime characterized by cool, wet winters and warm, dry summers (Coonan and Schwemm 2009). The northern Channel Islands, which are composed of San Miguel Island, Santa Rosa Island, Santa Cruz Island, and Anacapa Island are located approximately 20 to 44 km off the coast of Ventura and Santa Barbara counties (Junak et al. 1995) and are a tightly clustered group with no more than 9.6 km separating adjacent islands (Moody 2000; Fig. 1). The southern Channel Islands, which are composed of San Nicolas Island, Santa Barbara Island, Santa Catalina Island, and San Clemente Island, are located 32-79 km from the mainland (Junak et al. 1995) and are more remote and scattered than the northern islands, with the closest islands (Santa Catalina and San Clemente Islands) separated by 34 km (Moody 2000; Fig. 1).

San Miguel Island (hereafter San Miguel) is owned by the U.S. Navy, but managed by the NPS (Fig. 1). It is approximately 13 x 6 km with a land area of approximately 37 km^2 and a maximum elevation of 253 m (Junak et al. 1995). The island is primarily a gently sloping plateau with long, sandy beaches that is fully exposed to the prevailing northwesterly winds (Coonan and Schwemm 2009).

Santa Rosa Island (hereafter Santa Rosa) is the second largest of the Channel Islands and is owned by the NPS (Fig. 1). The island is approximately 24 x 16 km and encompasses about 217 km^2 with a central mountain range reaching an elevation of approximately 475 m (Junak et al. 1995, Rick 2009). The central highland is dissected by drainages; a relatively gentle marine terrace occurs north of the highland, whereas steep, deeply incised drainages comprise much of the south portion of the island (Coonan and Schwemm 2009).

Santa Cruz Island (hereafter Santa Cruz) is the largest of the 8 Channel Islands and is owned by the NPS (eastern 24% of the island) and The Nature Conservancy (TNC; western 76% of the island). The island measures about 38 km long by 12 km wide at its widest point (Fig. 1), encompassing approximately 249 km^2 with a maximum elevation of 753 m (Junak et al. 1995).

Anacapa Island (hereafter Anacapa), which is composed of 3 islets (East, Middle, and West Anacapa; Fig. 1) is owned by the NPS. The island encompasses approximately 2.8 km^2, spanning about 8 km from end to end and reaching a maximum elevation of 283 m (Junak et al. 1995).

San Nicolas Island (hereafter San Nicolas), owned by the U.S. Navy, is the most remote of the Channel Islands. It is located 98 km from the mainland (Junak et al. 1995) and 45 km from

its nearest neighbor, Santa Barbara Island (Moody 2000; Fig. 1). It is approximately 13 x 5 km in size and has an area of about 58 km^2 and a maximum elevation of 277 m (Junak et al. 1995).

Santa Barbara Island (hereafter Santa Barbara), owned by the NPS, is located 62 km from the nearest point on the mainland and 38 km east of its nearest neighboring island, Santa Catalina Island (Fig. 1). With an area of only 2.6 km^2 it is the smallest of the Channel Islands. It has a series of low terraces, with small peaks at the north and south ends of the island (high point at 193 m) and is bound by sheer cliffs on much of the north, west, and part of the south sides of the island (Drost and Junak 2009).

Santa Catalina Island (hereafter Catalina), located 34 km south of Long Beach, California, is owned primarily by the Santa Catalina Island Conservancy (~90%). The island is 34 km long, 0.8 to 13.0 km wide, and has an area of 194 km^2, 80 km of coastline, and maximum elevation of 648 m (Junak et al. 1995; Fig. 1).

San Clemente Island (hereafter San Clemente), owned by the U.S. Navy, is the southernmost of the Channel Islands, located approximately 92 km off the coast of California (Fig. 1). The island is 143 km^2, about 34 km long, and has a high point of 610 m (Willey 1997). It is characterized by a series of marine terraces on the west side and a steep escarpment on the east side (Kaiser et al. 2009)

METHODS

Permitting

Our peregrine research activities were covered by multiple state and federal permits. IWS has a Memorandum of Understanding and Scientific Collecting Permits (Permit #s SC-2485 [Peter Sharpe] and SC-0932 [David Garcelon]) with the CDFW to conduct peregrine research on the Channel Islands, a banding permit (# 21564) from the United States Geological Survey's Bird Banding Laboratory (BBL) allowing us to band peregrines with both federal and auxiliary leg bands and draw blood, and research permits from the NPS (Permit # CHIS-2013-SCI-0004) and the Santa Catalina Island Conservancy (Permit 12-014) to allow us to conduct our research on Channel Islands National Park islands and Santa Catalina Island. Authorization for Migratory Bird Treaty Act (MBTA) permits were delayed, so IWS was added to the Region 8 FWS MBTA permit (Permit# MB164274-0) to allow collection of feathers, failed eggs, and eggshells at nests.

Survey Method

We used a survey method similar to that used by the National Park Units in the Northern Colorado Plateau Network (NCPN), as described by Daw et al. (2006). The protocol involved monitoring potential nesting areas for up to 4 hours, normally the maximum time between eyrie visits/exchanges at the ledge (Daw et al. 2006), with a minimum of 4 visits to each known territory between February and June. The NCPN protocol allows for the use of recorded vocalizations to elicit vocal or behavioral responses from territorial birds, which has been found to increase the likelihood of detection and decrease the amount of time required to detect many bird species (Johnson et al. 1981, Anderson 2007, Barnes et al. 2012). Although call broadcast surveys have typically been used for forest-dwelling raptors (Kimmel and Yahner 1990, Watson et al. 1999), they have also been used for non-forest raptors (Balding and Dibble 1984).

The call-broadcast technique we incorporated into our survey protocol was developed by Barnes et al. (2012) to survey for peregrines in the Lake Mead National Recreation Area. The 10-minute survey protocol begins with a 3-min passive observation period, followed by a 30-sec broadcast period, a 1-min observation period, a second 30-sec broadcast period, and a final 5-min passive observation period. We loaded recorded peregrine vocalizations (Stokes Field Guide to Bird Songs: Western Region; Time Warner Trade Publishing, New York, NY), which were converted to mp3 format to be compatible with a digital game caller (FOXPRO NX4, FOXPRO Inc., Lewiston, PA). The vocalizations consisted of 5 sec of the 'cack' alarm call, immediately followed by 10 sec of the 'eechup' call from an adult female peregrine (described in Linthicum 1996), which were looped to produce 30 sec of continuous calling. During the call-broadcast a surveyor rotated up to 360° (depending on terrain, habitat, and broadcast location) in order to evenly project the sound around the broadcast point and the broadcast was discontinued immediately when a responding peregrine was detected.

We used the 4-hr passive observation and/or the 10-min call-broadcast protocol, depending on where and when we were conducting the survey, as described below. We did not conduct surveys or monitoring during periods of heavy rain, heavy fog, or severe cold. The general protocol called for not conducting surveys or monitoring during periods of sustained high winds greater than 25 km/h (~15 miles/hour). However, the Channel Islands, especially San Miguel, Santa Rosa, San Nicolas, and Santa Barbara, can have long periods of high winds, which would have made it impossible to conduct any surveys for a week or more. Therefore, when

there were high winds we attempted to conduct most surveys/monitoring on leeward sides of the islands. If it was necessary to survey during high winds, we did not include the survey in the minimum of 4 surveys required to determine that a territory was unoccupied.

Surveying Historic Nesting Areas

IWS biologists began surveying territories for activity in February 2015. All known territory locations on the Channel Islands reported by Latta (2012), the CDFW's database (provided by Carie Battistone), and our 2013-2014 surveys (Sharpe 2014, 2015) were uploaded into Garmin eTrex 20 GPS units (Garmin International Inc., Olathe, KS) to assist in locating the known territories on each island. We added satellite imagery (BirdsEye Satellite Imagery™, available through Garmin Basecamp™) onto each GPS unit for ease of orienting in relation to geographic features.

Initial surveys at each historic territory included a 10-min call-broadcast survey, followed by up to 4 hours of passive observations if no peregrines were detected. For each visit to an historic territory we completed a Peregrine Falcon Monitoring Occupancy and Productivity Data Form (Appendix I). If any peregrines were detected, we would return at approximately 10-14 day intervals for further monitoring (see Monitoring Active Territories below). If no pair was detected, we usually returned at least 3 more times at approximately 1-month intervals to verify that the territory was inactive.

Surveying for New/Unknown Territories

We used the 10-min call-broadcast method to conduct ground-based and boat surveys for new or unknown peregrine territories on the islands. Although peregrine habitat typically contains tall cliffs (50+ m) to serve as perching and nesting sites (Johnsgard 1990), we did not assume that those were the only places that peregrines would nest on the islands. In other studies, peregrines have been found nesting on the ground (Hickey and Anderson 1969, Pagel et al. 2010) and in tree nests of other raptors and in tree cavities (Campbell et al. 1977). Because peregrine nests have historically been found far inland in canyons on Santa Rosa (Pemberton 1928), we surveyed for peregrines both along the coastal bluffs and cliffs and in interior portions of the islands. Call-broadcast locations during a single day were generally ~1 km apart, although they could be more closely spaced if required for adequate coverage in areas of high topographic

relief that may have minimized the distance at which the broadcast could be heard by peregrines (e.g., opposite sides of a steep ridge, along a coastline with many harbors or prominent points) or where ocean noise impacted our ability to hear responding peregrines. We used GPS units to record our daily survey routes, call-broadcast locations, and sightings of peregrines. At each call-broadcast location we completed a Call-Broadcast Survey Form (Appendix II). We revisited areas with potential peregrine habitat at approximately monthly intervals to determine whether birds had gone undetected or had occupied an area after a previous survey.

Monitoring Active Territories

A primary goal of peregrine monitoring under Phase 2 of the MSRP Restoration Plan was to determine breeding chronology and outcome, including egg-laying and incubation periods, reproductive success/failure, recycling attempts, and number of young produced and fledged (Montrose Settlements Restoration Program 2012). We attempted to visit occupied territories at 10-14 day intervals to estimate the chronology of the breeding season. We were able to refine estimates of lay and hatch dates by aging the chicks using photos and descriptions in Clum et al. (1996) and Moritsch (1983) with an assumed incubation period of 33 days. We only used the 10-min call-broadcast about 1 time per month at active territories, if needed, to minimize the chance that the birds would become acclimatized to the recorded vocalizations. We observed peregrines and potential or known nest sites from a distance of 150-1500 m using 20-60x60 spotting scopes and binoculars. Distances to peregrines or nest sites were estimated using a distance measuring function on our GPS units.

On each visit to an active territory we recorded data on weather conditions, time, observer location, peregrines observed, and behavior of any adult and chicks on the Peregrine Falcon Monitoring Occupancy and Productivity Data Form (Appendix I). To standardize behavioral observations made during these visits, we used the definitions and descriptions in Linthicum (1996). At each territory we took digital photos of the general area where peregrine activity was observed, the eyrie (if known and visible), and the adult birds, if possible. For territories with chicks, we made our last visits when chicks were $\geq$ 28 days of age to determine success (see Terminology below).

Nest Entry and Banding

We entered active nests either when the chicks were approximately 21-28 days of age (recommended age range is 21-35 days; Heinrich 1996). We lowered the upper age limit to minimize the likelihood of chicks jumping from the eyrie. We evaluated each eyrie prior to entry to determine the safest anchoring technique(s) and route of entry. For eyries that were only visible from a distant location, a biologist remained at the observation point and used a handheld radio to help direct the climbing team to the eyrie. Chicks were placed in a small duffle bag and carried to the top of the nest cliff for processing.

Peregrines exhibit reverse size dimorphism and sex can be determined accurately based upon their size and appearance (Burnham et al. 2003). We determined the sex of each chick primarily based on weight, overall size, and the breadth of the tarsi (Burnham et al. 2003, J. Barnes, personal communication). We attempted to band chicks when they were at least 21 days old, at which time they had developed sufficiently so that differences in the size of the tarsus was evident (Craig and Enderson 2004). Males were fit with a USFWS lock-on #6 band on the left leg and a black anodized aluminum band with silver alphanumerical characters (Acraft Sign & Nameplate Co., Edmonton, Alberta, Canada) on the right leg, and females were banded with a USFWS lock-on #7A band on the right leg and an Acraft band on the left leg. If there was any question as to the sex of the birds, then we used the female bands (Heinrich 1996, Gustafson et al. 1997). We collected approximately 0.5 cc of heparinized whole blood from most chicks for future DNA and/or contaminants analyses. We recorded banding and morphological information for each chick on a banding form (Appendix III).

During nest entries we collected eggshell fragments and prey remains. Samples were labeled and delivered to the Western Foundation of Vertebrate Zoology (WFVZ, Camarillo, CA) for determination of shell thickness (addled eggs and fragments) and prey identification. We enhanced nest ledges, if necessary, by removing sharp stones or adding suitable substrate to reduce the chance of eggs breaking in the nest in the future.

Prey Remains

Prey remains delivered to the WFVZ were analyzed by N. John Schmitt. He keyed out prey items using a reference collection and determined the minimum number of individuals

(MNI) based upon duplicate feathers or body parts (e.g., 2 left feet of a species would indicate a minimum of 2 individuals).

