PEREGRINE FALCON MONITORING ON THE CALIFORNIA CHANNEL ISLANDS, CALIFORNIA, 2014

Prepared by:

Peter B. Sharpe
Institute for Wildlife Studies
Post Office Box 1104
Arcata, California 95518

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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 occupied territories in 2007, and 45 occupied territories in 2013.

In 2014, the Institute for Wildlife Studies surveyed 50 historic peregrine territories and located 4 previously unknown territories on the Channel Islands using a combination of passive surveys and a call-broadcast survey. A total of 48 territories were occupied, including 44 of 50 historic territories (88%), with at least two occupied territories on each island. There were 9 occupied territories on San Miguel Island, 11 on Santa Rosa Island, 15 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 73 chicks are known to have hatched on the Channel Islands in 2014, of which 65 are known to have survived to $\geq$ 28 days of age. The earliest and latest dates for the start of incubation were 21 February (MC72 North Signal Peak, Santa Barbara Island) and 7 May (MC75 Silver Peak, Catalina Island), respectively. The mean dates for the start of incubation and chick hatching were 26 March and 27 March, respectively. Nest success and productivity in occupied territories with known outcomes increased from 53.7% and 1.43 chicks/occupied territory in 2013 to 77.8% and 1.67 chicks/occupied territory in 2014.

Measurements on eggs and/or eggshell fragments collected from 8 peregrine territories on 3 islands had average thinning of 14.41%, which is a decrease from previous studies, but a slight increase over the 2013 measurements (mean = 12.39%). Eggshell thinning in 2014 ranged from -0.55% to 31.04% and was generally higher on Santa Cruz Island.

We collected prey remains from 15 territories on 5 islands. Fifty-five percent of prey items that were identified to at least the family level were alcids (29%), sandpipers (10%), cardinals (7.7%), or gulls (8.1%). Alcids and gulls have previously been shown to have high burdens of DDE, so they are a potential source of DDE for breeding peregrines on the Channel Islands.

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.

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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 nine active eyries on four 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 done 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 five of the eight 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, another peregrine survey and monitoring effort was initiated in 2013 (Montrose Settlements Restoration Program 2012). The Institute for Wildlife Studies (IWS) conducted surveys on all 8 Channel Islands and found 45 occupied territories, with at least one territory on each island. Instead of waiting until 2017 to conduct the next scheduled survey, IWS and the MSTC decided to conduct annual surveys through 2017 in order to gain more information on population demography and important population parameters, such as survival, immigration and emigration. This report summarizes the results of the 2014 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 eight 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 three 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 California 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 California Channel Islands, a banding permit (# 21564) from the United States Geological Survey's Bird Banding Laboratory 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 (Permits 12-014 and 13-005) 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 four hours, normally the maximum time between eyrie visits/exchanges at the ledge (Daw et al. 2006), with a minimum of four 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 Cade et al. 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 on the windward sides, we did not include the survey in the minimum of 4 surveys required to determine that a territory was inactive.

Surveying Historic Nesting Areas

IWS biologists began surveying territories for activity in February 2014. All known territory locations on the Channel Islands reported by Latta (2012), the CDFW's database (provided by Carie Battistone), and our 2013 surveys (Sharpe 2014a) 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 Island (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 Cade et al. (1996) and Moritsch (1983) with an assumed incubation period of 33 days. We only used the 10-min call-broadcast about one 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 Cade et al. (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, as described by Cade et al. 1996 (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; Cade et al. 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 based primarily on weight, overall size, and the breadth of the tarsi (Burnham et al. 2003, J. Barnes *pers. comm.*). 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 (Cade et al. 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 addled eggs, eggshell fragments and prey remains. Samples were labeled and delivered to the Western Foundation of Vertebrate Zoology (WFVZ, Camarillo, CA) for contaminants analysis of addled eggs, 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 (WFVZ) and Paul Collins (Santa Barbara Museum of Natural History). They keyed out prey items using

reference collections 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 is no longer attached to the shell at the equator, then measurements are taken without membrane, but an average membrane thickness is also 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, uses 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 uses 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 $N\% = [1-(\text{thickness}/0.364)] \times 100$ (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 (two 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 two or more visits to a territory.

Nest Success: the proportion of occupied territories on the Channel Islands in which one or more young ≥ 28 days old was observed, using the aging guidelines in Cade 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 Cade et al. 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 one 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 50 historic peregrine territories and located 4 previously unknown territories on the Channel Islands (Table 1). A total of 48 territories were occupied, including 44 of 50 historic territories (88%), with at least two occupied territories on each island (Figs. 2 and 3, Table 1, Appendix IV). We provide survey summaries for each island and territory below.

San Miguel Island

Surveys began on San Miguel on 11 February and continued every other week through 15 June. We surveyed the 11 previously known territories on San Miguel and found 9 occupied territories and did not locate any new territories (Fig. 4, Table 1). We observed Prince Island and Castle Rock, the two off-shore rocks/islands that are suitable for peregrine nesting, from the nearest points on San Miguel.

MC17 Hoffman Point: We confirmed a pair in the historic Hoffman Point territory (Fig. 4) on 13 February, the first of ten visits to the territory. The pair was categorized as being in the courtship stage through 15 March and was incubating by 31 March. The eyrie was not visible, but we suspected chicks were present by 11 May. We entered the eyrie on 26 May and banded a single female chick (Table 2, Appendix V). The chick was still present on our last visit on 12 June, at which time it was within a week of fledging.

Figure 2. Occupied peregrine falcon territories located on the northern Channel Islands in 2014.

Figure 3. Occupied peregrine falcon territories located on the southern Channel Islands in 2014.

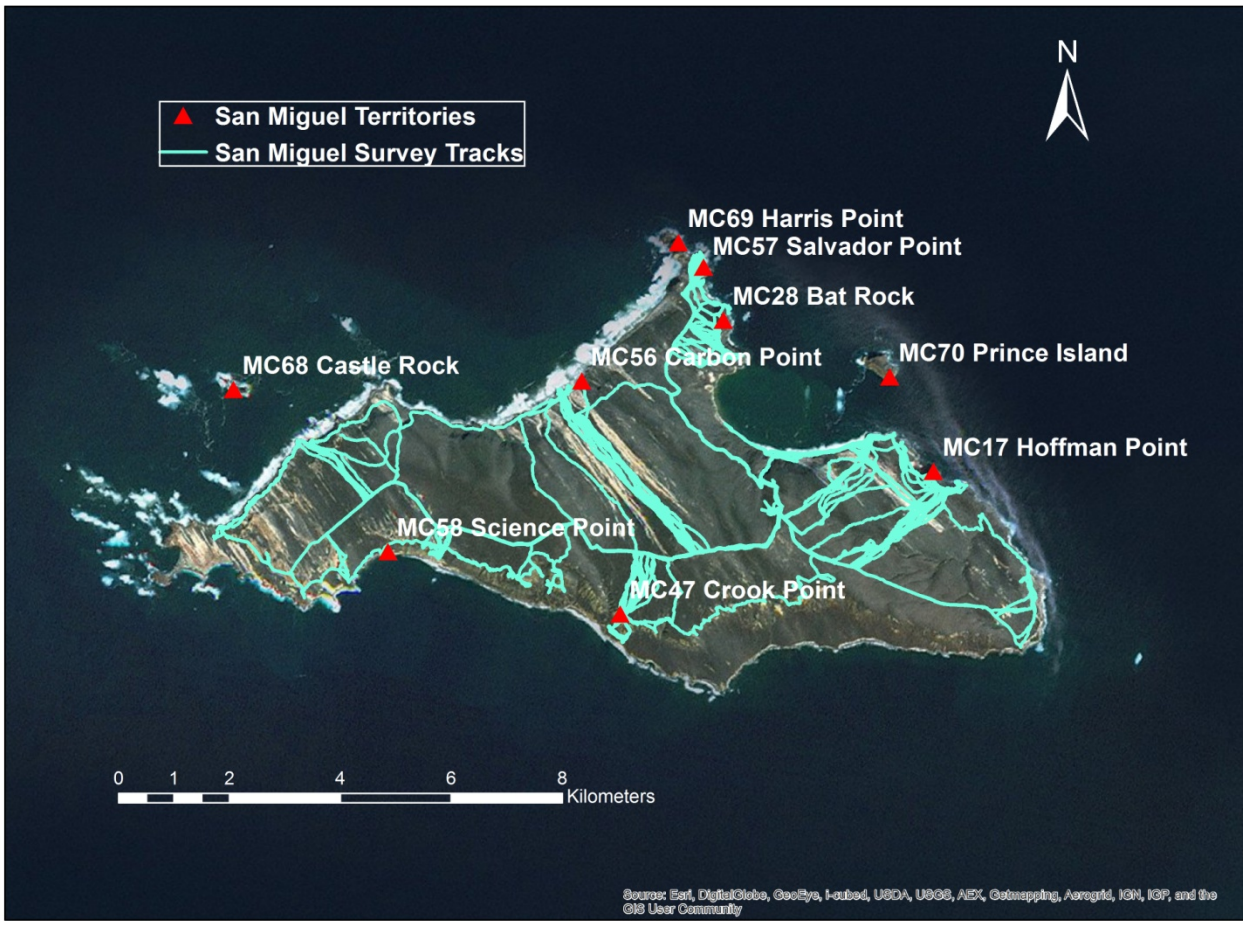

Figure 4. Peregrine falcon survey routes and territories on San Miguel Island, CA, 2014.

MC28 Bat Rock: We confirmed a pair in the historic Bat Rock territory (Fig. 4) on 11 February. The pair was first classified in the courtship stage on 17 March and as incubating on 28 March. We saw at least one nestling on 7 May and entered the eyrie on 25 May and banded 3 female chicks (Table 2, Appendix V). We confirmed successful fledging of 2 of 3 chicks during our next visit on 11 June, at which time the third chick was still on the eyrie.