Eggshell Measurements

René Coronado (WFVZ) measured the thickness of eggshells using 2 methods. Method 1, referred to as the René Coronado "RC" method, used a measuring device consisting of a thin gauge wire mounted to a digital gauge (Starrett Gauge; 0.00005 mm resolution) fixed to a mounting bracket with a moveable bottom plate. For whole eggs, 10 shell measurements were taken around the equator of each egg (not at the poles because more calcium is deposited at the ends), where there is no visible debris, both with and without the membrane, as applicable. If a membrane was no longer attached to the shell at the equator, then measurements were taken without membrane, but an average membrane thickness was measured separately and provided. For samples that contain only eggshell fragments, usually only 1-2 measurements were taken on each fragment. To ensure that the egg fragments actually belong to the species in question, only those fragments that could be clearly identified as peregrine eggshells were measured.

Method 2, referred to as the Sam Sumida "SS" method, used a mechanical gauge (Federal Gauge; 0.01 mm resolution) attached to the same mounting bracket and pin used in Method 1, to allow for comparison with historical measurements taken by Sam Sumida and the WFVZ prior to 2003. Method 2 used the same procedure as described for Method 1, except for the change in the gauge, and a tapping of the raising and lowering arm of the mounting bracket.

Percent eggshell thinning was calculated by comparing measured eggshell thickness with the standard pre-DDT peregrine eggshell thickness in California of 0.364 mm (Kiff 1994) using the equation N% = [1-(thickness/0.364)] x 100 (Latta 2012).

Terminology

Different states and groups have used various definitions to describe peregrine occupancy and nesting success, but we followed the guidelines in the 2003 Monitoring Plan for the American Peregrine Falcon (U.S. Fish and Wildlife Service 2003), as defined below.

Occupied Territory: a territory where either a pair of peregrines is present (2 adults or an adult/subadult mixed pair), or there is evidence of reproduction (e.g., incubation, brooding,

eggs or young, food delivery to an eyrie). We considered a territory occupied if there was evidence of occupancy on 2 or more visits to a territory.

Nest Success: the proportion of occupied territories on the Channel Islands in which 1 or more young ≥ 28 days old was observed, using the aging guidelines in Clum et al. (1996).

Productivity: the number of young observed at ≥ 28 days old per occupied territory, averaged across the Channel Islands.

We further categorized occupied territories based upon the following breeding stages (see Linthicum 1996 for further descriptions).

Courtship: behavior indicative of pair bonding, such as cooperative hunting, adult prey exchanges, copulation, or ledge courtship displays.

Incubation: adult observed in incubation posture (low horizontal position) or inferred to be incubating based upon behavior (for eyries that were not visible). The female does the majority of incubation, but the male will bring her food several times per day and relieve her at incubation. During incubation there is generally an adult present at the eyrie at all times, except when disturbed or for short periods on warm days.

Nestling: chick(s) present. May be able to see chicks, hear begging, or see adults in what appears to be feeding. Generally only females brood and feed nestlings. An adult brooding young nestlings (< 7 days old) can look a lot like incubation, so we waited for a prey delivery to the eyrie to confirm that chicks were present.

Fledgling: when young reach ≥ 28 days old.

We classified the breeding activity of occupied territories as either successful, unsuccessful, or none as described below.

Successful: A pair produced 1 or more nestlings that survived until at least 28 days of age.

Unsuccessful: A pair that engaged in prolonged courtship or copulating that either did not produce eggs or failed during the incubation or nestling stage (chicks < 28 days old).

None: Pair present, but no or minimal signs of courtship observed.

Data Management

Data from the Peregrine Falcon Monitoring Occupancy and Productivity Data Forms (Appendix I) were entered into island-specific Excel files that were shared via the cloud-based

file storage program Dropbox. Dr. Sharpe combined the weekly data into a master database and the datasheets were kept on each island as backup records. We downloaded data from our GPS units daily to the free Garmin Basecamp™ program, which allowed us to evaluate which areas needed additional surveys and to share data among our biologists. Information from each Call-Broadcast Survey Form was entered for each corresponding point in Basecamp™ so that we could easily find the results of previous surveys. To facilitate the transfer of information between crews, the crew on each island sent an email to each biologist with a weekly summary of what areas were surveyed and the results of the surveys.

RESULTS

Surveying and Nest Monitoring

We surveyed 49 historic peregrine territories on the Channel Islands and did not locate any previously unknown territories (Table 1). We confirmed occupancy in 48 territories (98%), with at least 2 occupied territories on each island (Figs. 2 and 3, Table 1, Appendix IV). Survey summaries for each island and territory are provided below.

San Miguel Island

Surveys began on San Miguel on 11 February and continued every other week through 22 June. We surveyed 10 previously known territories on San Miguel, of which 9 (90%) were confirmed occupied (Fig. 4, Table 1). We did not survey the historic Rat Trap (MC37) territory because our 2013-2014 surveys indicated that this pair had likely moved to Castle Rock (MC68). We were unable to attempt banding at any nests on San Miguel in 2015 due to Navy restrictions.

MC17 Hoffman Point: We confirmed a pair in the historic Hoffman Point territory (Fig. 4) on 12 February, the first of 10 visits to the territory. The pair was categorized as being in the courtship stage through 28 March and was incubating by 11 April. The eyrie was not visible, but we suspected chicks were present by 8 May. We confirmed that there were 3 older chicks/fledglings on 5 and 19 June.

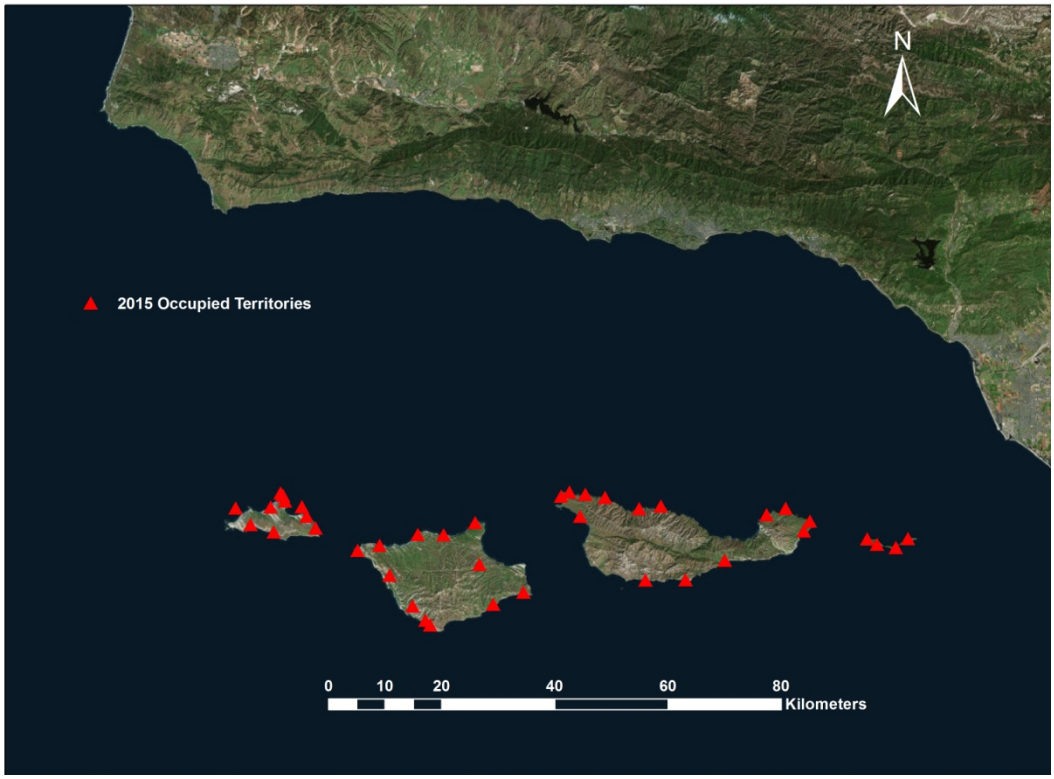

Figure 2. Occupied peregrine falcon territories located on the northern Channel Islands in 2015.

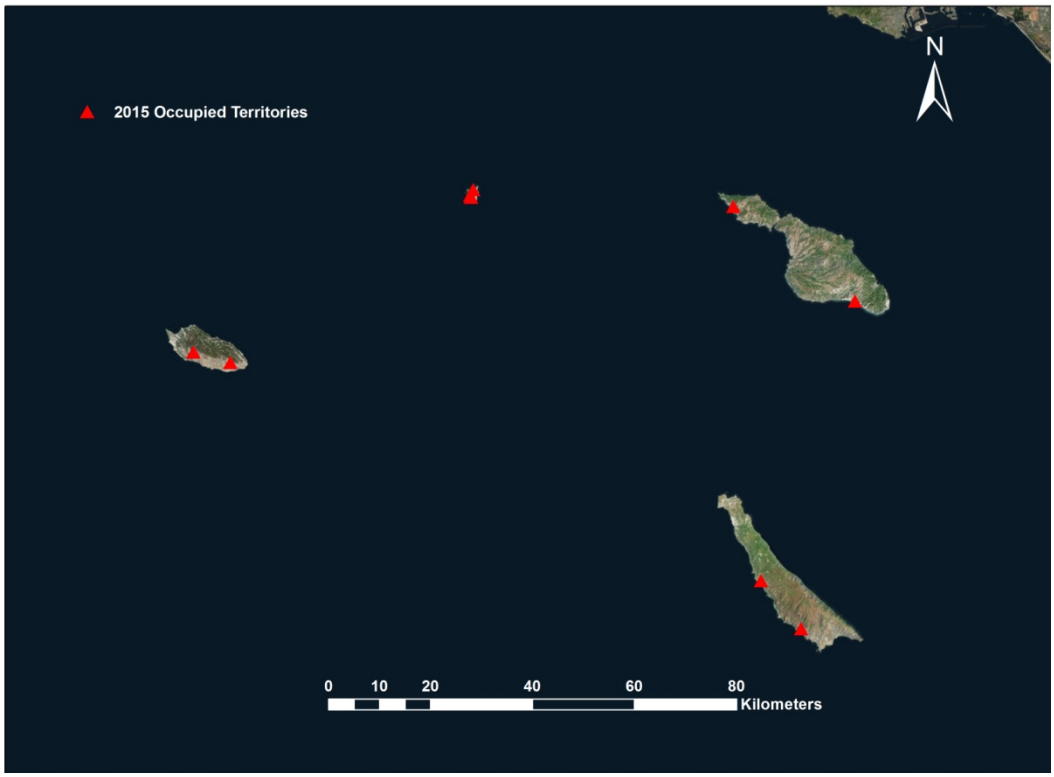

Figure 3. Occupied peregrine falcon territories located on the southern Channel Islands in 2015.

Figure 4. Peregrine falcon survey routes and territories on San Miguel Island, CA, 2015.

MC28 Bat Rock: We confirmed a pair in the historic Bat Rock territory (Fig. 4) on 16 February. The pair was first classified in the courtship stage on 13 March and as incubating on 10 April. We only saw the female starting on 24 May and her behavior suggested the nest had failed during incubation or early chick-rearing.

MC44 Cardwell Point: We were unable to confirm the presence of a pair in the historic Crook Point territory (Fig. 4, Table 1) during 10 visits this season. Our only sightings of peregrines were on 29 March (2 adults), 10 May (adult male and 2nd year female), and 7 June (adult male and unidentified bird).

MC47 Crook Point: We confirmed a pair in the historic Crook Point territory (Fig. 4) on 15 February, at which time they were in the courtship stage. They were confirmed incubating on 25

March and at least 1 chick had hatched by 23 April. Two chicks were confirmed on 6 May and older chicks/fledglings were present on 3, 8, and 16 June (Table 1).

MC56 Carbon Point: We confirmed a pair in the historic Carbon Point territory (Fig. 4) on 11 February and they showed signs of courtship on 15 March. The pair was incubating by 25 March and at least 1 chick was present by 6 May. We confirmed that 3 chicks had fledged on 3 and 17 June.

MC57 Salvador Point: We confirmed a pair in the historic Salvador Point territory (Fig. 4) on 28 February, at which time they were exhibiting courtship behavior. Based upon behavior, they were incubating on 25 April and 1 or more nestlings were present on 23 May. We confirmed that there was at least 1 fledgling on 20 June.

MC58 Science Point: We confirmed a pair in the historic Science Point territory (Fig. 4) on 11 March. They were classified as in courtship on 26 March and incubating on 9 April, based upon behavior because we could not see into the eyrie. We believe they had at least 1 nestling on 9 May and 1 fledgling was seen on 21 June.

MC68 Castle Rock: We confirmed a pair in the historic Castle Rock territory (Fig. 4) during our second visit on 27 February. We could not see the eyrie, but based upon behavior the pair appeared to be incubating by 9 May and nestlings were likely present by 22 June. The field season ended before we could confirm fledging.

MC69 Harris Point: We visited the historic Harris Point territory (Fig. 4) 10 times between 13 February and 20 June, but could never confirm the presence of a pair.

MC70 Prince Island: We confirmed a pair in the historic Prince Island territory (Fig. 4) on 26 February. The pair was incubating by 28 March and 3 chicks were present by 8 May. We observed 3 fledglings on 5 and 18 June.

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Table 1. Status and breeding activity observed at peregrine falcon territories surveyed on the California Channel Islands in 2015.

Island/ Territory Name	State Code[b]	Territory Type	Occupancy Status	Breeding Activity	# Chicks Hatched[b]	# of Fledglings	Notes (see report text for more details)
San Miguel							
Hoffman Point[a]	MC17	Historic	Occupied	Successful	3-4	3	
Bat Rock[a]	MC28	Historic	Occupied	Unsuccessful	0	0	Failed during incubation/early brooding
Cardwell Point	MC44	Historic	Unoccupied	None	.	.	1-2 adults seen 3/29, 5/10, 6/7
Crook Point[a]	MC47	Historic	Occupied	Successful	2	2	
Carbon Point[a]	MC56	Historic	Occupied	Successful	3-4	3	
Salvador Point[a]	MC57	Historic	Occupied	Successful	1+	1+	
Science Point[a]	MC58	Historic	Occupied	Successful	1+	1+	
Castle Rock	MC68	Historic	Occupied	Unknown	1+	?	Field season ended before fledging.
Harris Point	MC69	Historic	Occupied	None	.	.	Could be part of MC57.
Prince Island[a]	MC70	Historic	Occupied	Successful	3-4	3	
Santa Rosa							
Carrington Point[a]	MC16	Historic	Occupied	Successful	3	2+	Banded 1 of 3 chicks on 5/22.
Lime Point[a]	MC27	Historic	Occupied	Unsuccessful	.	.	Failed during incubation.
Water Canyon	MC31	Historic	Occupied	Unsuccessful	.	.	Courtship, but no known nesting.
Bee Rock Canyon[a]	MC34	Historic	Occupied	Unsuccessful	1	0	Failed prior to banding.
Orr's Camp[a]	MC35	Historic	Occupied	Successful	2	2	Banded 2 chicks on 5/23.
Trancion[a]	MC50	Historic	Occupied	Unsuccessful	2	0	Failed prior to banding.
Krumholtz[a]	MC51	Historic	Occupied	Successful	3	3	Chicks were not banded.
Soledad[a]	MC55	Historic	Occupied	Successful	2	2	Chicks were not banded.
Bonn Point[a]	MC65	Historic	Occupied	Successful	3	3	Banded chicks on 5/22.
Chickasaw Canyon	MC66	Historic	Occupied	Unknown	.	.	Courtship, but no known nesting.
Sandy Point[a]	MC67	Historic	Occupied	Successful	3	3	Banded 3 chicks on 5/21.
Gnoma[a]	MC76	Historic	Occupied	Successful	1	1	Banded chick on 5/19.

Table 1. Continued.

Island/ Territory Name	State Code[a]	Territory Type	Occupancy Status	Breeding Activity	# Chicks Hatched[b]	# of Fledglings	Notes (see report text for more details)
Santa Cruz							
Gherini Knife Edge[a]	MC18	Historic	Occupied	Successful	2	2	Chicks were not banded.
Laguna[a]	MC19	Historic	Occupied	Successful	2	2	Chicks were not banded.
West End[a]	MC20	Historic	Occupied	Unsuccessful	.	.	Failed during incubation.
Sea Lion[a]	MC30	Historic	Occupied	Successful	3	2+	Chicks banded on 6/3.
Black Point[a]	MC38	Historic	Occupied	Successful	3	3	Chicks banded on 6/6.
Arch Rock[a]	MC45	Historic	Occupied	Unsuccessful	.	.	Failed during incubation/early brooding
Valley Anchorage[a]	MC46	Historic	Occupied	Successful	2+	2	Banded 2 chicks on 6/2.
Bowen Point[a]	MC53	Historic	Occupied	Successful	3	3	Banded 3 chicks on 6/4.
Cavern Point[a]	MC59	Historic	Occupied	Unsuccessful	.	.	Failed during incubation.
Punta Diablo[a]	MC61	Historic	Occupied	Unsuccessful	.	.	Failed during incubation.
Punta Gorda[a]	MC62	Historic	Occupied	Successful	1	1	Banded chick on 6/3.
San Pedro West[a]	MC63	Historic	Occupied	Successful	2+	2	Did not band chicks.
West Point South	MC64	Historic	Occupied	Successful	1+	1+	Status unknown until fledge.
East Smuggler's	MC77	Historic	Occupied	Unknown	2	?	Could not confirm fledge.
Anacapa							
West Anacapa	MC21	Historic	Occupied	Unknown	.	.	Could not determine nesting status
Middle Anacapa[a]	MC43	Historic	Occupied	Successful	2+	2+	Did not band chicks
Cathedral Cove[a]	MC54	Historic	Occupied	Unsuccessful	1+	0	Failed prior to banding.
Camel Point[a]	MC80	Historic	Occupied	Unknown	2+	2+	Chicks were ~26 days old on last check.
San Nicolas							
Harrington[a]	MC73	Historic	Occupied	Successful	2+	2+	Chicks too old to band.
Cattail Canyon	MC74	Historic	Occupied	Successful	3	?	Banded 3 chicks on 6/1.
Santa Barbara							
Signal Peak	MC33	Historic	Occupied	Unknown	.	.	Did not confirm nesting.
North Peak	MC71	Historic	Occupied	Unsuccessful	.	.	Extended courtship, no signs of nesting.

Table 1. Continued.

Island/ Territory Name	State Code[a]	Territory Type	Occupancy Status	Breeding Activity	# Chicks Hatched[b]	# of Fledglings	Notes (see report text for more details)
Santa Barbara (Cont.)							
North Signal Peak	MC72	Historic	Occupied	Successful	2+	2+	Status determined near fledging.
Santa Catalina							
Silver Peak[a]	MC75	Historic	Occupied	Successful	3	3	Did not band chicks.
Lone Tree[a]	MC78	Historic	Occupied	Successful	2+	2+	Did not band chicks
San Clemente							
Cave Canyon	MC52	Historic	Occupied	Successful	2	2	Status determined after fledging.
Seal Cove	MC79	Historic	Occupied	Unknown	.	.	Pair present, but no known nesting.

[a]Territory included in calculations of productivity

[b] Designated by the California Department of Fish and Wildlife (CDFW).

[c]Range of number of chicks is listed when the eyrie was not visible and it is possible that chicks died before banding or fledging. Assumes maximum clutch of 4.

Santa Rosa Island

Surveys began on Santa Rosa on 12 February and continued weekly through 9 June. We surveyed 12 previously known territories on Santa Rosa, all of which were occupied, and did not locate any new territories (Fig. 5).

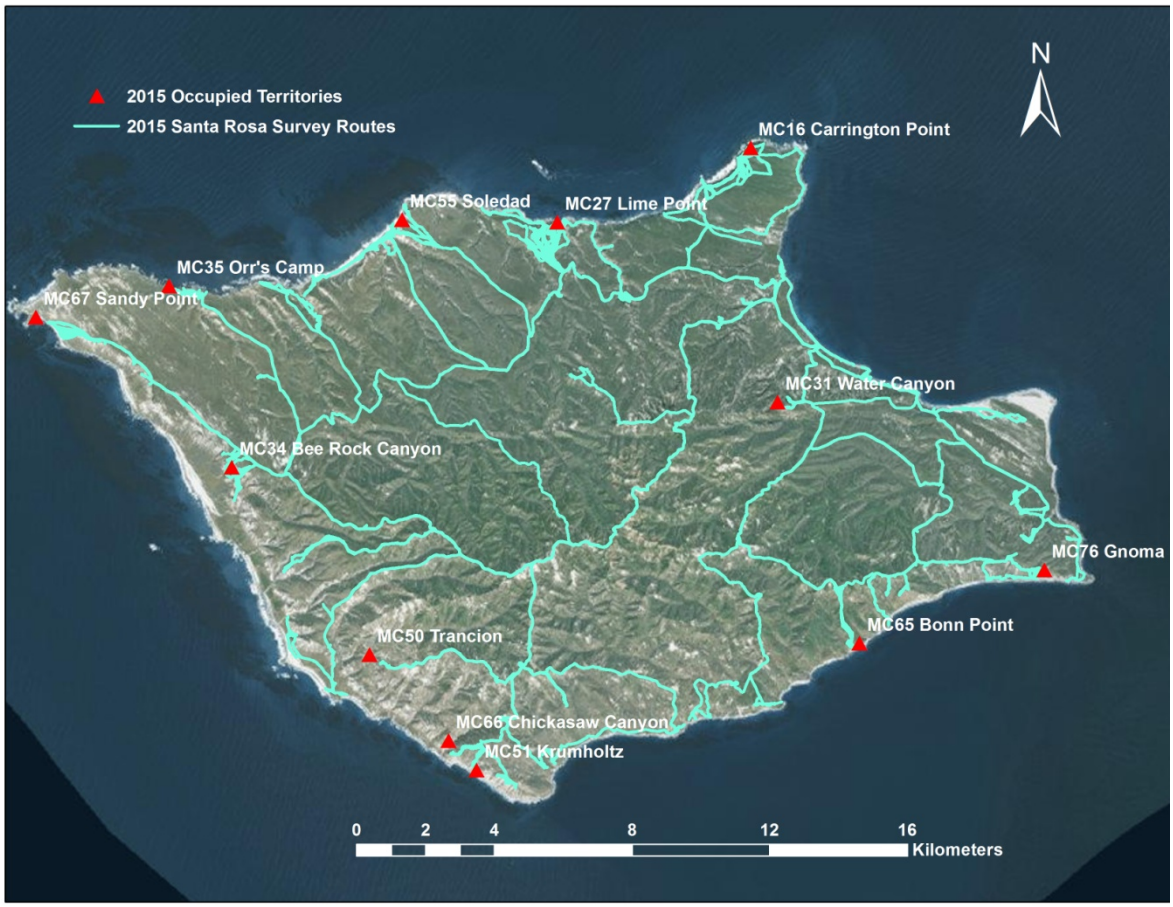

Figure 5. Peregrine falcon survey routes and territories on Santa Rosa Island, CA, 2015.

MC16 Carrington Point: We confirmed a pair engaged in courtship activities on our second visit to the historic Carrington Point territory (Fig. 5) on 28 February. We could not determine the breeding status of the birds until 9 May, when the adults' behavior indicated that there were chicks present. We entered the eyrie to band on 22 May. We only were able to band 1 of 3 chicks that were approximately 20 days old because the eyrie was on a long ledge and the chicks were mobile and out of reach (Table 2, Appendix V). We confirmed that there were at least 2 chicks present on our last visit on 5 June, at which time they were about 33-35 days old.

Table 2. Summary of peregrine falcon banding on the California Channel Islands, CA, 2015.

Island/Territory Name	Sex	Age (days)	USGS Band #	Color Band	Wt. (g)
Santa Rosa					
MC16 Carrington Point	Male	20	1156-16844	07/AC	550
MC35 Orr's Camp	Female	20	1947-21660	73/AE	690
MC35 Orr's Camp	Female	17	1947-21661	80/AE	795
MC65 Bonn Point	Female	20-21	1947-21659	95/AE	785
MC65 Bonn Point	Male	20-21	1156-16842	47/AC	570
MC65 Bonn Point	Male	20-21	1156-16843	49/AC	555
MC67 Sandy Point	Female	21-23	1947-21658	82/AE	530
MC67 Sandy Point	Male	21-23	1156-16840	22/AE	470
MC67 Sandy Point	Male	21-23	1156-16841	17/AC	425
MC76 Gnoma	Female	25-27	1947-21657	72/AE	720
Santa Cruz					
MC30 Sea Lion	Female	32	1947-21663	62/AE	825
MC30 Sea Lion	Female	32	1947-21664	71/AE	990
MC38 Black Point	Female	28	1947-21667	78/AE	.
MC38 Black Point	Male	28	1156-16851	02/AE	.
MC38 Black Point	Male	28	1156-16852	05/AE	.
MC46 Valley Anchorage	Male	25-27	1156-16848	18/AC	535
MC46 Valley Anchorage	Male	25-27	1156-16849	11/AC	310
MC53 Bowen Point	Female	33-35	1947-21665	93/AE	.
MC53 Bowen Point	Female	33-35	1947-21666	83/AE	.
MC53 Bowen Point	Male	29	1156-16850	36/AC	.
MC62 Punta Gorda	Female	27	1947-21662	94/AE	735
San Nicolas					
MC74 Cattail Canyon	Male	18	1156-16845	37/AE	545
MC74 Cattail Canyon	Male	16	1156-16846	42/AC	550
MC74 Cattail Canyon	Male	19	1156-16847	40/AE	560

MC27 Lime Point: We confirmed a pair in the historic Lime Point territory (Fig. 5) on 12 February. We found the female in an eyrie with 2 eggs on 11 April. She was not incubating, so it is likely she was still laying eggs. The nest had failed by our next visit on 24 April. The eyrie was located on a steep slope above a cliff and easily could have been entered by a fox.