MC37 Rat Trap: We made full 4-hour surveys of the historic Rat Trap territory on 15 February, 12 March, and 13 April. We classified the territory as unoccupied (Table 1) because the only time we saw birds in the territory was on 13 April, when a second-year female was observed. The adult male from the Castle Rock territory also was observed flying from the offshore rock to the Rat Trap territory on 13 April, which indicates that the historic Rat Trap pair may have moved to Castle Rock (see below).

MC44 Cardwell Point: We made full 4-hour surveys of the historic Cardwell Point territory on 16 February, 15 March, and 20 May. We observed an adult male on 16 February, but no peregrines were observed during the remaining two surveys, so we classified this territory as unoccupied (Table 1).

MC47 Crook Point: We confirmed the presence of a pair in the historic Crook Point territory (Fig. 4) on 12 February. The pair was first seen incubating on 26 March and 2 chicks 10-15 days old were seen on 9 May. We entered the eyrie and banded 3 chicks (2 M: 1 F) on 23 May (Table 2, Appendix V). We confirmed that all 3 chicks had fledged on 13 June.

MC56 Carbon Point: We confirmed a pair in the historic Carbon Point territory (Fig. 4) on 12 February and they showed signs of courtship on our next visit on 3 March. The pair had their first egg by 17 March and at least one chick was present by 8 May. We entered the eyrie on 24 May and banded 2 females (Table 2, Appendix V). We confirmed that they had fledged on 15 June.

MC57 Salvador Point: We confirmed a pair in the historic Salvador Point territory (Fig. 4) on 11 February. They were classified as in courtship through 28 March and as incubating on 30 March. Based upon adult behavior, we believe chicks were present by 7 May. We entered the eyrie on 25 May and banded 2 females (Table 2, Appendix V). We were unable to capture a third chick that was too deep in the eyrie to reach. We confirmed that all 3 chicks had fledged on 11 June.

MC58 Science Point: We made 6 visits to the historic Science Point territory (Fig. 4) between 14 February and 25 April. A single adult was seen on 14 February and an adult male and female were seen on 26 March. There were no signs of courtship or nesting and based upon the lack of sightings, we cannot confirm that the territory was occupied this season (Appendix V).

Table 1. Status and breeding activity observed at peregrine falcon territories surveyed on the California Channel Islands in 2014.

Island/ Territory Name	State Code[a]	Territory Type	Occupancy Status	Breeding Activity	# Chicks Hatched[b]	# of Fledglings	Notes (see report text for more details)
San Miguel							
Hoffman Point	MC17	Historic	Occupied	Successful	1+	1	Banded 1 chick on 5/26.
Bat Rock	MC28	Historic	Occupied	Successful	3	3	Banded 3 chicks 5/25.
Rat Trap	MC37	Historic	Unoccupied	None	.	.	May be part of MC68 territory.
Cardwell Point	MC44	Historic	Unoccupied	None	.	.	Adult male seen on 2/16 only.
Crook Point	MC47	Historic	Occupied	Successful	3	3	Banded 3 chicks on 5/23.
Carbon Point	MC56	Historic	Occupied	Successful	2	2	Banded 2 chicks on 5/24.
Salvador Point	MC57	Historic	Occupied	Successful	3-4	3	Banded 2 of 3 chicks on 5/25.
Science Point	MC58	Historic	Occupied?	Unknown	.	.	Pair present but only seen on 3/26
Castle Rock	MC68	Historic	Occupied	Successful	2-4	2+	Chicks first seen on 5/24.
Harris Point	MC69	Historic	Occupied	None	.	.	Courtship, but no known nesting,
Prince Island	MC70	Historic	Occupied	Unknown	1+	Unknown	Thought to be chick(s), but never seen.
Santa Rosa							
Carrington Point	MC16	Historic	Occupied	Successful	3-4	3	Banded 3 chicks on 5/2.
Lime Point	MC27	Historic	Occupied	Unknown	.	.	Courtship, but no known nesting.
Lobos Canyon	MC27a	Historic	Unoccupied	None	.	.	Likely same pair as MC27 Lime Point.
Water Canyon	MC31	Historic	Unoccupied	None	.	.	No birds observed in 7 visits.
Bee Rock Canyon	MC34	Historic	Occupied	Unsuccessful	2	0	Failed prior to banding.
Orr's Camp	MC35	Historic	Occupied	Successful	2	2	Banded 2 chicks on 5/3.
Lost Hat	MC36	Historic	Unoccupied	None	.	.	No birds seen in 2013 or 2014.
Trancion	MC50	Historic	Occupied	Successful	3	3	Chicks were not banded.
Krumholtz	MC51	Historic	Occupied	Successful	1	1	Chick was not banded.
Soledad	MC55	Historic	Occupied	Successful	3	3	Chicks were not banded.
Gnoma	MC76	Historic	Occupied	Successful	1	1	Chick was not banded.
Bonn Point	MC65	Historic	Occupied	Successful	3	3	Chicks were not banded.
Chickasaw Canyon	MC66	Historic	Occupied	None	.	.	Courtship, but no known nesting.
Sandy Point	MC67	Historic	Occupied	Successful	2	1	Lost 1 chick between 5/24 and 6/1.

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	MC18	Historic	Occupied	Successful	3	3	Banded 2 of 3 chicks on 5/7.
Laguna	MC19	Historic	Occupied	Successful	1-4	1	Banded 1 chick on 6/1.
West End	MC20	Historic	Occupied	Unsuccessful	.	.	Failed during incubation.
Sea Lion	MC30	Historic	Occupied	Successful	2	1	Lost one chick before banding on 5/31.
Black Point	MC38	Historic	Occupied	Successful	3	2	One chick lost after 5/31 banding.
Arch Rock	MC45	Historic	Occupied	Unsuccessful	.	.	Failed during incubation/early brooding.
Valley Anchorage	MC46	Historic	Occupied	Successful	3-4	3	Banded 3 chicks on 5/29.
Bowen Point	MC53	Historic	Occupied	Unsuccessful	.	.	Failed during incubation/early brooding.
Cavern Point	MC59	Historic	Occupied	Unsuccessful	.	.	Failed during incubation/early brooding.
Pelican Bay	MC60	Historic	Occupied	Unsuccessful	.	.	Courtship, but no known nesting.
Punta Diablo	MC61	Historic	Occupied	Successful	2-4	2	Banded 2 chicks on 5/30.
Punta Gorda	MC62	Historic	Occupied	Successful	2	2	Banded 1 of 2 chicks on 5/5.
San Pedro West	MC63	Historic	Occupied	Successful	1	1	Three eggs laid. Did not band chick.
West Point South	MC64	Historic	Occupied	Successful	1-4	1	Banded 1 chick on 5/31.
East Smuggler's	MC77	New	Occupied	Unsuccessful	.	.	Failed during incubation.
Anacapa							
West Anacapa Alt.	MC21	Historic	Occupied	Successful	3-4	3	Eyrie was not visible or accessible.
Middle Anacapa	MC43	Historic	Occupied	Successful	1-4	1	Status not determined until after fledge.
Cathedral Cove	MC54	Historic	Occupied	Successful	2	2	Banded 2 chicks on 5/17.
Camel Point	MC80	New	Occupied	Unknown	.	.	Eyrie was not visible or accessible.
San Nicolas							
Harrington	MC73	Historic	Occupied	Successful	2	2	Did not band chicks.
Cattail Canyon	MC74	Historic	Occupied	Successful	3	3	Banded 3 chicks on 6/3.
Santa Barbara							
Signal Peak	MC33	Historic	Occupied	Successful	3-4	3	Did not band chicks.
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	1-4	1+	Status determined after fledging.
Santa Catalina							
Long Point	MC42	Historic	Unoccupied	.	.	.	No peregrines observed.
Bullethead	MC49	Historic	Unoccupied	.	.	.	No peregrines observed.
Silver Peak	MC75	Historic	Occupied	Unsuccessful	2	0	1 chick banded on 7/4; dead by 7/6.
Lone Tree	MC78	New	Occupied	Unknown	.	.	Territorial adults present entire season.
San Clemente							
Cave Canyon	MC52	Historic	Occupied	Successful	3-4	3	Status determined after fledging.
Seal Cove	MC79	New	Occupied	Unsuccessful	.	.	Pair present, but no known nesting.

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

Table 2. Summary of peregrine falcon banding on the California Channel Islands, CA, 2014.

Island/Territory Name	Sex	Age (days)	USGS Band #	Color Band	Wt. (g)	Notes
San Miguel						
MC17 Hoffman Point	Female	20	1947-21648	51/AC	760	
MC28 Bat Rock	Female	25-27	1947-21643	61/AC	1030	
MC28 Bat Rock	Female	25-27	1947-21644	72/AC	785	
MC28 Bat Rock	Female	25-27	1947-21645	74/AC	975	
MC47 Crook Point	Female	25-27	1947-21635	81/AC	930	
MC47 Crook Point	Male	25-27	1156-16826	34/AC	665	Found dead 10/22
MC47 Crook Point	Male	25-27	1156-16827	19/AC	680	
MC56 Carbon Point	Female	29-31	1947-21636	91/AC	965	
MC56 Carbon Point	Female	29-32	1947-21637	83/AC	950	
MC57 Salvador Point	Female	36	1947-21646	82/AC	920	
MC57 Salvador Point	Female	32	1947-21647	90/AC	1005	
Santa Rosa						
MC16 Carrington Point	Female	28	1947-21630	96/AC	995	
MC16 Carrington Point	Male	28	1156-16821	38/AC	655	
MC16 Carrington Point	Male	28	1156-16822	23/AC	680	
MC35 Orr's Camp	Female	17	1947-21631	98/AC	620	
MC35 Orr's Camp	Male	17	1156-16823	33/AC	495	
Santa Cruz						
MC18 Gherini Knife Edge	Female	21	1947-21633	78/AC	675	
MC18 Gherini Knife Edge	Male	19-21	1156-16824	30/AC	.	
MC19 Laguna	Male	~28	1156-16831	16/AC	670	
MC30 Sea Lion	Female	21-23	1947-21653	50/AE	815	
MC38 Black Point	Female	25-27	1947-21655	65/AE	775	
MC38 Black Point	Male	21-23	1156-16829	01/AC	600	
MC38 Black Point	Male	21-23	1156-16830	37/AC	625	
MC46 Valley Anchorage	Female	29-31	1947-21649	58/AC	675	
MC46 Valley Anchorage	Female	27-28	1947-21650	90/AC	560	
MC46 Valley Anchorage	Male	29-31	1156-16828	14/AC	485	
MC61 Punta Diablo	Female	21-23	1947-21651	52/AE	720	
MC61 Punta Diablo	Female	21-23	1947-21652	77/AE	730	
MC62 Punta Gorda	Female	15-17	1947-21632	53/AC	440	On mainland 8/17
MC64 West Point South	Female	40	1947-21654	64/AE	1115	
Anacapa						
MC54 Cathedral Cove	Female	25-27	1947-21634	63/AC	720	
MC54 Cathedral Cove	Male	25-27	1156-16825	28/AC	735	

Table 2. Continued.