MC31 Water Canyon: We confirmed a pair in the historic Water Canyon territory (Fig. 5) on 27 March. They exhibited courtship behavior through 5 May, but we were never able to confirm whether they nested.

MC34 Bee Rock Canyon: We confirmed a pair exhibiting courtship behavior in the historic Bee Rock Canyon territory (Fig. 5) during our second survey on 25 February. The birds were incubating on 8 April and a single chick was in the eyrie on 21 and 24 May. On 4 June, the chick was found dead about 50 m below the eyrie The carcass was relatively fresh, indicating that the chick had likely fallen out of the eyrie within the previous 1-2 days.

MC35 Orr's Camp: We confirmed a pair in the historic Orr's Camp territory (Fig. 5) on our fourth survey on 11 March. The pair began incubating in the 2014 eyrie by 8 April and at least 1 chick was present on 5 May. We entered the eyrie on 23 May and banded 2 females that were 17-20 days old (Table 2, Appendix V). There were still 2 chicks about 31-32 days old on our last visit on 12 June.

MC50 Trancion: We confirmed a pair in the historic Trancion territory (Fig. 5) on 15 February. Courtship was confirmed on 26 February and the birds were incubating in the 2014 eyrie on 27 March. We observed 1 newly hatched chick on 26 April and there were 2 chicks present on 8 May (12-14 days old). We entered the eyrie on 20 May for banding, but found the eyrie empty. We searched the cliff and hillside below the eyrie, but did not find any chicks.

MC51 Krumholtz: We confirmed a pair in the historic Krumholtz territory (Fig.5) during our second visit on 26 February. The pair was incubating by 9 April and there were 3 chicks (~13 days old) on 21 May. There were still 3 chicks in the eyrie on our last visit on 6 June, at which time they were approximately 26-28 days old.

MC55 Soledad: We confirmed a pair in the historic Soledad territory (Fig. 5) on 28 March, at which time they were incubating. They were believed to have started incubating by 28 March, based upon adult behavior, and at least 1 chick was thought to be present by 7 May. We entered the eyrie on 23 May to band, but found that the chicks were too young to band (only 12-13 days old), indicating that we likely had observed them during or soon after hatching on 7 May. Both chicks were still present on our last visit on 4 June, at which time they were estimated to be 26-28 days old.

MC65 Bonn Point: We located a pair in the historic Bonn Point territory (Fig. 5) on 14 February. The pair was incubating on 10 April and there were at least 2 chicks present on 7 May. We entered the eyrie on 22 May and banded 3 chicks (1 F: 2 M) that were estimated to be 20-21 days old (Table 2, Appendix V). All 3 chicks were still present on our last visit on 3 June, when they were estimated to be 33-35 days old.

MC66 Chickasaw Canyon: We confirmed a pair exhibiting courtship behavior in the historic Chickasaw Canyon territory (Fig. 5) on 26 February. We were unable to locate the birds on 3 surveys between 27 March and 8 May, so we were not able to determine their nesting status.

MC67 Sandy Point: We confirmed a pair in the historic Sandy Point territory (Fig. 5) on 13 February. They were incubating by 8 April and had at least 2 chicks by 6 May. We entered the eyrie on 21 May and banded 3 chicks (1 F: 2 M) that were about 21-23 days old (Table 2, Appendix V). All 3 chicks were still in the eyrie on our last visit on 4 June, at which time they were estimated to be 37-38 days old.

MC76 Gnoma: We confirmed a pair in the historic Gnoma territory (Fig. 5) on 13 March. The pair was incubating by 27 March and there was 1 chick (2-4 days old) and at least 1 egg present on 24 April. We entered the eyrie on 19 May and banded a female (Table 2, Appendix V) that was estimated to be 25-27 days old. The chick had fledged by our last visit on 3 June.

Santa Cruz Island

Surveys began on Santa Cruz on 4 February and continued every other week through 13 July. We surveyed 14 historic territories, all of which were occupied, and did not locate any previously unknown territories (Fig. 6).

MC18 Gherini Knife Edge: We confirmed a pair exhibiting courtship behavior in the historic Gherini Knife Edge territory (Fig. 6) on 8 March. The pair was incubating by 4 April and at least 1 chick was present on 4 May. We confirmed that there were 2 chicks approximately 14-16 days old on 13 May. We did not band the birds and both were still present on our last visit on 13 June.

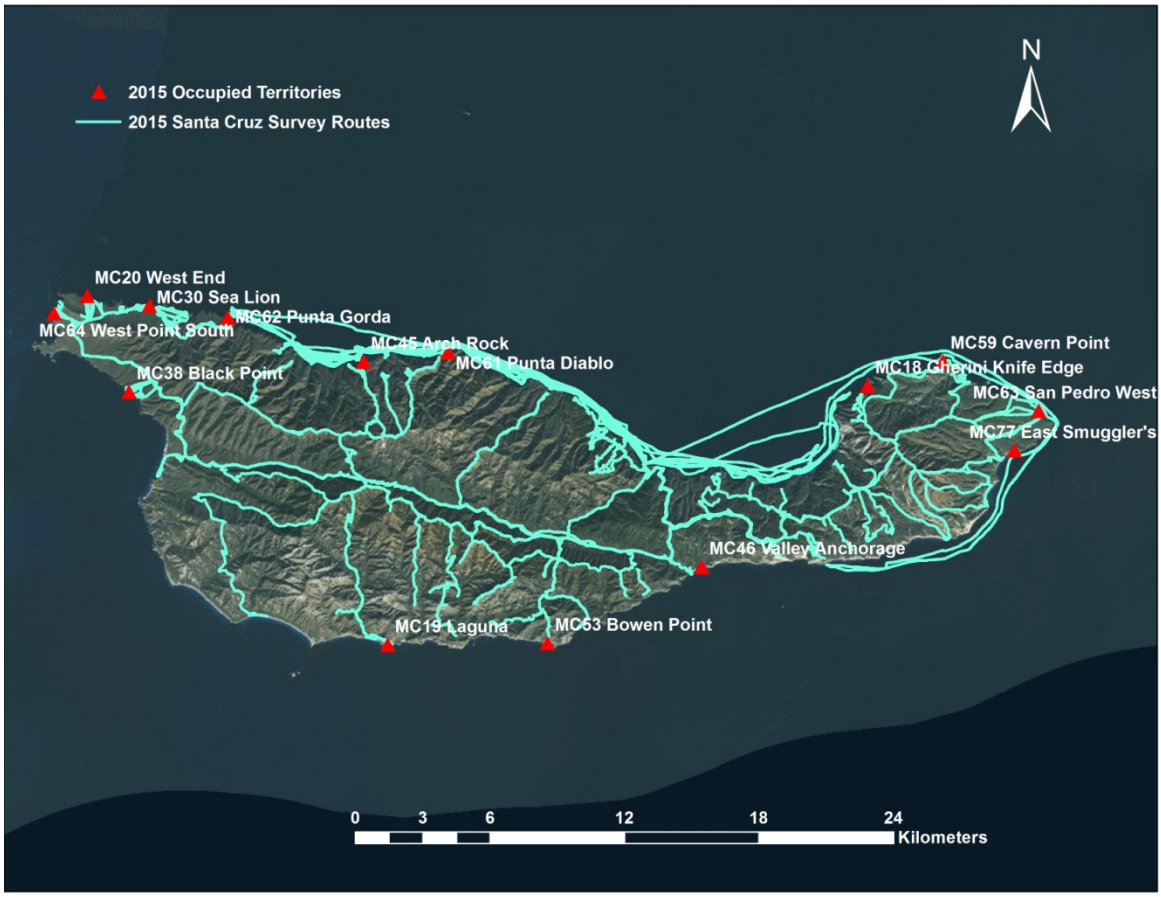

Figure 6. Peregrine falcon survey routes and territories on Santa Cruz Island, CA, 2015.

MC19 Laguna: We confirmed a pair incubating in the historic Laguna territory (Fig. 6) on 5 April. Based upon adult behavior, there was at least 1 chick present by 16 May. We attempted to enter the eyrie for banding on 4 June, but were unable to reach it. We confirmed that there were at least 2 chicks present on 10 June, which were estimated to be about 32 days old. We did not observe fledglings on our last visit on 25 June, but aggressive behavior by the adults indicated that fledglings were present.

MC20 West End: We confirmed a pair exhibiting courtship behavior in the historic West End territory (Fig. 6) on 20 March. They were incubating on 18 April, but the nest had failed by 29 April. We observed the female lay an egg in a new eyrie on 17 May, but this nesting attempt failed sometime after 6 June.

MC30 Sea Lion: We could not confirm a pair in the historic Sea Lion territory (Fig. 6) until we found an adult incubating on 1 April. There were 3 nestlings approximately 9-11 days old on 14 May. We entered the eyrie on 3 June and banded 2 females (3rd chick had disappeared since 1 June) that were approximately 32 days old (Table 2, Appendix V). Both chicks had fledged by 24 June.

MC38 Black Point: We first confirmed that a pair was present in the historic Black Point territory (Fig. 6) when we located the female incubating on 18 April. We saw 2 chicks that were approximately 4-6 days old on 14 May. We entered the eyrie and banded 3 chicks (1 F:2 M) that were approximately 28 days old (Table 2, Appendix V) on 6 June. All 3 chicks were still present on our last visit on 11 June.

MC45 Arch Rock: We confirmed a pair in courtship in the historic Arch Rock territory (Fig. 6) on 19 April. We thought the birds were likely incubating when we visited on 28 May and 4 June, but did not confirm incubation until 12 June. There was no activity at the eyrie during our 29 June and 12 July visits, so we believe the nest failed during incubation or early chick-rearing.

MC46 Valley Anchorage: We observed a pair in courtship activity in the historic Valley Anchorage territory (Fig. 6) on 9 March. Based upon adult behavior, we determined that the birds were incubating on 3 April and at least 1 chick was present on 3 May. We entered the eyrie and banded 2 male chicks approximately 25-27 days old on 2 June (Table 2, Appendix V). Chicks were still present on 7 June, but there was no activity in the area on 24 or 25 June, so we cannot confirm fledging.

MC53 Bowen Point: We confirmed a pair in the historic Bowen Point territory (Fig. 6) on 3 April, at which time they were exhibiting incubation behavior. Nestlings were thought to be present on 14 May. We entered the eyrie on 4 June and banded 3 chicks (2 F: 1 M) that were estimated to be 29-35 days old (Table 2, Appendix V). All 3 chicks were present on our last visit on 14 June.

MC59 Cavern Point: We confirmed a pair exhibiting courtship behavior in the historic Cavern Point territory (Fig. 6) on 4 April. We observed a nest exchange by the adults, indicating incubation, on 15 April, but no activity was seen in the territory on 13 May, 1 June, and 14 June, so we classified this as a failed nesting attempt.

MC61 Punta Diablo: We confirmed a pair exhibiting courtship behavior in the historic Punta Diablo territory (Fig. 6) on 2 April and they were incubating on 1 May. We were unable to return to the territory until 7 June, by which the nest had failed.

MC62 Punta Gorda: We confirmed a pair in the historic Punta Gorda territory (Fig. 6) on 1 April, at which time they were still in courtship. The pair was incubating on 14 April and there was at least 1 chick present on 14 May. We confirmed there was only 1 chick on 2 June. The eyrie was empty when we entered on 3 June, but we located the healthy chick about 30 m below the nest. We retrieved the ~27 day old female, banded her, and returned her to the eyrie (Table 2, Appendix V). The chick was still present on our last visit on 12 June.

MC63 San Pedro West: We confirmed an incubating pair in the historic San Pedro West territory (Fig. 6) on 5 April. There was at least 1 chick present on 30 April and 13 May. We visited the territory for potential banding on 5 June and observed 2 chicks in the nest, but they were too old for banding (~35 days old). Both birds had fledged on our last visit on 14 June.

MC64 West Point South: We confirmed a pair in the historic West Point South territory (Fig. 6) on 18 February, but were unable to determine their nesting status during our next 6 visits through 14 May. On 17 May, we suspected that there was at least 1 older chick present based upon adult behavior and a possible prey delivery. We observed a female fledgling (larger than the adult male) on our last visit on 30 May.

MC77 East Smuggler's: We confirmed a pair in the historic East Smuggler's territory (Fig. 6) 5 February. The pair was incubating by 5 April and we suspected that at least 1 chick was present on 13 May. We attempted to enter the eyrie on 5 June for banding, but the 2 chicks were only about 10 days old, indicating that either the earliest date of incubation was incorrect or that the

first nesting attempt failed early in incubation. During the aborted nest entry we determined that the cliff above the eyrie posed a threat of collapsing on the chicks, so we will not attempt to band in this territory in the future until a new eyrie is established.

Anacapa Island

We surveyed Anacapa from a charter boat (the *Retriever*) and via Island Packers trips to East Anacapa (to check Cathedral Cove from land) between 28 March and 1 June. We located pairs in each of the 4 historic territories (Fig. 7).

MC21 West Anacapa: We confirmed a pair in the historic West Anacapa territory (Fig. 7) on 28 March, but were unable to determine their nesting status. We were unable to see any chicks/fledglings, but adult behavior and possible chick vocalizations indicated that chicks were present on our last visit on 1 June. We were unable to access West Anacapa to check the eyrie or band chicks because of breeding seabird activity.

MC43 Middle Anacapa: We confirmed a pair in courtship in the historic Middle Anacapa territory (Fig. 7) on 28 March. There was at least 1 chick present on 30 April and at least 2 fledglings were observed on 1 June. We were unable to access Middle Anacapa to band chicks because of breeding seabird activity.

MC54 Cathedral Cove: We confirmed a pair in courtship in the historic Cathedral Cove territory (Fig. 7) on 28 March. At least 1 chick was present on 16 May and adult behavior indicated nestlings were present on our next boat survey on 1 June. However, when we accessed the eyrie to band on 9 June, there were no chicks or adults present.

MC80 Camel Point: We saw only 1 adult on our first visit to the historic Camel Point territory (Fig. 7) on 28 March. Based upon adult behavior, we suspected that they were incubating on 30 April, and 2 chicks were seen during our last visit on 1 June. We were unable to access West Anacapa to band chicks because of breeding seabird activity.

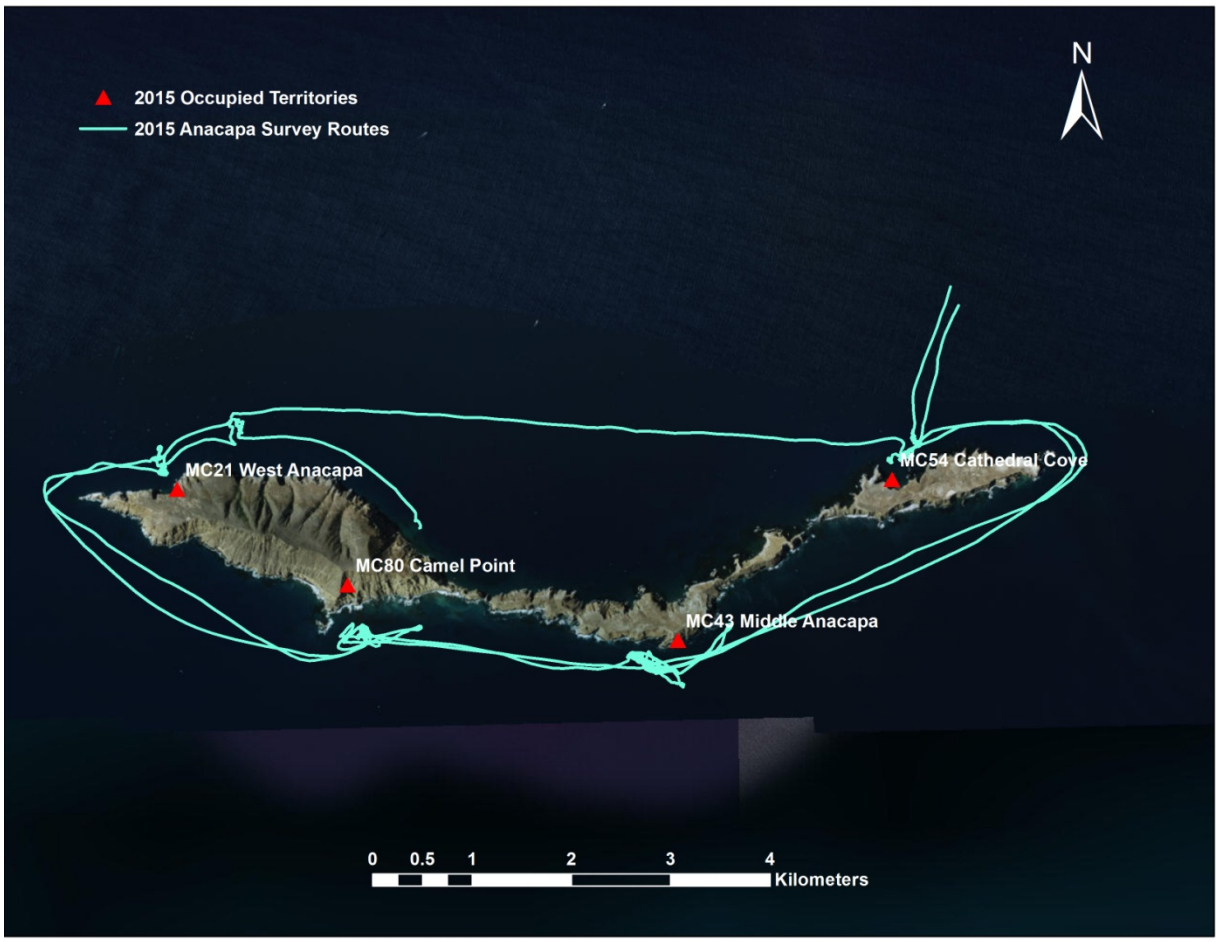

Figure 7. Peregrine falcon survey routes and territories on Anacapa Island, CA, 2015.

San Nicolas Island

We surveyed San Nicolas on 20-22 March, 28-29 April, 21 May, and 1 June. We located pairs in the 2 historic territories on the south side of the island and did not locate any new territories (Fig. 8), although a possible pair was seen along the north central coastline during our first survey.

MC73 Harrington: We confirmed a pair exhibiting courtship behavior in the historic Harrington territory (Fig. 8) on 20 March and likely saw the female laying the first egg on 22 March. They were still incubating on our next visit on 28 April and had at least 2 chicks on 21 May. There were still at least 2 chicks that were ~35 days old on our last visit on 1 June. We did not attempt to band the chicks because they were deemed too old for us to safely capture them.

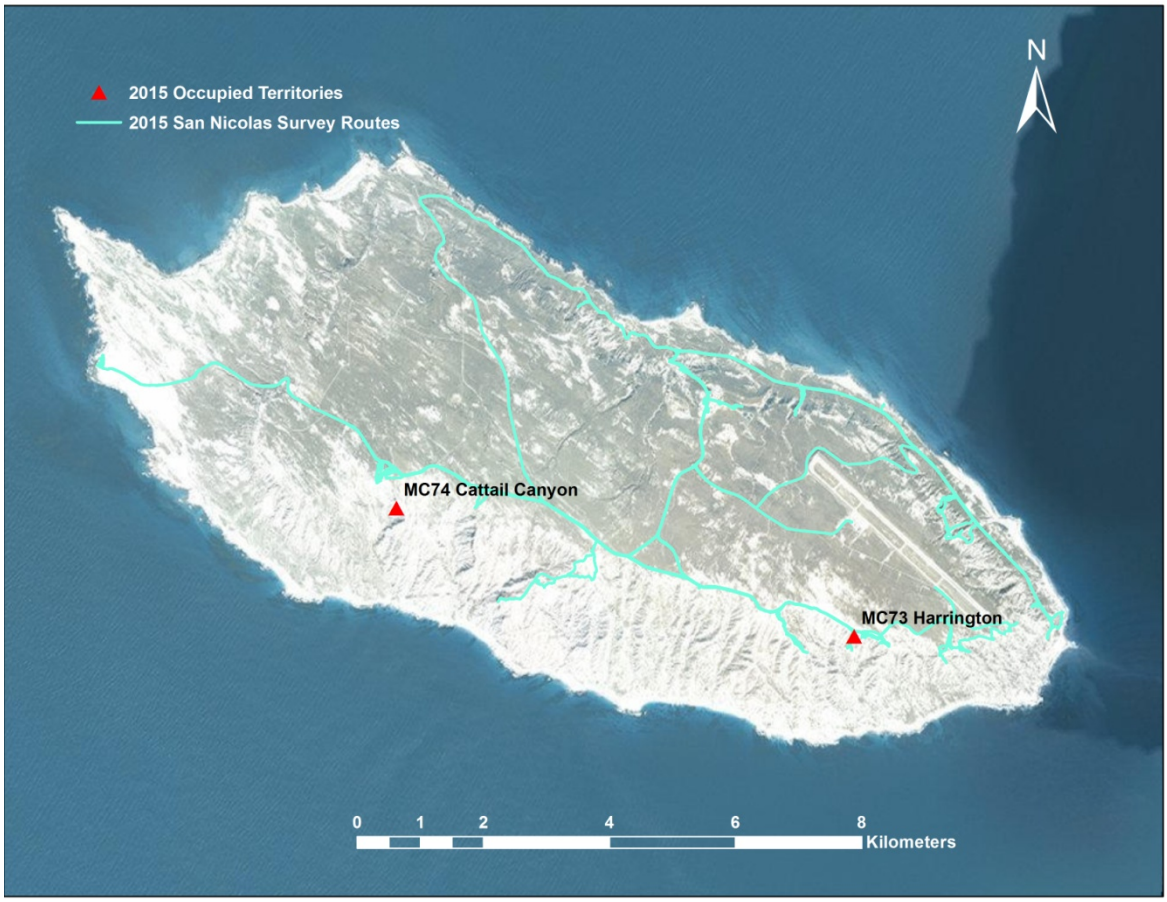

Figure 8. Peregrine falcon survey routes and territories on San Nicolas Island, CA, 2015.

MC74 Cattail Canyon: We confirmed a pair exhibiting courtship behavior in the historic Cattail Canyon territory (Fig. 8) on 20 March. They were incubating on 29 April and there were 3 chicks present on 21 May. We entered the eyrie and banded 3 males (Table 2, Appendix V) on 1 June. The chicks were ~16-19 days at banding and we did not return later in the season, so we cannot classify these chicks as having fledged.

Santa Barbara Island

We surveyed on Santa Barbara on 26 February – 3 March and 1-7 April. We located pairs in all 3 historic territories and did not locate any new territories (Fig. 9).

MC33 Signal Peak: We confirmed a pair exhibiting courtship behavior in the historic Signal Peak territory (Fig. 9) on 28 February, but we were never able to determine their nesting status during visits on 2 March and 2-7 April.

Figure 9. Peregrine falcon survey routes and territories on Santa Barbara Island, CA, 2015.

MC71 North Peak: We observed a pair exhibiting courtship behavior at the historic North Peak territory (Fig. 9) on 27 February and 3 March. We surveyed the area again on 1 and 6 April, at which time we only saw the female, and there was no evidence of nesting.

MC72 North Signal Peak: We confirmed a pair in the historic North Signal Peak territory (Fig. 9) on 28 February and the adults were aggressively defending the territory. They were thought to be in courtship until 4 April, when we spotted a fledgling and 35-42 day old chick. Based upon a 33-day incubation period, eggs would have to have been laid in mid-January and chicks hatched in mid- to late-February, prior to our first visit.

Santa Catalina Island

We surveyed 2 previously identified territories on the island, both of which were occupied, and located no new territories (Fig. 10).

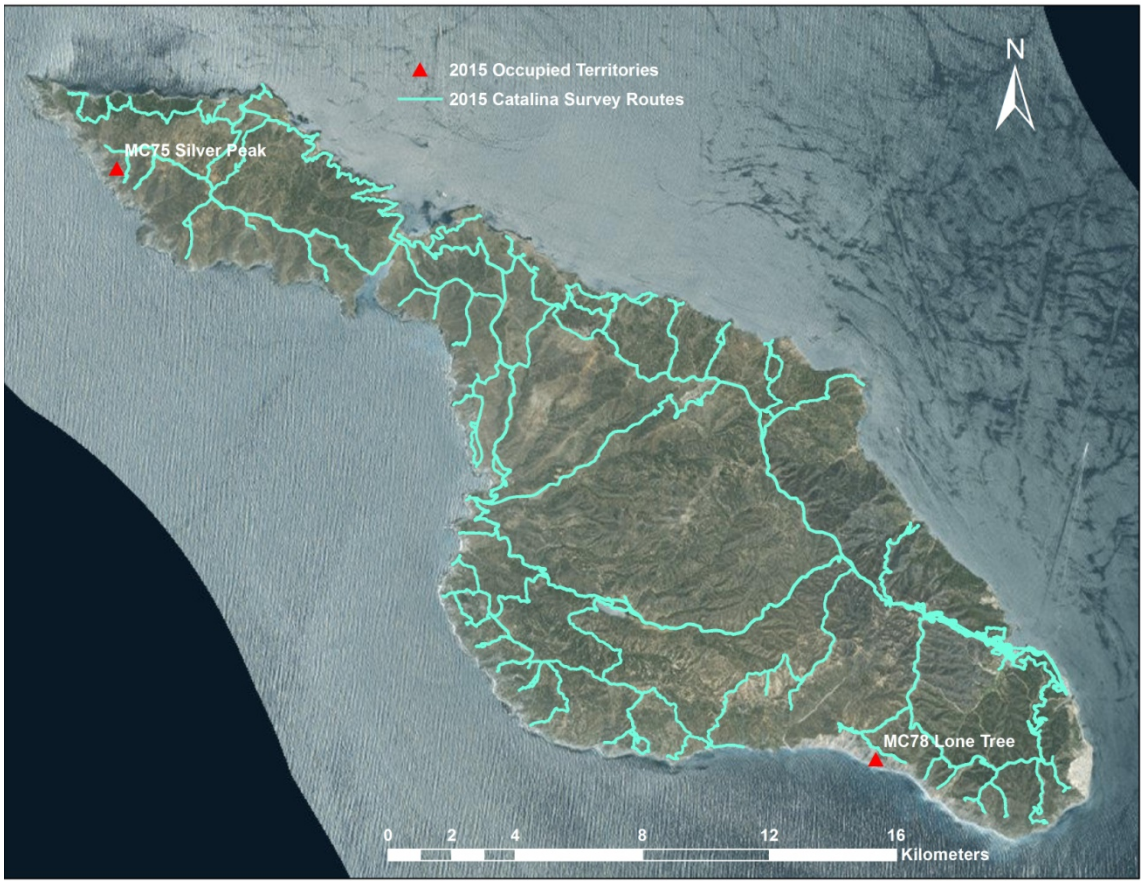

Figure 10. Peregrine falcon survey routes and territories on Santa Catalina Island, CA, 2015.