Island/Territory Name	Sex	Age (days)	USGS Band #	Color Band	Wt. (g)	Notes
San Nicolas						
MC74 Cattail Canyon	Female	25-27	1947-21656	92/AE	915	
MC74 Cattail Canyon	Male	25-27	1156-16837	03/AC	670	
MC74 Cattail Canyon	Male	28	1156-16838	13/AC	705	
Santa Catalina						
MC75 Silver Peak	Male	~25	1156-16839	10/AC	375	Found dead 7/6

MC68 Castle Rock: We confirmed a pair in the historic Castle Rock territory (Fig. 4) during our second visit on 2 March. The pair was incubating by 27 March and nestlings were present by 25 April. At least 2 chicks were seen on 24 April and 2 fledglings were seen on 14 June. The eyrie is on an inaccessible off-shore rock, so the chicks were not banded.

MC69 Harris Point: We confirmed a pair in the historic Harris Point territory (Fig. 4) on 17 February. We visited the territory 4 more times through 12 April, including 4-hour observations on 3 March, 9 April, and 12 April and did not see any signs of nesting.

MC70 Prince Island: We confirmed a pair in the historic Prince Island territory (Fig. 4) on 13 February. The pair was incubating by 27 February and chicks were likely present by 10 April, based upon adult behavior and posture while at the eyrie. We may have caught a brief glimpse of the chick(s) on 24 April, but were unable to determine the outcome of the nesting attempt because of the viewing distance to Prince Island from San Miguel and our inability to see in to the eyrie.

Santa Rosa Island

Surveys began on Santa Rosa on 12 February and continued weekly through 28 June. We surveyed 13 previously known territories on Santa Rosa and found 11 occupied and did not locate any new territories (Fig. 5).

MC16 Carrington Point: We confirmed a pair engaged in courtship activities on our second visit to the historic Carrington Point territory (Fig. 5) on 20 February. The pair used the same eyrie as

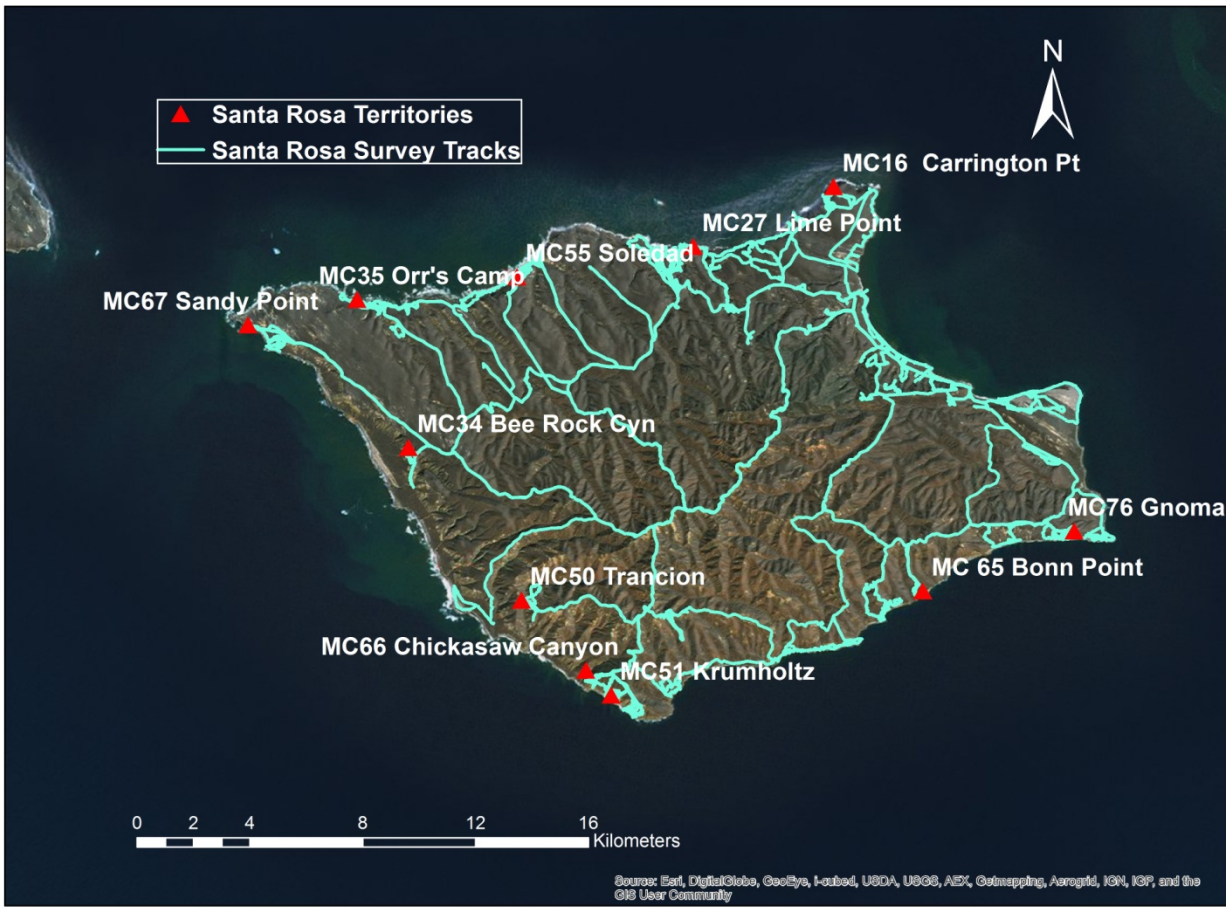

Figure 5. Peregrine falcon survey routes and territories on Santa Rosa Island, CA, 2014.

in 2013 and was suspected to be incubating by 9 March, based upon adult behavior. Adult behavior indicated that there were chicks present on 7 April and we entered the eyrie and banded 3 chicks that were approximately 28 days old (1 F:2 M) on 2 May (Table 2, Appendix V). We confirmed that all 3 chicks had fledged on 12 June.

MC27 Lime Point/MC27a Lobos Canyon: We did not confirm a pair in the historic Lobos Canyon territory (Fig. 5), although single individuals were seen on 13 February and 2 March. However, we did locate a pair in the nearby alternate Lime Point territory (Fig. 5) on 29 March. The pair exhibited courtship behavior, but were not known to have nested. For future reports we will refer to this territory as MC27 Lime Point.

MC31 Water Canyon: We made 7 visits to the historic Water Canyon territory between 18 February and 28 May, ranging from 10 minutes to 3 hours. We did not observe any peregrines in this territory in 2014.

MC34 Bee Rock Canyon: We confirmed a pair in the historic Bee Rock Canyon territory (Fig. 5) during our second survey on 19 February. Courtship activities were confirmed on 27 February and the birds were incubating on 6 April. Two young chicks (~2-4 days old) were observed on 8 May, but the nest had failed by our next visit on 24 May.

MC35 Orr's Camp: We confirmed a pair in the historic Orr's Camp territory (Fig. 5) on our first survey on 16 February. The pair began incubating in the 2013 eyrie by 15 March and two chicks and an unhatched egg were observed on 16 April. We entered the eyrie and banded 2 chicks (1 F: 1 M) on 3 May (Table 2, Appendix V). We confirmed that both chicks had fledged on our last visit on 12 June.

MC36 Lost Hat: We surveyed the historic Lost Hat territory on 3 occasions between 17 February and 28 May. As in 2013, there were no peregrines detected.

MC50 Trancion: We confirmed a pair in the historic Trancion territory (Fig. 5) on 19 February. Courtship was confirmed on 6 March and the birds were incubating in the 2013 eyrie on 5 April. We observed at least one chick on 23 May and confirmed that there were 3 chicks approximately 20-23 days old on 27 May. We did not band the chicks because of scheduling conflicts, but we did confirm that all 3 chicks had fledged by 25 June.

MC51 Krumholtz: We confirmed a pair in the historic Krumholtz territory (Fig.5) during our second visit on 21 February. The pair was incubating in the 2013 eyrie (a large stick nest) by 10 March. At least one chick was thought to be present by 24 April, based upon adult behavior. We confirmed the presence of a single chick approximately 8-12 days old on 2 May. Although we did not band the chick, we did confirm that it fledged on 10 June.

MC55 Soledad: We confirmed a pair exhibiting courtship activity in the historic Soledad territory (Fig. 5) on 24 February. They are believed to have started incubating by 27 March, based upon adult behavior, and at least one chick was thought to be present by 4 May. We confirmed that 3 chicks were present on 29 May (~30 days old) and they were confirmed fledged on 14 June. As with most of the nests on Santa Rosa, we were unable to band the chicks because of scheduling conflicts.

MC65 Bonn Point: We located a pair exhibiting courtship behavior in the historic Bonn Point territory (Fig. 5) on 21 February. The pair was incubating at least 2 eggs on 4 April and there were at least 2 chicks present on 28 April. We confirmed the presence of 3 chicks on 23 May, at which time they were estimated to be 25-26 days old. We did not band the chicks and they were all confirmed fledged on 11 June.

MC66 Chickasaw Canyon: We confirmed a pair in the historic Chickasaw Canyon territory (Fig. 5) on 6 March, but did not observe courtship behavior until 30 April. Although at least 1 bird was seen each visit through 1 June, we were not able to determine their nesting status.