MC75 Silver Peak: We located a pair in the historic Silver Peak territory (Fig. 10) on 27 February. They were incubating in the 2014 eyrie on 3 April and 2 chicks were seen on 5 May. Three chicks were seen on 19 May and we did not attempt to band them. All 3 chicks had fledged by 22 June, which were the first known fledglings on Catalina since restoration and monitoring began in 1983.

MC78 Lone Tree: We confirmed a pair in the historic Lone Tree territory (Fig. 10) on 22 March. Based upon adult behavior, they appeared to be incubating on 14 April and to have at least 1 chick on 10 May. We did not attempt to band the chicks, but were able to determine that there were at least 2 chicks present. We confirmed a fledgling and a near fledgling on 23 June and 1 fledgling was perched in the territory on 15 July.

San Clemente Island

We surveyed the 2 historic territories, which were occupied, and located no additional territories (Fig. 11).

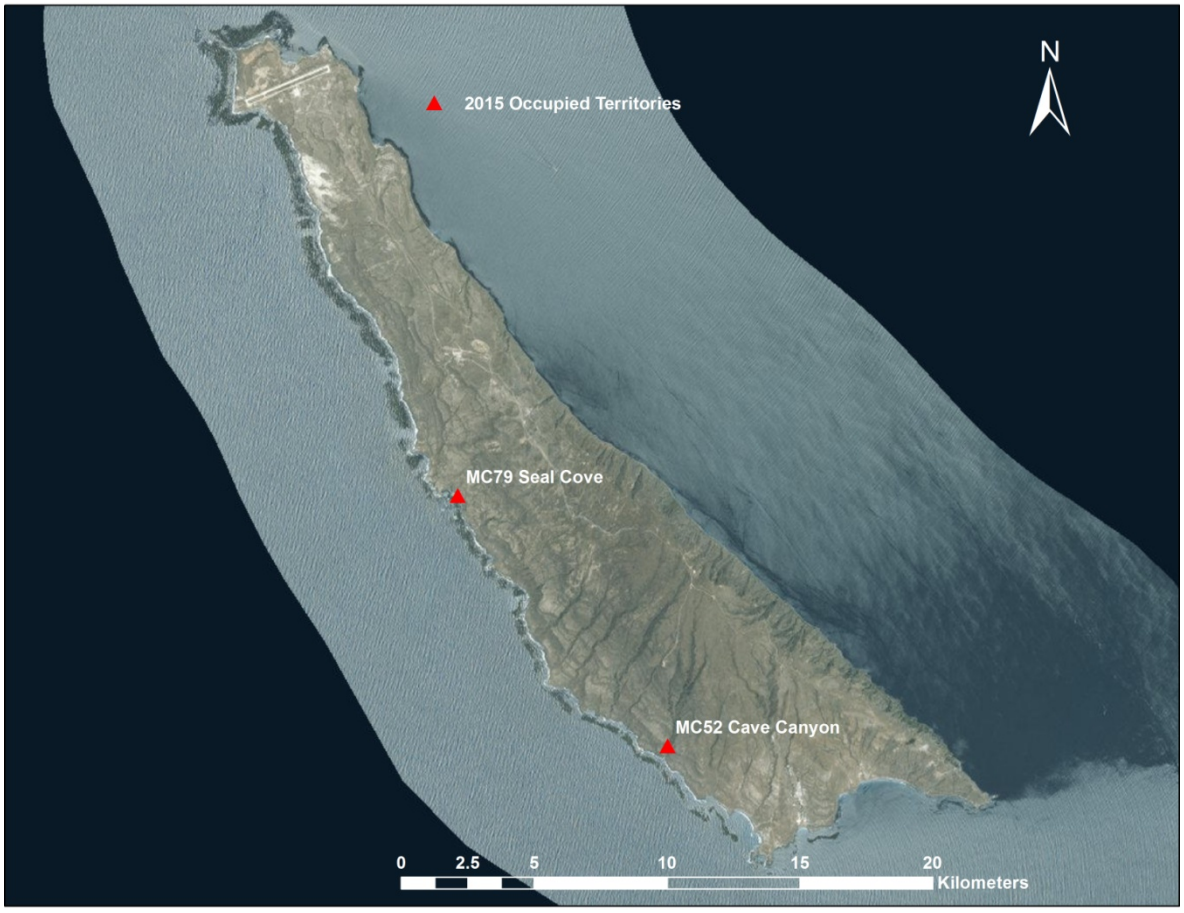

Figure 11. Peregrine falcon territories on San Clemente Island, CA, 2015.

MC52 Cave Canyon: There was a pair in the historic Cave Canyon territory (Fig. 11) and there were 2 nestlings present on 3 May. We did not attempt banding. Both chicks had fledged by 9 June.

MC79 Seal Cove: We confirmed a pair in the historic Seal Cove territory (Fig. 11), but there was no indication that they nested this year.

RESIGHTINGS

In 2015, we received reports of several sightings of peregrines on the mainland that we had banded as nestlings on the islands in 2013 - 2014.

On 12 February, a female banded in 2014 at the Punta Gorda territory on Santa Cruz (Band #1947-21632) was seen at Lake Balboa in Sherman Oaks, CA (Rick Scott, personal communication). The same bird was seen on 20 April (David Tinoco, personal communication), 27 June, and 22 November (BBL reports) at the Sepulveda Basin Wildlife Reserve in Los Angeles County.

On 28 April, Nick Todd, who studies peregrines at Vandenberg Air Force Base, reported that a male we banded in 2014 at the Carrington Point territory on Santa Rosa (Band #1156-16821) was the new breeding male at the Point Arguello territory at Vandenberg. Breeding as a second year bird, the pair produced 4 eggs, of which 2 hatched and 1 chick fledged (2^{nd} died within a few days of hatching).

On 18 May, a female banded in 2014 at the Valley Anchorage territory on Santa Cruz (Band #1947-21649) was seen chasing a snowy plover at San Diego Bay National Wildlife Refuge (reported by Brian Collins, USFWS). She was trapped on 16 July near Chula Vista and transported to the Tehama Wildlife Area, Tehama County, CA, where she was released on 23 July.

PREY REMAINS

We collected prey remains from 11 territories on 4 islands, from which N. John Schmitt (WFVZ) identified a total of 114 individual prey items. Ninety-eight prey items (88%) were identified to the species level, representing 36 different species. Six additional prey items could be identified only to genus, 8 prey items were identified to the family level, and 2 prey items could only be classified as bird or shorebird (Table 3). The most common species identified were House Finch (*n*=15), Eurasian Collared Dove (*n*=8), Horned Lark (*n*=7) Cassin's Auklet (*n*=7), Western Meadowlark (*n*=6), and California Gull (*n*=6).

Table 3. Prey remains (minimum. number of individuals) collected from peregrine falcon eyries on the California Channel Islands in 2015.

Family/ Scientific Name	Common Name	Island[a]				
		SRI	SCI	ANA	SNI	Total
Alaudidae						
Eremophila alpestris	Horned Lark	5			2	7
Alcidae						
Cepphus Columba	Pigeon Guillemot		4			4
Ptychoramphus aleuticus	Cassin's Auklet	4	2	1		7
Anatidae						
Duck sp.	Unidentified Duck			1		1
Apodidae						
Aeronautes saxatalis	White-throated Swift		2			2
Bombycillidae						
Bombacilla cedrorum	Cedar Waxwing	1				1
Cardinalidae						
Passerina amoena	Lazuli Bunting		1			1
Pheucticus melanocephalus	Black-Headed Grosbeak	1				1
Piranga ludoviciana	Western Tanager	3	2			5
Columbidae						
Columba livia	Rock Pigeon	1				1
Patagioenas fasciata	Band-tailed Pigeon		1			1
Streptopelia decaocto	Eurasian Collared Dove	1	7			8
Zenaida macroura	Mourning Dove	3				3
Corvidae						
Aphelocoma insularis	Island Scrub Jay		1			1
Emberizidae						
Melospiza melodia	Song Sparrow	2				2
Pipilo maculates	Spotted Towhee	2	1			3
Falconidae						
Falco sparverius	American Kestrel				1	1
Fringillidae						
Carpodacus mexicanus	House Finch	9	3	1	2	15
Haematopodidae						
Haematopus bachmani	Black Oystercatcher	1				1
Hirundinidae						
Swallow sp.	Unidentified Swallow		1			1
Hyrdobatidae						
Oceanodroma spp.	Storm-petrel spp.		1			1
Icteridae						
Icterus bullockii	Bullock's Oriole		1			1
Sturnella neglecta	Western Meadowlark	6				6
Laniidae						
Lanius ludovicianus	Loggerhead Shrike	3				3

Table 3. Continued

Family/ Scientific Name	Common Name	Island[a] SRI	SCI	ANA	SNI	Total
Laridae						
Larus californicus	California Gull	6				6
Larus heermanni	Heermann's Gull		1			1
Larus occidentalis	Western Gull	1				1
Leucophaeus pipixcan	Franklin's Gull		1			1
Tern sp.	Unidentified Tern		1			1
Parulidae						
Dendroica spp.	Warbler spp.	1				1
Setophaga petechia	Yellow Warbler	1				1
Warbler spp.	Unidentified Warbler	3	1			4
Phasianidae						
Alectoris chukar	Chukar				2	2
Picidae						
Melanerpes formicivorus	Acorn Woodpecker	2	1			3
Podicipedidae						
Podiceps nigricollis	Eared Grebe	1				1
Polioptilidae						
Polipotila caerulea	Blue-gray Gnatcatcher		1			1
Scolopacidae						
Calidris alba	Sanderling	1				1
Calidris spp.	Sandpiper spp.	1	1			2
Phalaropus lobatus	Red-necked Phalarope	1				1
Phalaropus fulicarius	Red Phalarope	1	1			2
Phalaropus spp.	Unidentified Phalarope		1			1
Tringa incana	Wandering Tattler	1				1
Tringa semipalmata	Willet	1				1
Turdidae						
Thrush spp.	Unidentified Thrush	1				1
Tyrannidae						
Sayornis nigricans	Black Phoebe		1			1
Empidonax spp.		1				1
Unidentified Bird			1			1
Unidentified Shorebird				1		1

[a] Santa Rosa (SRI), Santa Cruz (SCI), Anacapa (ANA), San Nicolas (SNI)

EGGSHELL MEASUREMENTS

We collected eggshell fragments from 10 territories on 3 islands in 2015 (Table 4, Appendix V). The eggshell measurements using the "SS" method were thicker, and thus had less eggshell thinning, than the "RC" method in all 10 samples (Table 4). Percent eggshell thinning,

compared to peregrine eggs from pre-1947 in California, ranged from -3.8% to 18.5% using the SS method, and 9.0% to 25.0% using the "RC" method (Table 4).

PRODUCTIVITY

At least 74 chicks are known to have hatched on the Channel Islands in 2015, of which 65 (88%) are known to have survived to ≥28 days of age. We calculated productivity based upon 35 pairs (see Table 1) that were monitored from early in the breeding season (i.e., courtship, incubation) and for which we know the outcome of the breeding season. All 35 pairs laid eggs, 29 pairs (83%) hatched at least 1 chick, and 26 pairs (74%) successfully produced at least 1 chick ≥28 days of age. Minimum productivity was 1.63 chicks per occupied territory, or 2.19 chicks per successful nesting attempt.

BREEDING CHRONOLOGY

We calculated the breeding chronology of pairs that produced chicks based upon estimated hatch dates and a 33-day incubation period (Linthicum 1996) and approximately 42 days of chick-rearing. The earliest start of incubation was on Santa Barbara, where we estimate that the North Signal Peak (MC72) territory began incubating around 19 January (Fig. 12). The latest known incubation of a first clutch was at the East Smuggler's territory (MC77) on Santa Cruz, where we estimate incubation began on 20 April (Fig. 12). The only known second clutch this season was by the West End (MC20) female, who started a second clutch on 17 May. All territories, except for the North Signal Peak territory, are estimated to have initiated their first clutch between 20 March and 20 April. The estimated mean and median date of the start of incubation was 28 March and 30 March, respectively. The estimated mean and median dates of chicks hatching (first chick of clutch) was 30 April and 2 May, respectively.