MC67 Sandy Point: We did not confirm a pair in the historic Sandy Point territory (Fig. 5) until our fourth visit on 8 March, at which time they were exhibiting courtship behavior. They were incubating by 6 April and had at least 1 chick by 4 May. We confirmed 2 chicks on 24 May, but 1 chick had disappeared by 1 June. The remaining chick was confirmed fledged on 14 June.

MC76 Gnoma: We confirmed a pair in the historic Gnoma territory (Fig. 5) on 17 February. The pair was incubating by 14 April and 1 chick was present by 9 May. We did not band the chick, but it was confirmed fledged on 17 June.

Santa Cruz Island

Surveys began on Santa Cruz on 12 February and continued every other week through 5 July. We surveyed 14 historic territories, all of which were occupied, and located 1 previously unknown territory (Fig. 6).

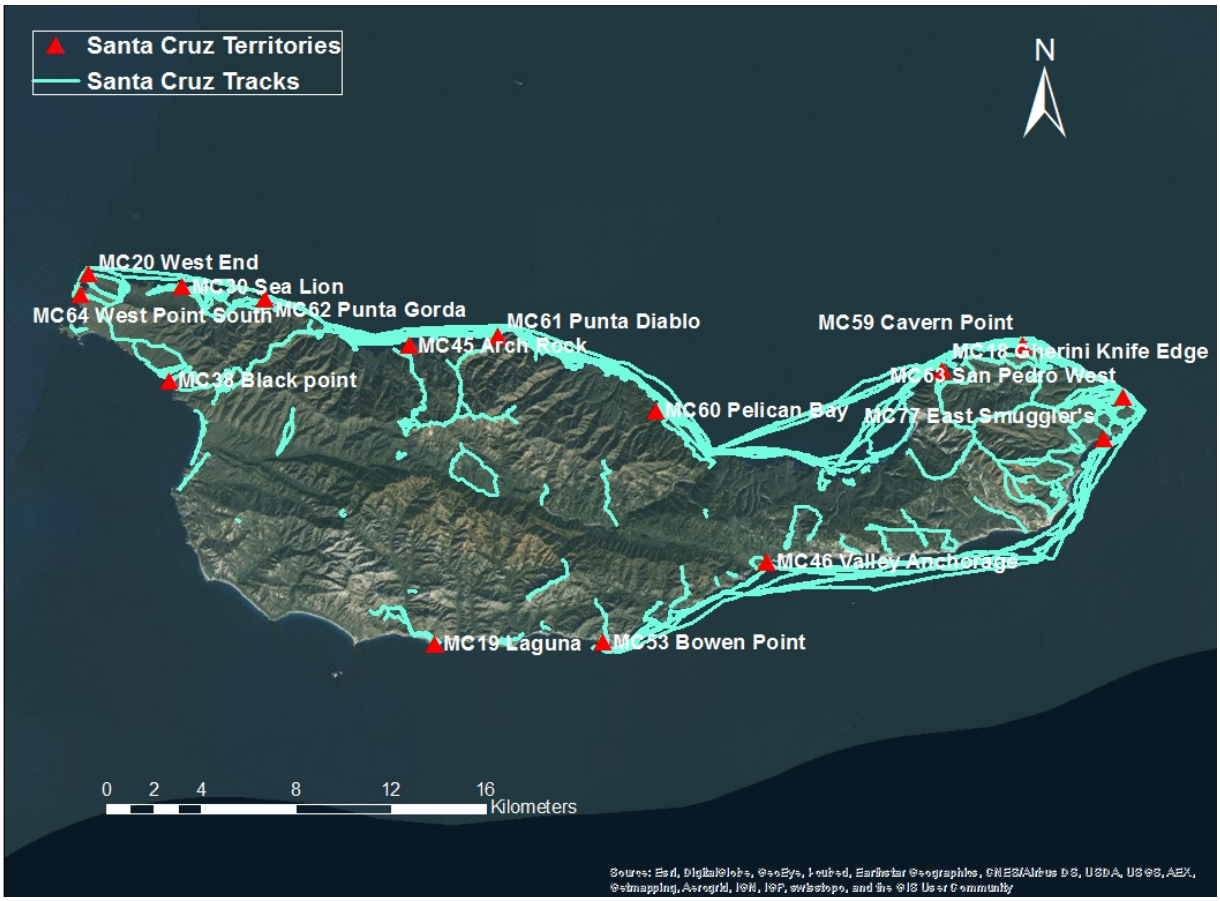

Figure 6. Peregrine falcon survey routes and territories on Santa Cruz Island, CA, 2014.

MC18 Gherini Knife Edge: We confirmed a pair exhibiting courtship behavior in the historic Gherini Knife Edge territory (Fig. 6) on 15 February. The pair was incubating by 14 March and at least 2 chicks approximately 5-7 days old were present on 23 April. We entered the eyrie on 8 May and banded 2 chicks (1 F:1 M) about 19-21 days old (Table 2, Appendix V). A third chick that was deemed too young to band was also present. All 3 chicks were still present on 23 May, which would have been close to fledging. It was too foggy to see the nest cliff on our last visit on 5 July, but at least 1 fledgling was heard vocalizing.

MC19 Laguna: We observed a pair in courtship activities in the historic Laguna territory (Fig. 6) on 17 February. Incubation began by 29 March and a chick(s) were thought to be present on 10 May and a single 16-19 day old chick was observed on 26 May. We entered the eyrie on 1 June and banded a single male chick (Table 2, Appendix V) approximately 28 days old. Our last visit was on 6 June, at which time the chick was still present.

MC20 West End: We confirmed a pair in the historic West End territory (Fig. 6) on 26 February. The pair exhibited courtship behavior on 12 March through 23 April. We were never able to locate an eyrie or confirm a nesting attempt and no peregrines were detected during visits on 24 May and 5 June.

MC30 Sea Lion: We confirmed a pair in the historic Sea Lion territory (Fig. 6) on 12 February. They showed signs of courtship activity on 12 March and at least 2 eggs were present on 11 April. At least 2 nestlings were present on 9 May, but only 1 remained on 21 May. We entered the eyrie on 31 May and banded a single female chick approximately 21-23 days old (Table 2, Appendix V). She was still present on our last visit on 19 June, at which time she was near fledging.

MC38 Black Point: We confirmed a pair exhibiting courtship behavior in the historic Black Point territory (Fig. 6) during our second visit on 26 February. The birds began incubating by 11 April and 3 chicks were present on 9 May. We entered the eyrie and banded 3 chicks (1 F:2 M) that were approximately 21-27 days old (Table 2, Appendix V) on 31 May. We could only confirm the presence of 2 chicks on 18 and 30 June, by which time at least 1 had fledged.

MC45 Arch Rock: We confirmed a pair in courtship in the historic Arch Rock territory (Fig. 6) on 13 March. The pair was found incubating on 9 April and was thought to have a chick(s) on 11 May. No birds were observed in or around the eyrie on 9 June, so we believe the nest failed.

MC46 Valley Anchorage: We observed a pair in courtship activity in the historic Valley Anchorage territory (Fig. 6) on 25 February. Based upon adult behavior, we determined that the birds were incubating on 26 March and at least one chick was present on 4 May. We entered the eyrie and banded 3 chicks (2 F:1 M) approximately 27-31 days old on 29 May (Table 2, Appendix V). We confirmed that at least 2 of the chicks had fledged on our last visit on 18 June.

MC52 Cavern Point: We confirmed a pair in the historic Cavern Point territory (Fig. 6) on 27 February. Courtship behavior was observed on 27 March, and the pair may have been incubating

by 8 May, based upon behavior, but we were never able to confirm an eyrie location or the outcome of any breeding attempts.

MC53 Bowen Point: We confirmed a pair in the historic Bowen Point territory (Fig. 6) on 13 March, at which time they were exhibiting courtship behavior. They were suspected to be incubating by 26 April and to have chicks by 23 May, but had failed by 6 June.

MC60 Pelican Bay: We confirmed a pair exhibiting courtship behavior in the historic Pelican Bay territory (Fig. 6) on 26 March. The pair was observed through 25 April, but were not seen during visits on 12 and 22 May.

MC61 Punta Diablo: We confirmed a pair in the historic Punta Diablo territory (Fig. 6) on 13 March. The pair was incubating on 14 April and brooding chicks on 11 May. We entered the eyrie on 30 May and banded 2 female chicks approximately 21-23 days old (Table 2, Appendix V). Both chicks were still present on our last visit on 7 June, at which time they were both at least 28 days old.

MC62 Punta Gorda: We confirmed a pair in the historic Punta Gorda territory (Fig. 6) on 13 March, at which time they were incubating. We estimated that hatching would occur by 15 April and nestlings were thought to be present on 28 April. We entered the eyrie on 5 May and banded a female chick approximately 15-17 days old (Table 2, Appendix V). A second chick was too young to band. At least 1 fledgling was heard on our last visit on 9 June.

MC63 San Pedro West: We confirmed a pair in the historic San Pedro West territory (Fig. 6) on 27 February and confirmed incubation on 10 April. A single chick and 2 eggs were present on 12 May, and the remaining eggs failed to hatch. We did not band the chick and it was confirmed to have fledged by 22 June.

MC64 West Point South: We confirmed a pair in the historic West Point South territory (Fig. 6) on 12 March. Although the eyrie was not visible, the birds appeared to be incubating by 28 March and at least 1 chick was likely present by 9 May. We entered the eyrie on 31 May and

banded a single female that was approximately 40 days old (Table 2, Appendix V). Although this chick was older than we would normally band, the eyrie was a deep pothole and the bird could be removed without threat of jumping. Because of the age, it is possible that 1 or more other chicks had already fledged.

MC77 East Smuggler's: We located a new pair in what we named the East Smuggler's territory (Fig. 6) on 14 April. The pair exhibited courtship behavior until 12 May, at which time they were likely incubating. The nest had failed by 23 May.

Anacapa Island

We surveyed Anacapa from a charter boat (the *Retriever*), our Zodiac inflatable boat, and via Island Packers trips to East Anacapa (to check Cathedral Cove from land) between 24 March and 3 July. Poor weather conditions and limited charter availability minimized the number of visits we were able to make. We located pairs in each of the three historic territories and located one new occupied territory (Fig. 7).

MC21 West Anacapa: We did not confirm a pair in the historic West Anacapa territory (Fig. 7) until our second visit on 16 May, at which time the pair had nestlings. We were unable to access the island for banding because of the presence of breeding seabirds, but confirmed three fledglings on 3 July.

MC43 Middle Anacapa: Although we saw an individual adult during our visits to the historic Middle Anacapa territory (Fig. 7) on 24 March and 16 May, we did not confirm a pair until 25 May. We were unable to determine the breeding status until our last visit on 3 July, at which time we saw one fledgling.

MC54 Cathedral Cove: We located an adult incubating at least two eggs in the 2013 eyrie in the historic Cathedral Cove territory (Fig. 7) on 24 March. Two nestlings were present on our next visit on 3 May. We accessed the eyrie and banded two 25-27 day old chicks (1 F:1 M) on 17 May (Table 2, Appendix V). We confirmed that both chicks had fledged on 3 July.

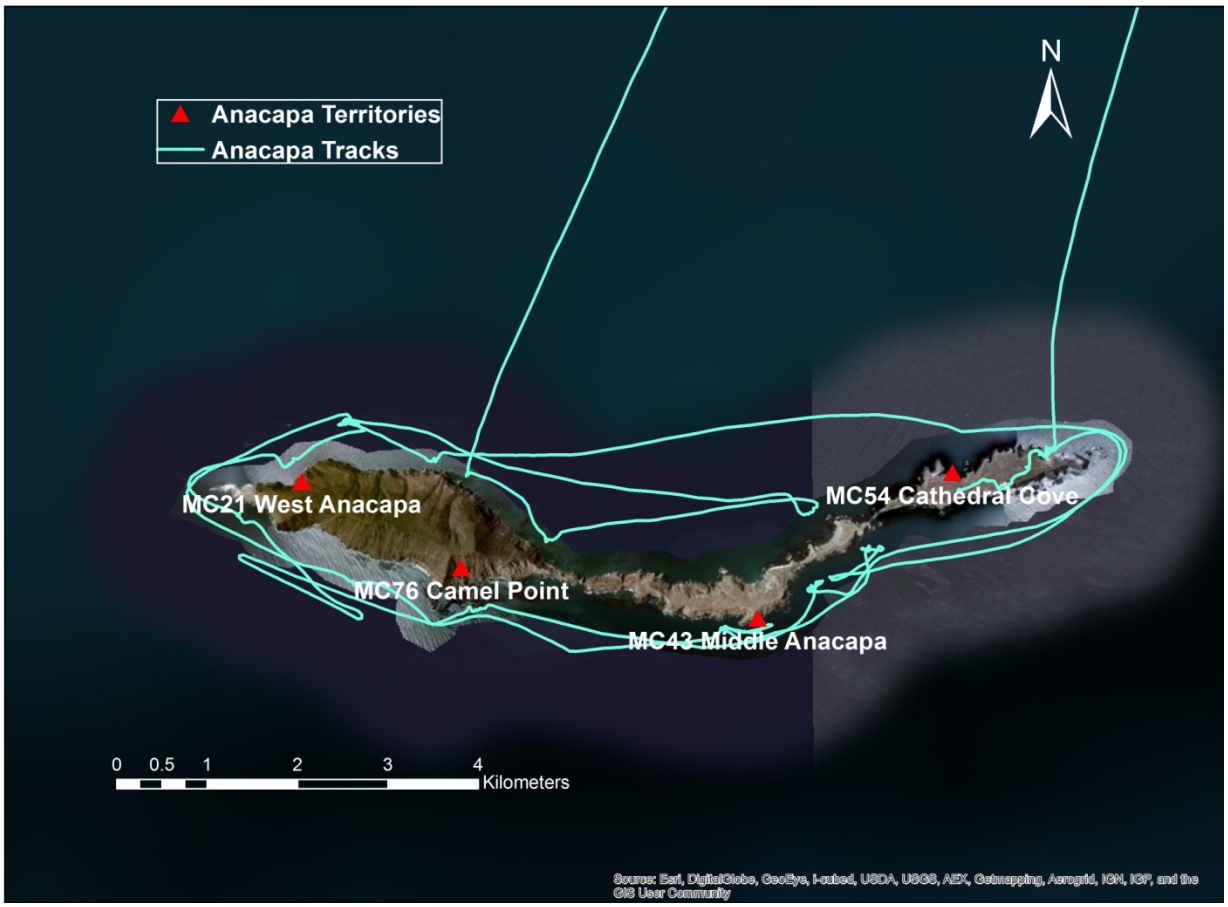

Figure 7. Peregrine falcon survey routes and territories on Anacapa Island, CA, 2014.

MC80 Camel Point: On 24 March we located a previously unknown pair exhibiting courtship behavior on the southeastern side of West Anacapa in a territory we named Camel Point (Fig. 7). Based upon adult behavior, we suspected that they had one or more nestlings as of 25 May, but were never able to confirm the outcome of any nesting attempts.

San Nicolas Island

We surveyed San Nicolas on 27-30 March and 12-13 May. We located pairs in the two historic territories on the south side of the island and did not locate any new territories (Fig. 8).

MC73 Harrington: We confirmed the pair was incubating in the historic Harrington territory (Fig. 8) on 28 March at a new eyrie location. There were two chicks approximately 15-17 days old present on 12 May. We did not band the chicks, but confirmed that both chicks were present and approximately 40 days old on our last visit on 3 June.

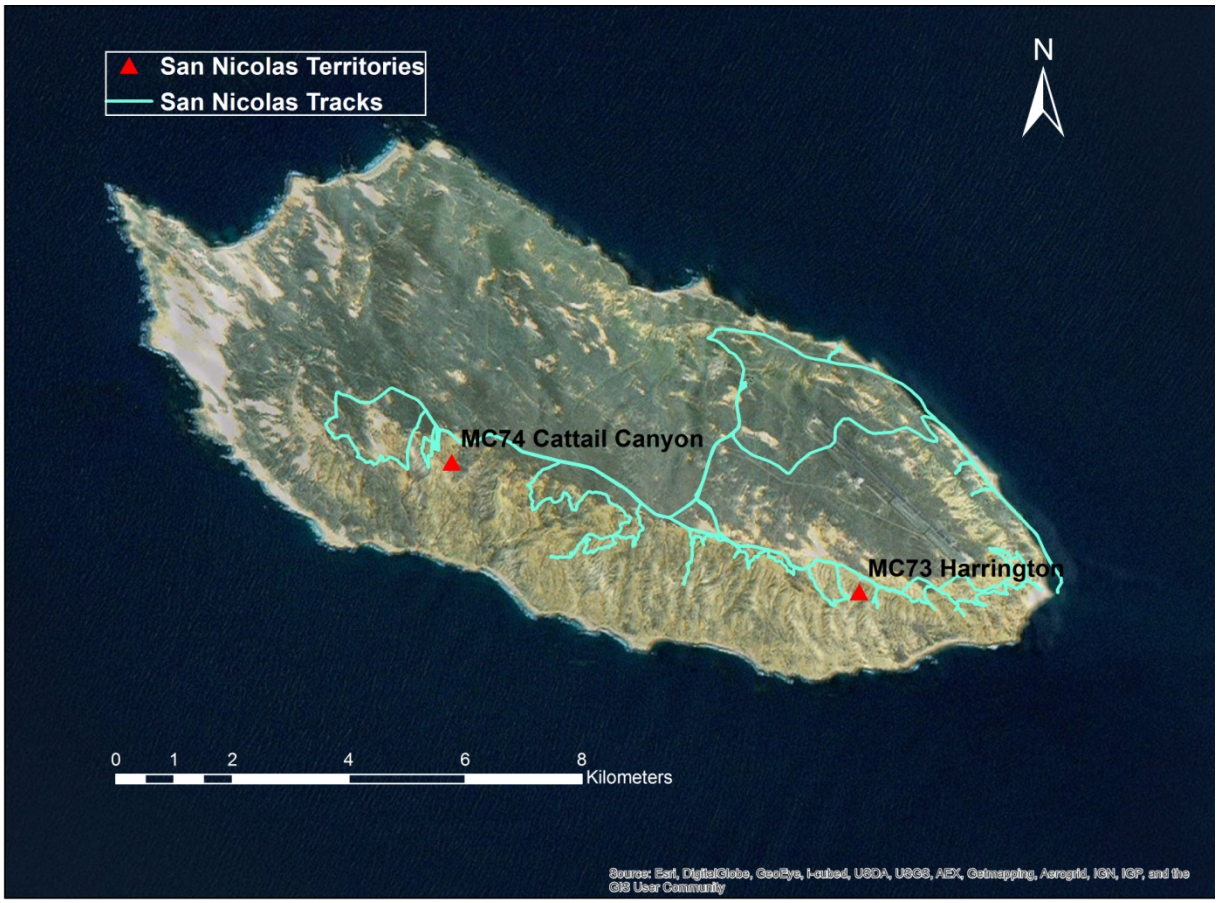

Figure 8. Peregrine falcon survey routes and territories on San Nicolas Island, CA, 2014.

MC74 Cattail Canyon: We confirmed a pair exhibiting courtship behavior in the historic Cattail Canyon territory (Fig. 8) on 28 March. There were 3 chicks (3-5 days old) on 12 May. We entered the eyrie on 3 June and banded 3 chicks (2 F: 1 M) that were 25-28 days old (Table 2, Appendix V) and considered the chicks old enough to be successful.