Table 4. Measurements of peregrine falcon eggs and eggshell fragments collected from nests on the California Channel Islands in 2015.

Island/Territory	Clutch Means (RC Technique) Eggshell Thickness (mm)	Clutch Means (RC Technique) % Thinning	Clutch Means (SS Technique) Eggshell Thickness (mm)	Clutch Means (SS Technique) % Thinning	Notes
San Nicolas Island					
MC74 Cattail Canyon	0.282	22.5	0.305	16.4	2 large pieces with membrane, from ends
Santa Rosa Island					
MC35 Orr's Camp	0.296	18.6	0.318	12.5	Measured fragments with membrane
MC50 Trancion	0.295	19.0	0.330	9.3	Measured 2 fragments with membrane
MC55 Soledad	0.327	10.3	0.339	6.9	5 small fragments with membrane, 5 without membrane
MC65 Bonn Point	0.318	12.6	0.378	-3.8	Fragments with and without membrane
MC67 Sandy Point	0.328	10.0	0.354	2.8	1 large piece with membrane
Island Mean[a]	0.313	14.1	0.344	5.5	
Santa Cruz Island					
MC30 Sea Lion	0.278	23.7	0.314	13.6	5 fragments with membrane
MC46 Valley Anchorage	0.331	9.0	0.337	7.5	10 small pieces, each measured with membrane
MC53 Bowen Point	0.281	22.7	0.297	18.5	Measured 3 fragments, with membrane
MC62 Punta Gorda	0.273	25.0	0.305	16.3	Fragments without membrane, added mean membrane
Island Mean	0.291	20.1	0.313	14.0	

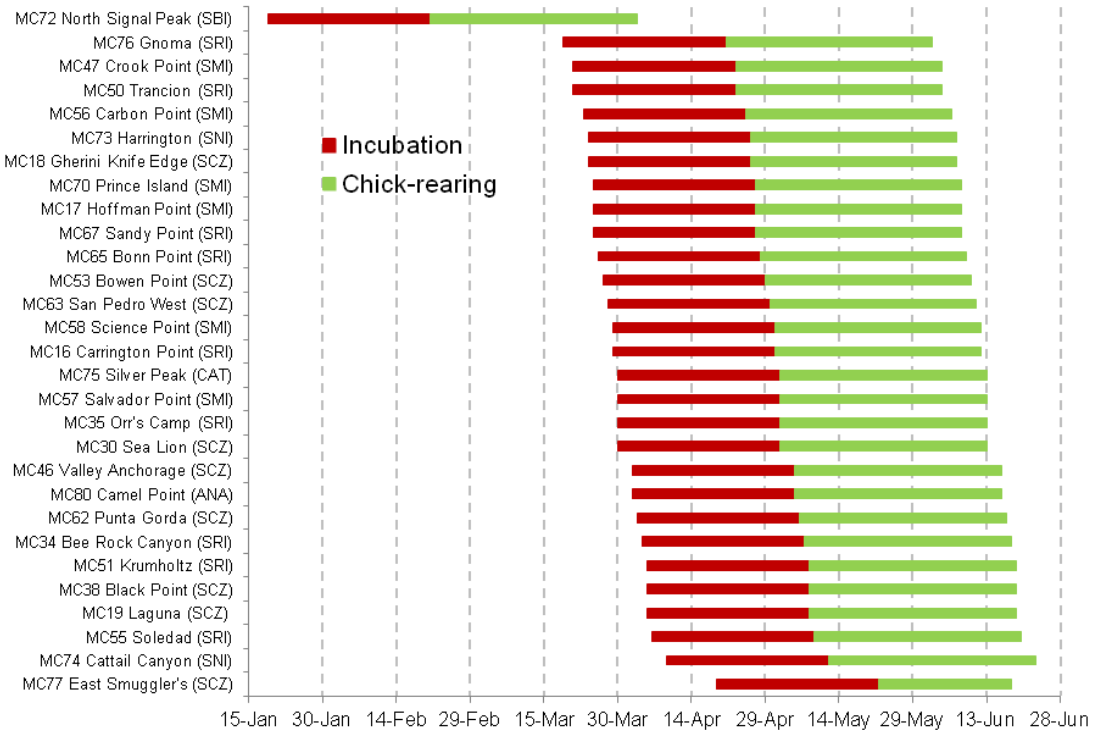

Figure 12. Breeding chronology of peregrine falcons on the California Channel Islands during 2015. Data are for nesting attempts that resulted in chicks that were aged at banding or when clearly visible in the eyrie so that we could estimate laying dates. The chick–rearing phase is based on 42 days from hatch to fledge, and the figure includes the entire phase, even if a nesting attempt failed during the chick-rearing phase period.

DISCUSSION

The peregrine has exhibited an astonishing recovery on the Channel Islands, going from being absent from the 1950s through 1983, to a population size that exceeds Hunt's (1994) estimates for historical periods. The number of known occupied territories on the Channel Islands during the 2015 season remained at 48, the same as in 2014 (Figure 13), but a milestone was reached with the first known successful fledglings from a nest on Catalina since peregrines were originally extirpated in the late 1940s.

The northern Channel Islands appear to be the stronghold for Channel Island peregrines. In other peregrine populations, density of peregrine territories appears to be positively correlated

with availability of food resources, with higher densities generally occurring in association with large seabird or shorebird colonies (Ratcliffe 1980). As compared to the southern Channel Islands, the northern Channel Islands generally have higher seabird diversity (Carter et al. 1992, Takekawa et al. 2004), as well as more cliffs with ledges and potholes for peregrine nesting (Hunt 1994; P. Sharpe, personal observations).

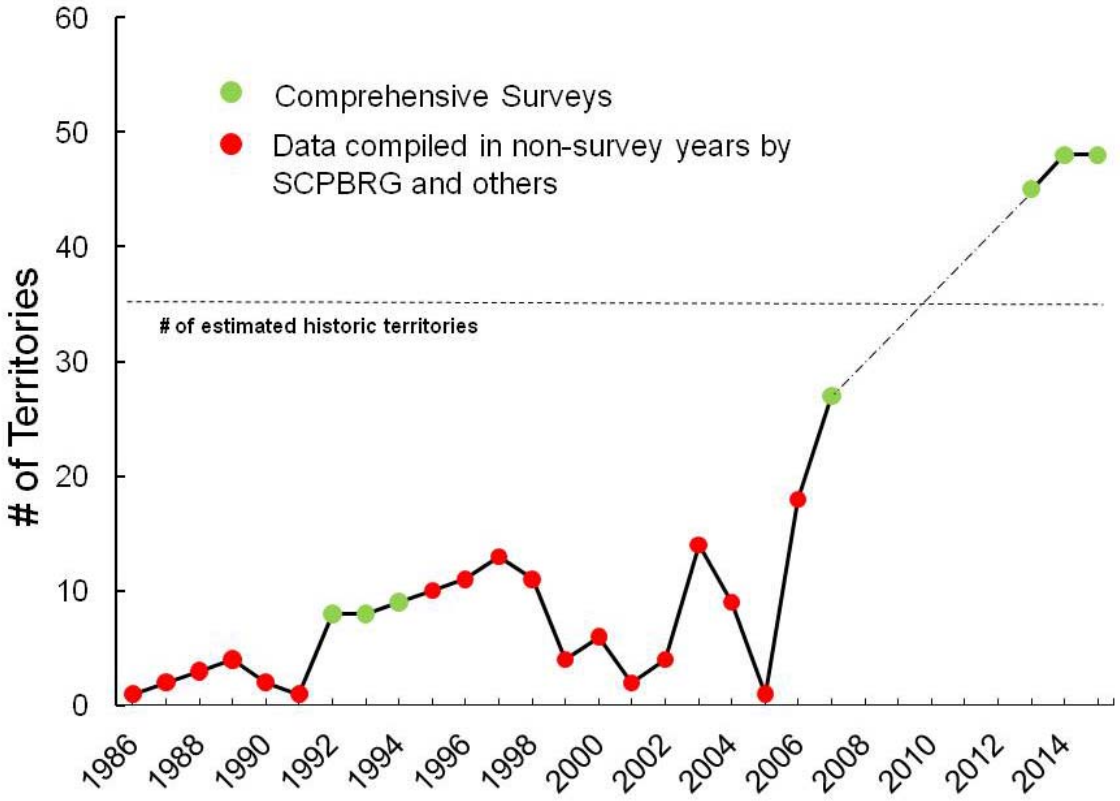

Figure 13. Number of known occupied peregrine falcon territories on the California Channel Islands from 1986 to 2015. Green points represent data from years when there were comprehensive surveys; red points are from years when there were no comprehensive surveys as reported in Appendix IV of Latta (2012).

Nest success in occupied territories with known outcomes decreased slightly from 2014 (78% to 74%) and productivity was nearly identical between the 2 years (1.63 chicks/occupied territory in 2015, 1.67 chicks/occupied territory in 2014 [Sharpe 2015]). After the 3 breeding seasons (2013-2015) that IWS has monitored peregrines on the Channel Islands, nest success has averaged 69% and productivity has been 1.58 chicks/occupied territory. Nest success and productivity on the Channel Islands is higher than that in the Pacific Region in 2003 (65% and 1.45 chicks/occupied territory), but slightly lower than the 2003 national average of 71% and

1.64 chicks/occupied territory (Green et al. 2003). More recent studies reported nest success of 77-78% and 1.8 chicks/occupied territory found in Colorado, Montana, Wyoming, and Idaho (Enderson et al. 2012, Moulton 2012). Nest success and productivity can vary greatly between years, so continued monitoring will allow us to better estimate long-term reproductive averages and trends in the peregrine population on the Channel Islands.

The potential impact of DDE on the productivity of peregrines on the Channel Islands is a continuing concern. Historically, peregrine populations with eggshell thinning exceeding 17% were either declining or extirpated (Peakall and Kiff 1988), but populations with average thinning below 14.5% appeared normal (Fyfe et al. 1988). Eighteen clutches collected on the Channel Islands from 1988-1993 had 19.8% thinning (Kiff 1994) and mean eggshell thinning was 18.34% in 2007 (Latta 2012), 12.39% in 2013 (Sharpe 2014), 14.41% in 2014 (Sharpe 2015), and 10% in 2015 using the "SS" method, which is the same method used in the previous Channel Island studies, and only 1 territory on Santa Cruz had >17% thinning in 2015. Many of the samples from this season were comprised of only a few eggshell fragments, so while there is evidence that eggshell thinning has decreased since the 1990s, we have to take into consideration that there can be a large variation in eggshell thickness within clutches (Burnham et al. 1984).

Although current eggshell thinning does not appear to be of particular concern, there is little doubt that DDE is still in the food chain. Peregrines prey on a wide variety of species, as indicated by the prey remains collected in 2007 (Latta 2012), 2013 (Sharpe 2014), 2014 (Sharpe 2015), and 2015. These prey collections may indicate the breadth of the diet, but not necessarily the proportional component of the diet because prey remains may blow out of the eyrie or be removed by adults. However, the data elucidate the potential pathways through which peregrines could acquire DDE. Enderson et al. (1982) reported that peregrines feeding on prey with 1.0 ppm DDE during the breeding season could be expected to lay eggs with 16% eggshell thinning. We would expect birds that feed largely on marine fish to have higher DDE body burdens than birds that feed on other food sources. Alcids and gulls, which made up ~33% of prey items we collected, have had DDE body burdens of 2 ppm or higher around the Channel Islands (Garcelon et al. 1989, Hunt 1994), so these species could be major sources of DDE to peregrines. These prey species could be acquiring contaminants by feeding closer to the major source of DDT contamination off the Palos Verdes Peninsula. In the case of gulls, they could also be ingesting DDE by feeding on dead marine mammals, which can have elevated DDE concentrations.

During 2003-2005, we collected tissue samples from sea lions on Santa Cruz and they had a geometric mean of 7.95 ppm, DDE (range 1.08-79.4 ppm) in their adipose tissue (MSRP, unpublished data).

We believe that the peregrine population will continue to expand into currently unoccupied breeding habitat, especially on the northern Channel Islands. Although nesting density is high on the northern Channel Islands and the levels of productivity appear sufficient to maintain the population, factors such as juvenile/adult survival and emigration/immigration rates play an important role in population persistence. Annual population monitoring and banding of young could help us gain an understanding of these population parameters for the Channel Island peregrines and help determine whether contaminants or other issues are negatively impacting the population.

During the 2016 season, we will continue monitoring the known territories on all 8 islands and spend more time surveying areas that have received minimal survey effort in previous years, such as along the escarpments in the central valley of Santa Cruz and along the coast of San Clemente. We will rely primarily on the call-broadcast protocol for the rapid assessment of areas with suitable habitat outside of known territories, as has been done in other studies (Klinger and Tomlinson 2010), and we recommend its use in peregrine population monitoring, especially when time and/or personnel are limited.