Santa Barbara Island

We surveyed Santa Barbara, including observations of Sutil Island from the southern portion of Santa Barbara, on 26 February – 4 March, 3-8 April and 14-20 May. We located pairs in all three 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 27 February. The pair appeared to be incubating on 7 April, although we could not see the eyrie. We were able to determine the presence of at least one nestling on 15

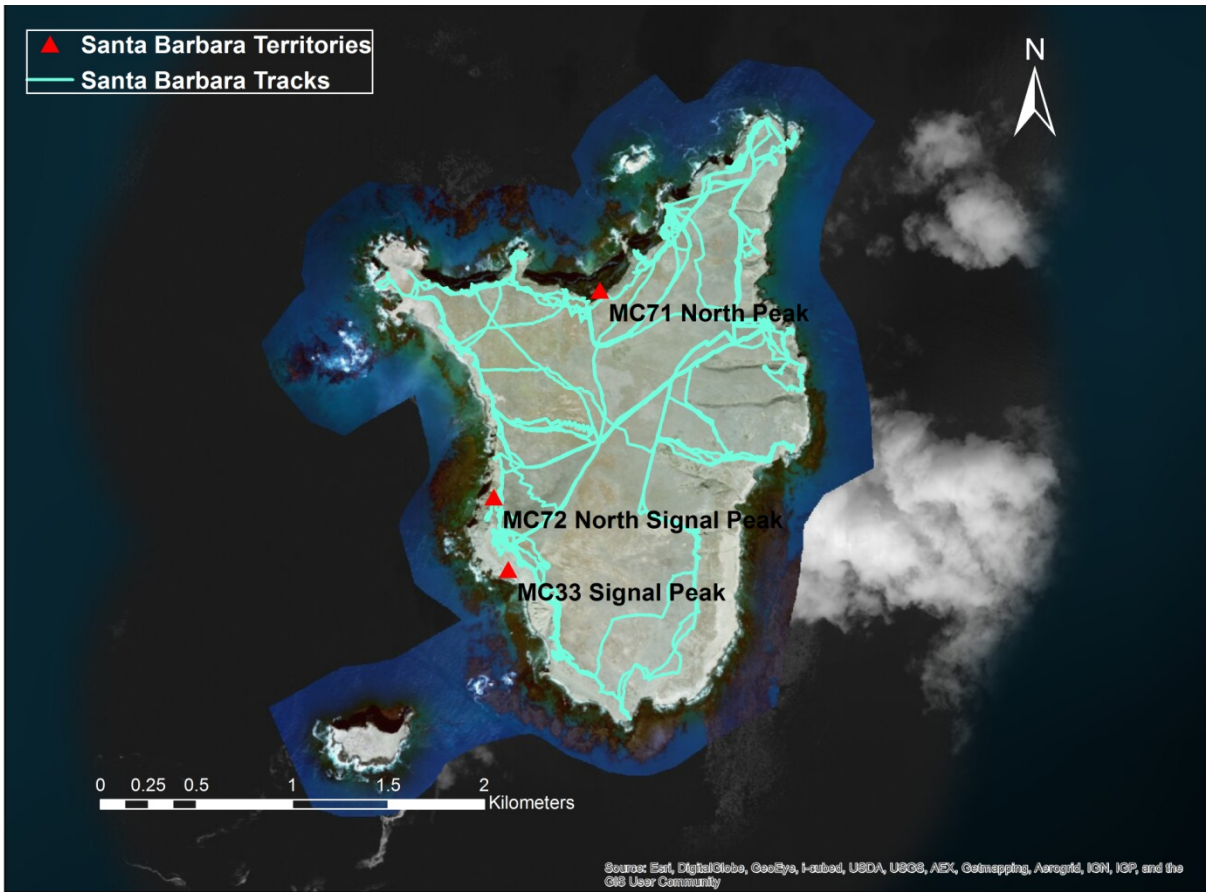

Figure 9. Peregrine falcon survey routes and territories on Santa Barbara Island, CA, 2014.

May. We saw three chicks in the eyrie on 17 May. The chicks were 35-40 days old and there was at least one male and one female (other chick was not visible enough to determine the sex).

MC71 North Peak: We observed a pair exhibiting courtship behavior at the historic North Peak territory (Fig. 9) on 1 March. We surveyed the area 5 more times through 19 May, but there was no indication that the birds ever nested.

MC72 North Signal Peak: We saw single adults in the historic North Signal Peak territory (Fig. 9) on 3 and 4 March, but did not confirm the presence of a pair until 5 April. We observed a single female fledgling approximately 50 days old on 15 May. Therefore, this pair was incubating by our first visit on 27 March.

Santa Catalina Island

We surveyed the three previously identified territories on the island, only one of which was occupied, and located one new territory (Fig. 10).

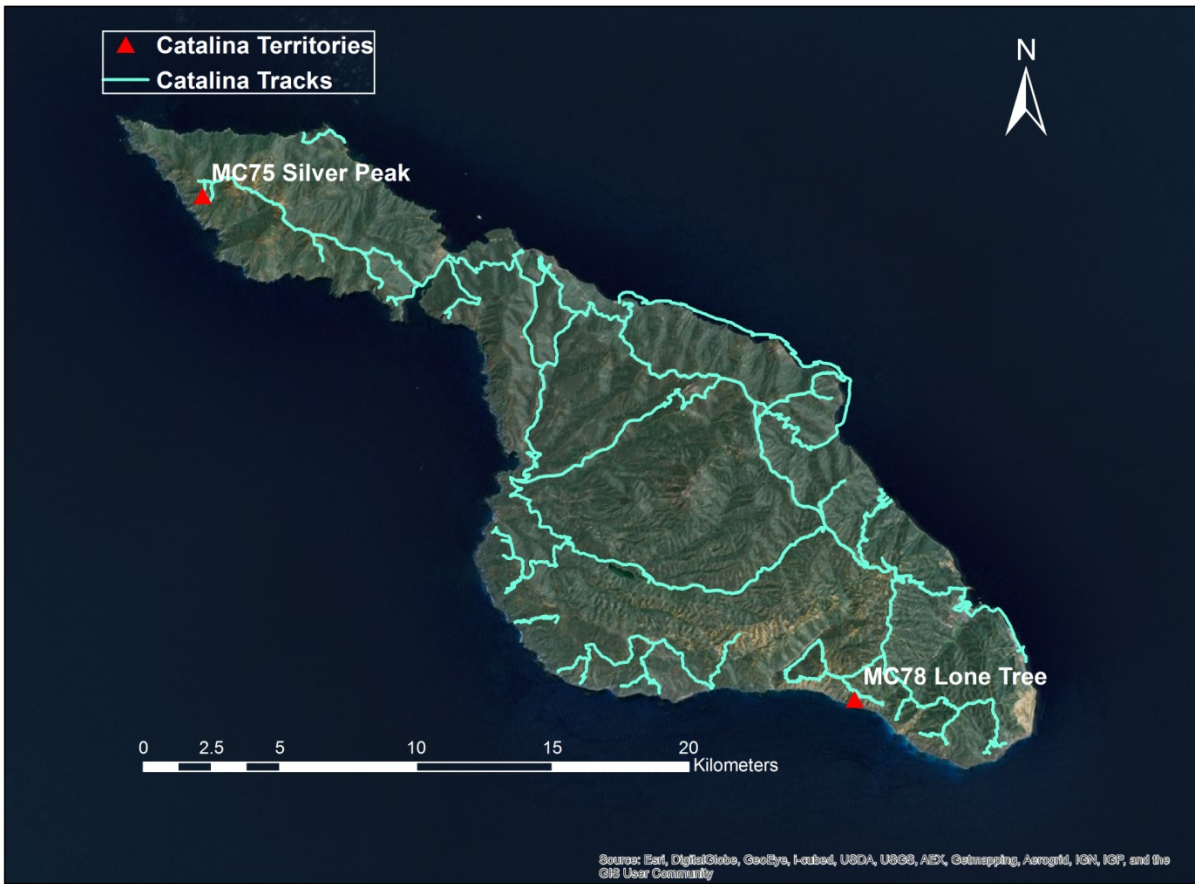

Figure 10. Peregrine falcon survey routes and territories on Santa Catalina Island, CA, 2014.

MC42 Long Point: The Long Point territory was classified as a wintering territory in 2007 (Latta 2012) and was unoccupied in 2013 (Sharpe 2014a). We only surveyed the territory on 11 March and did not observe any peregrines, but an osprey was present throughout the 4-hr survey and at least one bald eagle was flying in and near the territory.

MC49 Bullethead: We conducted 4-hr surveys in the historic Bullethead territory on 3 February and 18 March. This territory was also classified as a wintering territory in 2007 (Latta 2012) and as unoccupied in 2013 (Sharpe 2014a). No peregrines were observed in the territory.

MC75 Silver Peak: We located a pair exhibiting courtship behavior in the historic Silver Peak territory (Fig. 10) on 5 March. They were incubating on 8 May and two chicks were seen on 12 June. One of the chicks had disappeared by 1 July and we entered the eyrie on 4 July to band the remaining chick, a male that was approximately 25 days old (Table 2, Appendix V). Unfortunately, the chick was found dead at the bottom of the cliff on 6 July.

MC78 Lone Tree: We confirmed a pair in a new territory that we named Lone Tree (Fig. 10) on 29 April, but usually only saw one individual on most visits. The potential nest cliff was in an area that was not visible from land, and unlikely visible from the water. We were never able to determine the nesting status of the birds.

San Clemente Island

We surveyed the one historic territory, which was occupied, and located one additional occupied territory (Fig. 11).

MC52 Cave Canyon: An adult female was seen on 18 April in the historic Cave Canyon territory (Fig. 11), but no nest was ever found. On 15 June, an adult male was seen feeding 3 fledglings near the mouth of Cave Canyon. The birds likely used a new nest location that was not visible from areas that were accessible by foot.

MC79 Seal Cove: An unidentified peregrine was first observed in the new Seal Cove territory (Fig. 11) on 9 March. An adult male and a second-year female were observed on 17 April, 5 May, 16 June, and 26 June, but there was no indication that the birds nested this year.

RESIGHTINGS

We received reports of several resightings of peregrines that we banded in 2013 and 2014 on the mainland and islands in 2014. On 7 January, a male banded at the Signal Peak territory on Santa Barbara Island in 2013 (Band # 1156-16804) was found injured on San Clemente Island. It was sent to Project Wildlife in San Diego and later euthanized.

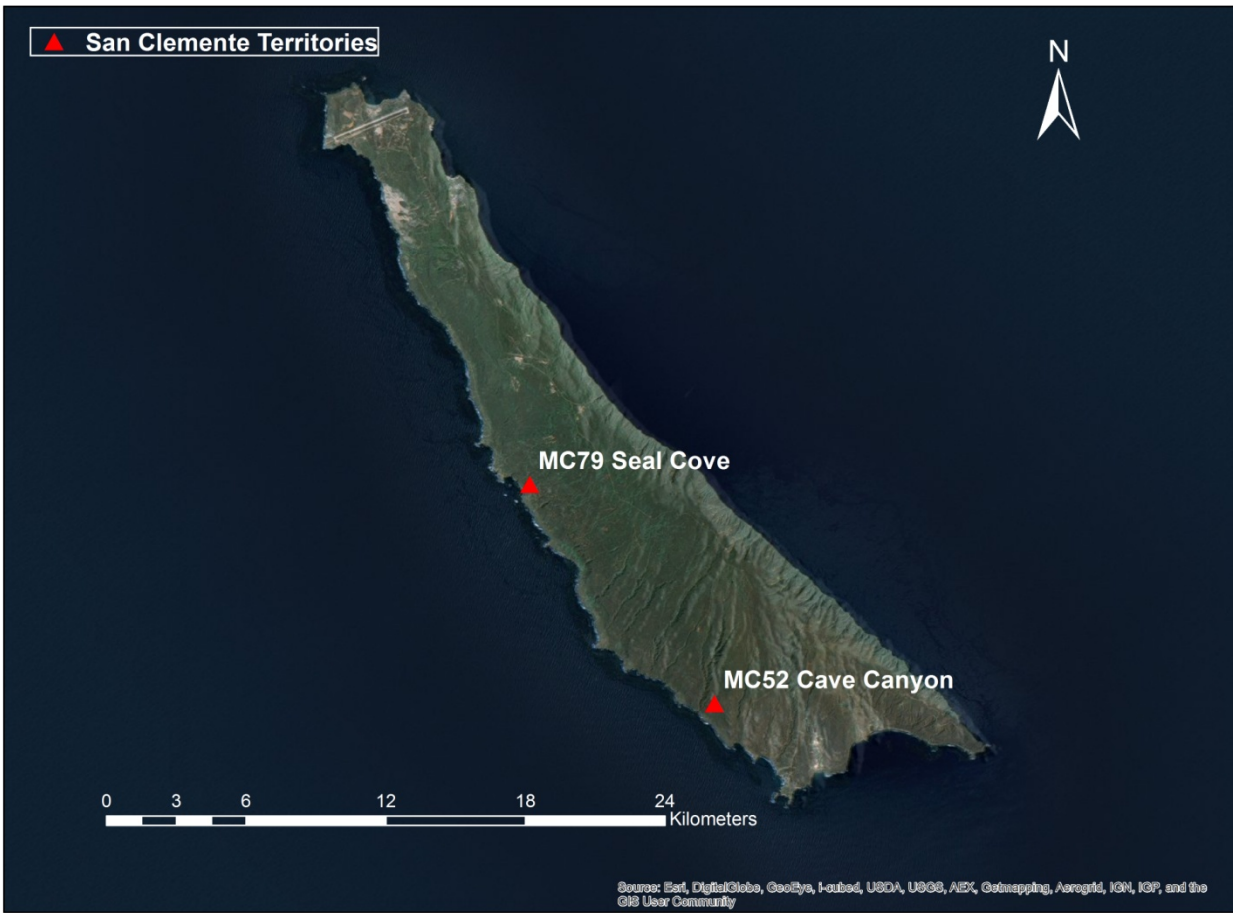

Figure 11. Peregrine falcon territories on San Clemente Island, CA, 2014.

On 5 June, a female banded at the Cathedral Cove territory on Anacapa in 2013 (Band # 1947-21612) was captured at Camp Pendleton, CA during efforts to minimize raptor predation on California Least Tern (*Sterna antillarum browni*) and the Western Snowy Plover (*Charadrius alexandrinus nivosus*) colonies. She was fit with a GPS transmitter and translocated to northern California. The bird returned to southern California between 10 and 13 September and the last data received was on 25 October (Fig. 12), at which time she was likely perched on a power pole about 3.5 km east of Camp Pendleton South. The location data were provided by Wendy Prestera at Tierra Data.

On 17 August, a female banded at the Punta Gorda territory on Santa Cruz in 2014 (Band # 1947-21632) was observed and photographed at the Sepulveda Dam Recreation Area in Los Angeles, CA (Fig. 13).

On 22 October, a male banded at the Crook Point territory on San Miguel in 2014 (Band #1156-16826) was found dead near the Bee Canyon peregrine territory on Santa Rosa, possibly a result of predation by a red-tailed hawk.

Finally, on 7 November, a male banded at the San Pedro West territory on Santa Cruz in 2013 was found dead near Pismo Beach in San Luis Obispo County, CA.

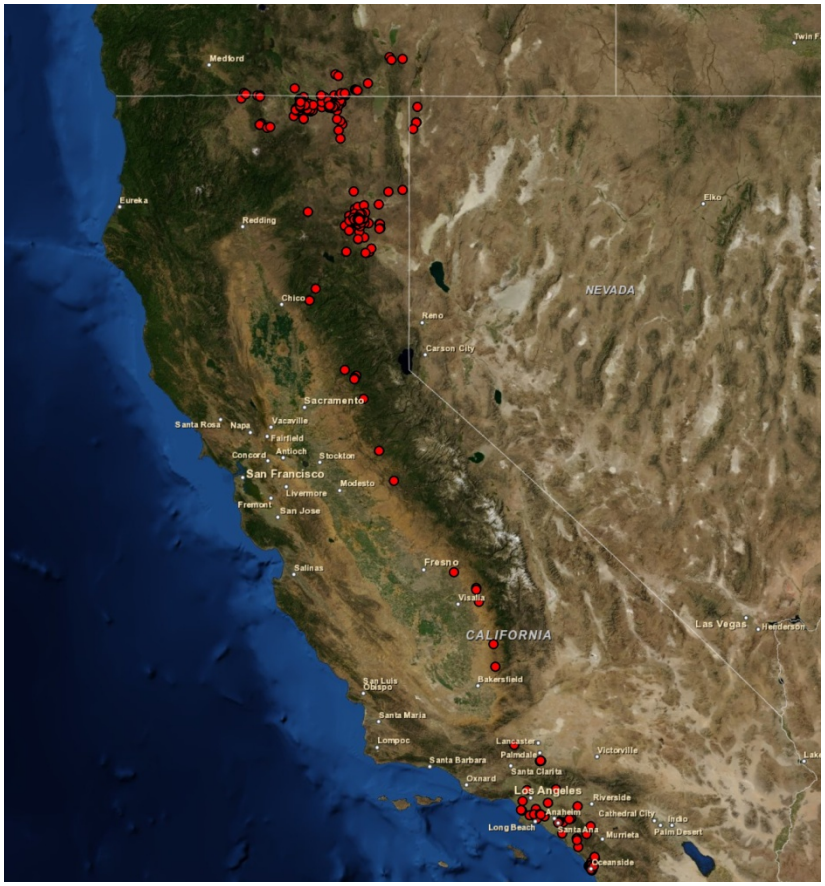

Figure 12. Movements of peregrine #1947-21612 between 6 June (release in N. CA) and 23 October 2014. The last data point was in southern California on 25 October.

PREY REMAINS

We collected prey remains from 15 territories on 5 islands. N. John Schmitt and Paul Collins identified a total of 184 individual prey items of 50 different species (Table 3). Thirteen prey items could be identified only to genus and 24 prey items were identified to the family level (Table 3). The most common species identified from prey remains were Cassin's Auklet (*n*=35), Pigeon Guillemot (*n*=18), and Black-headed Grosbeak (*n*=11).

Figure 13. Peregrine #1947-21632 at the Sepulveda Dam Recreation Area, Los Angeles Co., California.

Table 3. Prey remains (minimum. number of individuals) collected from peregrine falcon eyries on the California Channel Islands in 2014.

Family/ Scientific Name	Common Name	Island[a]					Total
		SMI	SRI	SCI	ANA	SBI	
Alcedinidae							
Megaceryle alcyon	Belted Kingfisher			1			1
Alcidae							
Cepphus columba	Pigeon Guillemot	17	1				18
Cerorhinca monocerata	Rhinoceros Auklet	1					1
Ptychoramphus aleuticus	Cassin's Auklet	29	1	4	1		35
Synthliboramphus scrippsi	Scripps's Murrelet			1		2	3
Auklet spp	Unidentified Auklet	7					7
Anatidae							
Anas platyrhynchos	Mallard			1			1
Branta bernicla	Brant				1		1
Duck sp.	Unidentified Duck					1	1
Apodidae							
Aeronautes saxatalis	White-throated Swift			1			1
Bombycillidae							
Bombacilla cedrorum	Cedar Waxwing	1					1
Cardinalidae							
Pheucticus melanocephalus	Black-headed Grosbeak	3	1	4	1	2	11
Piranga ludoviciana	Western Tanager	2	1	2		1	6
Charadriidae							
Pluvialis squatarola	Black-bellied Plover					1	1
Plover sp.	Unidentified Plover	1					1
Columbidae							
Columba livia	Rock Pigeon			1		1	2
Streptopelia decaocto	Eurasian Collared Dove	3	1	2	3	1	10
Zenaida macroura	Mourning Dove	2		1	2	1	6
Corvidae							
Aphelocoma insularis	Island Scrub Jay			1			1
Emberizidae							
Passerella iliaca	Fox Sparrow			1			1
Pipilo maculates	Spotted Towhee			1			1
Zonotrichia spp.	Unidentified Sparrow			4		1	5
Falconidae							
Falco sparverius	American Kestrel			1			1
Fringillidae							
Carpodacus mexicanus	House Finch	2	2	2			6
Haematopodidae							
Haematopus bachmani	Black Oystercatcher			5			5
Hirundinidae							
Hirundo rustica	Barn Swallow				1		1
Swallow spp.	Unidentified Swallow			1			1