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Appendix I. Peregrine Falcon Monitoring Occupancy and Productivity Data

Peregrine Falcon Monitoring Occupancy and Productivity Data Form

Date:_____ Observer:_____

Territory Name and/or State Code:_____
Island: ANA SCI SRI SMI SBI SNI SCA SCL
Survey Method: Foot_____ Boat_____ Other_____
Survey Type: Passive_____ Call-Broadcast_____ Mixed_____
Observation Point: Latitude:_____ Longitude:_____
Observation Start Time:_____ Observation Stop Time:_____
Wind speed: : <5 6-15 >15 Cloud Cover (%):_____
Dominant Habitat Type within 0.5 km:_____

Occupancy Status: Are birds present? No Yes (fill in below if Yes)

# of Birds Present: **Male:** SY___ A___ Unk___ **Female:** SY___ A___ Unk___
Unidentified Bird: _____

Stage of Reproduction at time of visit: Unknown Courtship Incubation Nestling Fledgling

Activity/Behavior (Check those that apply)		
Territorial Defense	Pair Present	Courtship Display
Cooperative Hunting	Copulation	Vocalizing
Adult Prey Exchange	Individual Hunting	Young Present
Prey Delivery to Ledge	Brooding	Incubation
Feeding Young	Describe other behavior in Comments	

Signs of Productivity
Eggs Observed:_____ # of Young Observed:_____ Estimated Age of Young (Days):_____
Fledglings Confirmed:_____

If Nest is Identified: Distance to Nest_____m Bearing to Nest_____ Aspect of Nest_____
Approximate Nest Coordinates: Latitude:_____ Longitude:_____
Nest Location: Ledge on Cliff____ Stick Nest on Cliff____ Cavity/Pothole on Cliff____ Open Hillside____
Level Ground____ Other
(Describe)_____
Possible to view the nest site well enough to see eggs or young? Yes No
If unable to see nest site, please
explain:_____

COMMENTS:_____

Photos Taken (file
names)_____

Appendix II. Call-Broadcast Survey Form: Peregrine Falcons

Date:

<table>
<tr><td colspan="3">Island: ANA SCI SRI SMI SBI SNI SCA SCL</td></tr>
<tr><td colspan="2">Observers:</td><td>Survey Mode: Foot___ Boat___ Other _____</td></tr>
<tr><td colspan="2">Location Name/Description:</td><td>Latitude: Longitude:</td></tr>
<tr><td>Start Time:</td><td>End Time:</td><td>Wind Speed: <5 6-15 >15</td></tr>
<tr><td colspan="2">Peregrines Detected? (circle one) Yes No</td><td>Time to Detection (min):</td></tr>
<tr><td colspan="2">Response to Call-broadcast: Yes No</td><td>Type of Response:: Flight Vocal Both</td></tr>
<tr><td colspan="2">Duration of Response (min):</td><td>Distance to Responding Individuals (m)</td></tr>
<tr><td colspan="2"># Responding PEFAs[1]:
Male: N____ SY____ A____ Unk____
Female: N____ SY____ A____ Unk____
Unidentified:</td><td># Non-Responding PEFAs[1]:
Male: N____ SY____ A____ Unk____
Female: N____ SY____ A____ Unk____
Unidentified:</td></tr>
<tr><td>Young Present:
Y N Unk</td><td>Breeding Stage[2] (circle):
C I N F Unk</td><td>Interspecifics Present:</td></tr>
<tr><td colspan="3">Comments (include description of habitat quality and whether the area should be resurveyed):</td></tr>
</table>

[1]Age Class: Nestling (N) Second Year (SY) Adult (A)
[2]Courtship (C) Incubation (I) Nestling (N) Fledgling (F) Unknown (Unk)

Appendix III. Peregrine banding form.

Start Time:
End Time:

Peregrine Banding/Trapping Data Form

Date Banded/Trapped _____ Banding/Trapping Location _____

Trapping Method _____

FWS Band # _____ Leg _____ Acraft Band # _____ Leg _____

Blood Drawn _____ cc

Estimated Sex : M F Confirmed Sex: M F

****General Rule: Male: Band Size 6 fits with space around leg, weight < 700g**

Female: Band Size 7A fits with space around leg, weight >700g

Estimated Age _____ days

****Compared with aging guide**

Plumage Photographed: Y N

<u>Morphometrics</u>

Total Tail Length (center feather) _____ mm

Weight _____ g - Bag wt. _____ g = _____ g

Notes:

Appendix IV. Territory codes, as designated by the California Department of Fish and Wildlife, in numerical order and the island where they are located.

State Code	Territory Name	Island	Year of First Known Occupancy[a]
MC16	Carrington Point	Santa Rosa	1989
MC17	Hoffman Point	San Miguel	1986
MC18	Gherini Knife Edge	Santa Cruz	1991
MC19	Laguna	Santa Cruz	1991
MC20	West End	Santa Cruz	1989
MC21	West Anacapa	Anacapa	1989
MC27	Lime Point	Santa Rosa	1992
MC28	Bat Rock	San Miguel	1992
MC30	Sea Lion	Santa Cruz	1993
MC31	Water Canyon	Santa Rosa	1995
MC33	Signal Peak	Santa Barbara	1995
MC34	Bee Rock Canyon	Santa Rosa	1996
MC35	Orr's Camp	Santa Rosa	1996
MC36	Lost Hat	Santa Rosa	1998
MC37	Rat Trap	San Miguel	1999
MC38	Black Point	Santa Cruz	2000
MC42	Long Point	Santa Catalina	2002
MC43	Middle Anacapa	Anacapa	2003
MC44	Cardwell Point	San Miguel	2002
MC45	Arch Rock	Santa Cruz	2003
MC46	Valley Anchorage	Santa Cruz	2006
MC47	Crook Point	San Miguel	2006
MC49	Bullethead	Santa Catalina	2004
MC50	Trancion	Santa Rosa	2006
MC51	Krumholtz	Santa Rosa	2006
MC52	Cave Canyon	San Clemente	2011
MC53	Bowen Point	Santa Cruz	2007
MC54	Cathedral Cove	Anacapa	2007
MC55	Soledad	Santa Rosa	2007
MC56	Carbon Point	San Miguel	2006
MC57	Salvador Point	San Miguel	2004
MC58	Science Point	San Miguel	2007
MC59	Cavern Point	Santa Cruz	2007
MC60	Pelican Bay	Santa Cruz	2013
MC61	Punta Diablo	Santa Cruz	2013
MC62	Punta Gorda	Santa Cruz	2013
MC63	San Pedro West	Santa Cruz	2013
MC64	West Point South	Santa Cruz	2013
MC65	Bonn Point	Santa Rosa	2013

Appendix IV. Continued

State Code	Territory Name	Island	First Known Occupancy[a]
MC66	Chickasaw Canyon	Santa Rosa	2013
MC67	Sandy Point	Santa Rosa	2013
MC68	Castle Rock	San Miguel	2013
MC69	Harris Point	San Miguel	2013
MC70	Prince Island	San Miguel	2013
MC71	North Peak	Santa Barbara	2013
MC72	North Signal Peak	Santa Barbara	2013
MC73	Harrington	San Nicolas	2013
MC74	Cattail Canyon	San Nicolas	2013
MC75	Silver Peak	Santa Catalina	2013
MC76	Gnoma	Santa Rosa	2007
MC77	East Smuggler's	Santa Cruz	2014
MC78	Lone Tree	Santa Catalina	2014
MC79	Seal Cove	San Clemente	2014
MC80	Camel Point	Anacapa	2014

[a]Data from California Department of Fish and Wildlife and Latta 2012 (Appendix IV)

Appendix V. Samples collected in 2015.

Sample ID	Island[a]	Territory	Sample Type	Collection Date	Notes
15-MC34-C-1	SRI	Bee Rock Canyon	Chick	6/4/2015	Found dead below eyrie
15-MC50-F-1	SRI	Trancion	Feathers	5/20/2015	Collected from eyrie
15-MC30-PR-1	SCI	Sea Lion	Prey Remains	6/3/2015	Collected from eyrie
15-MC35-PR-1	SRI	Orr's Camp	Prey Remains	5/23/2015	Collected from eyrie
15-MC46-PR-1	SCI	Valley Anchorage	Prey Remains	6/2/2015	Collected from eyrie
15-MC50-PR-1	SRI	Trancion	Prey Remains	5/20/2015	Collected from eyrie
15-MC50-PR-2	SRI	Trancion	Prey Remains	5/20/2015	Collected from eyrie
15-MC53-PR-1	SCI	Bowen Point	Prey Remains	6/4/2015	Collected from eyrie
15-MC54-PR-1	AI	Cathedral Cove	Prey Remains	6/9/2015	Collected from eyrie
15-MC55-PR-1	SRI	Soledad	Prey Remains	5/23/2015	Collected from eyrie
15-MC62-PR-1	SCI	Punta Gorda	Prey Remains	6/3/2015	Collected from eyrie
15-MC65-PR-1	SRI	Bonn Point	Prey Remains	5/22/2015	Collected from eyrie
15-MC67-PR-1	SRI	Sandy Point	Prey Remains	5/21/2015	Collected from eyrie
15-MC74-PR-1	SNI	Cattail Canyon	Prey Remains	6/1/2015	Collected from eyrie
15-MC76-PR-1	SRI	Gnoma	Prey Remains	5/19/2015	Collected from eyrie
15-MC30-SF-1	SCI	Sea Lion	Shell Fragments	6/3/2015	Collected from eyrie
15-MC35-SF-1	SRI	Orr's Camp	Shell Fragments	5/23/2015	Collected from eyrie
15-MC46-SF-1	SCI	Valley Anchorage	Shell Fragments	6/2/2015	Collected from eyrie
15-MC50-SF-1	SRI	Trancion	Shell Fragments	5/20/2015	Collected from eyrie
15-MC53-SF-1	SCI	Bowen Point	Shell Fragments	6/4/2015	Collected from eyrie
15-MC55-SF-1	SRI	Soledad	Shell Fragments	5/23/2015	Collected from eyrie
15-MC62-SF-1	SCI	Punta Gorda	Shell Fragments	6/3/2015	Collected from eyrie
15-MC65-SF-1	SRI	Bonn Point	Shell Fragments	5/22/2015	Collected from eyrie
15-MC67-SF-1	SRI	Sandy Point	Shell Fragments	5/21/2015	Collected from eyrie
15-MC74-SF-1	SNI	Cattail Canyon	Shell Fragments	6/1/2015	Collected from eyrie
15-MC30-WB-1	SCI	Sea Lion	Whole Blood	6/3/2015	Collected from 1947-21663
15-MC30-WB-2	SCI	Sea Lion	Whole Blood	6/3/2015	Collected from 1947-21664

Appendix V. Continued

Sample ID	Island[a]	Territory	Sample Type	Collection Date	Notes
15-MC35-WB-1	SRI	Orr's Camp	Whole Blood	5/23/2015	Collected from 1947-21661
15-MC35-WB-2	SRI	Orr's Camp	Whole Blood	5/23/2015	Collected from 1947-21660
15-MC38-WB-1	SCI	Black Point	Whole Blood	6/6/2015	Collected from 1156-16852
15-MC46-WB-1	SCI	Valley Anchorage	Whole Blood	6/2/2015	Collected from 1156-16848
15-MC46-WB-2	SCI	Valley Anchorage	Whole Blood	6/2/2015	Collected from 1156-16849
15-MC53-WB-1	SCI	Bowen Point	Whole Blood	6/4/2015	Collected from 1156-16850
15-MC53-WB-2	SCI	Bowen Point	Whole Blood	6/4/2015	Collected from 1947-21665
15-MC53-WB-3	SCI	Bowen Point	Whole Blood	6/4/2015	Collected from 1947-21666
15-MC62-WB-1	SCI	Punta Gorda	Whole Blood	6/3/2015	Collected from 1947-21662
15-MC65-WB-1	SRI	Bonn Point	Whole Blood	5/22/2015	Collected from 1156-16843
15-MC65-WB-2	SRI	Bonn Point	Whole Blood	5/22/2015	Collected from 1947-21659
15-MC65-WB-3	SRI	Bonn Point	Whole Blood	5/22/2015	Collected from 1156-16842
15-MC67-WB-1	SRI	Sandy Point	Whole Blood	5/21/2015	Collected from 1156-16840
15-MC67-WB-2	SRI	Sandy Point	Whole Blood	5/21/2015	Collected from 1947-21658
15-MC74-WB-1	SNI	Cattail Canyon	Whole Blood	6/1/2015	Collected from 1156-16845
15-MC74-WB-2	SNI	Cattail Canyon	Whole Blood	6/1/2015	Collected from 1156-16846
15-MC74-WB-3	SNI	Cattail Canyon	Whole Blood	6/1/2015	Collected from 1156-16847
15-MC76-WB-1	SRI	Gnoma	Whole Blood	5/19/2015	Collected from 1947-21657

[a]AI=Anacapa Island, SRI=Santa Rosa Island, SCI=Santa Cruz Island, SNI=San Nicolas Island.