Table 3. Continued

Family/ Scientific Name	Common Name	Island[a]					Total
		SMI	SRI	SCI	ANA	SBI	
Icteridae							
Icterus bullockii	Bullock's Oriole			1	1		2
Molothrus ater	Brown-headed Cowbird	2			2		4
Oriole spp.	Unidentified Oriole		1				1
Laridae							
Chroicocephalus philadelphia	Bonaparte's Gull			1		1	2
Larus californicus	California gull			4		2	6
Larus occidentalis	Western Gull	2		5		1	8
Larus delawarensis	Ring-billed Gull		1	1		1	3
Leucophaeus pipixcan	Franklin's Gull			1			1
Mimidae							
Mimus polyglottos	Northern Mockingbird	1					1
Parulidae							
Setophaga townsendi	Townsend's Warbler				1		1
Setophaga petechia	Yellow Warbler			1			1
Setophaga coronate	Yellow-rumped Warbler			1			1
Warbler spp.	Unidentified Warbler	1	1	4		2	8
Phalacrocoracidae							
Phalacrocorax pelagicus	Pelagic Cormorant	1					1
Picidae							
Melanerpes formicivorus	Acorn Woodpecker			1			1
Woodpecker sp.	Unident. Woodpecker		1				1
Podicipedidae							
Podiceps nigricollis	Eared Grebe	5	1	3			9
Podilymbus podiceps	Pied-billed Grebe	1		1			2
Grebe spp.	Unidentified Grebe		1				1
Scolopacidae							
Limnodromus sp.	Dowitcher sp.					1	1
Limosa fedoa	Marbled Godwit	1					1
Calidris spp.	Sandpiper spp.	2		1	1	1	5
Numenius phaeopus	Whimbrel	1				1	2
Phalaropus lobatus	Red-necked Phalarope	3	2	4			9
Phalaropus fulicarius	Red Phalarope	1		2			3
Phalarope spp.	Unidentified Phalarope	0			1		1
Strigidae							
Psiloscops flammeolus	Flammulated Owl			1			1
Troglodytidae							
Catherpes mexicanus	Canyon Wren			1			1
Turdidae							
Catharus guttatus	Hermit Thrush			2		1	3
Catharus ustulatus	Swainson's Thrush	1		1			2

Table 3. Continued

Family/ Scientific Name	Common Name	Island[a]					Total
		SMI	SRI	SCI	ANA	SBI	
Turdidae (Continued)							
Turdus migratorius	American Robin			1			1
Thrush spp.	Unidentified Thrush				2		2
Tyrannidae							
Myiarchus cinerascens	Ash-throated Flycatcher					1	1
Sayornis nigricans	Black Phoebe	1					1
Sayornis saya	Say's Phoebe			1			1
Empidonax spp.			2				2
Unidentified Passerine		3	2	3			8
MAMMALS							
Peromyscus maniculatus.	Deer Mouse					1	1

[a] San Miguel (SMI), Santa Rosa (SRI), Santa Cruz (SCI), Anacapa (ANA), Santa Barbara (SBI)

EGGSHELL MEASUREMENTS

We collected 3 addled eggs from 3 different territories and eggshell fragments from 8 territories on 5 islands in 2014 (Table 4, Appendix V). An addled egg from MC54 Cathedral Cove was kept intact for future reference (WFVZ 2014). The eggshell sample from MC74 Cattail Canyon was not measured because it was a single fragment (WFVZ 2014). The eggshell measurements using the "SS" method were thicker, and thus had less eggshell thinning, than the "RC" method in 8 of 9 samples (89%) where both methods were used (Table 4). Percent eggshell thinning, compared to peregrine eggs from pre-1947 in California, ranged from -0.55% to 31.04% using the SS method, and 9.07% to 40.38% using the "RC" method (Table 4). Overall, the eggshell thinning was higher on Santa Cruz than on any other island.

PRODUCTIVITY

At least 73 chicks are known to have hatched on the Channel Islands in 2014, of which 62 (85%) are known to have survived to $\geq$ 28 days of age. We calculated productivity based upon 36 pairs that were monitored from early in the breeding season (i.e., courtship, incubation) and for which we know the outcome of the breeding season. Thirty-four of 36 pairs (94%) laid eggs and 28 of 36 pairs (77.8%) successfully produced at least one chick $\geq$28 days of age. Productivity was 1.67 chicks per occupied territory or 2.14 chicks per successful nesting attempt.

Table 4. Measurements of peregrine falcon eggs and eggshell fragments collected from nests on the California Channel Islands in 2014 (WFVZ 2014).

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 Miguel Island					
MC47 Crook Point	0.272	25.27	0.303	16.76	Shell fragments with average membrane thickness added
MC17 Hoffman Point	0.297	18.41	0.328	9.89	Shell fragments with membrane
Island Mean	0.285	21.84	0.316	13.33	
Santa Rosa Island					
MC35 Orr's Camp	0.305	16.21	0.305	16.21	Addled egg with membrane
MC35 Orr's Camp	0.325	10.71	0.342	6.04	Shell fragments with membrane
Clutch Mean[a]	0.315	13.46	0.324	11.13	
Santa Cruz Island					
MC18 Gherini Knife Edge	0.217	40.38	0.251	31.04	Shell fragments with membrane
MC30 Sea Lion	0.292	19.78	0.338	7.14	Shell fragments with average membrane thickness added
MC19 Laguna	0.273	25.0	0.298	18.13	Shell fragments with average membrane thickness added
MC38 Black Point	0.331	9.07	0.366	-0.55	Shell fragments with average membrane thickness added
MC62 Punta Gorda	0.272	25.27	0.273	25.0	Addled Egg
Island Mean	0.277	23.9	0.305	16.15	

[a]Reported separately by Western Foundation of Vertebrate Zoology (WFVZ 2014).

BREEDING CHRONOLOGY

We calculated the breeding chronology of pairs that produced chicks based upon estimated hatch dates and a 33-day incubation period (Cade et al. 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 21 February (Fig. 14). The latest known incubation was at the Silver Peak territory (MC75) on Catalina, where we estimate incubation began on 7 May (Fig. 14). Except for 2 of the 3 earliest breeding attempts being made on Santa Barbara, there did not appear to be a relationship between breeding chronology and island. The mean and median date of the start of incubation was 26 March and 27 March, respectively. The mean and median dates of chicks hatching (first chick of clutch) was 28 April and 29 April, respectively.

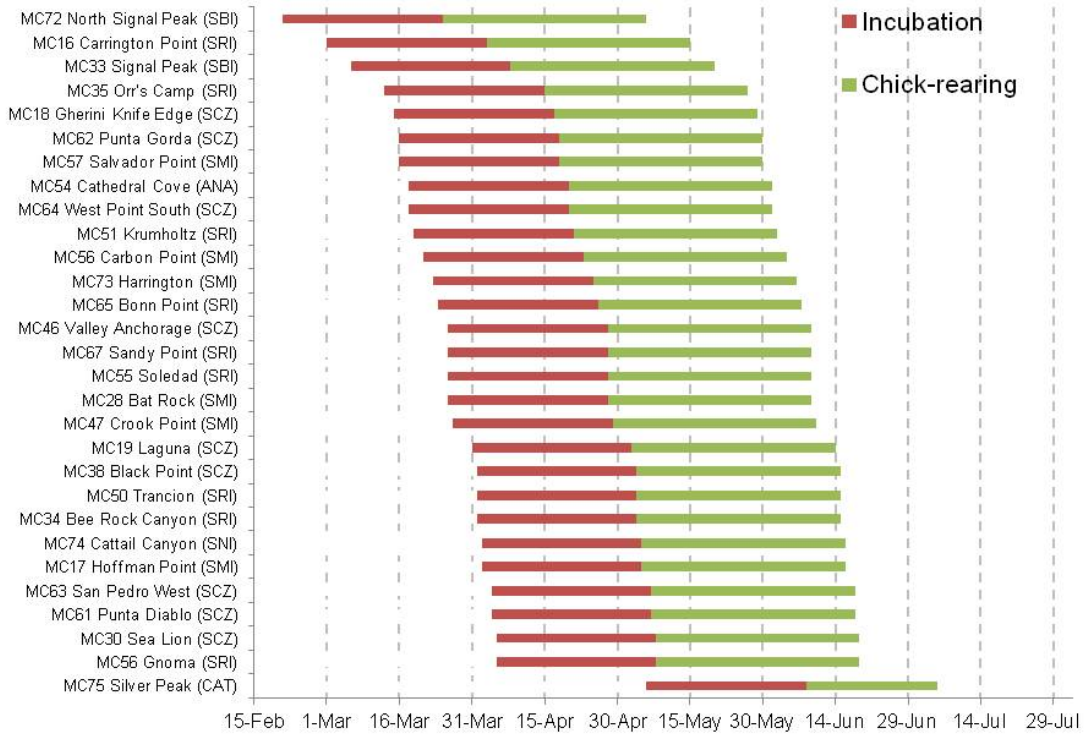

Figure 14. Breeding chronology of peregrine falcons on San Miguel (SMI), Santa Rosa (SRI), Santa Cruz (SCZ), San Nicolas (SNI), Santa Barbara (SBI), and Catalina (CAT) Islands, CA during 2014.

DISCUSSION

During the 2014 season, the number of known occupied peregrine territories on the California Channel Islands increased by 6.7% compared to 2013 (45 in 2013 versus 48 in 2014). Our incorporation of a call-broadcast into our survey protocol decreased the time necessary to determine occupancy in historic territories and was instrumental in our locating previously unknown territories. We would recommend the use of the 10-minute call-broadcast protocol in any future peregrine surveys on the islands or other areas of the country.

The peregrine population on the California Channel Islands has recovered to a level that is above Hunt's (1994) predicted historic levels (Fig. 15), which were likely conservative. The northern Channel Islands appear to be the stronghold for Channel Island peregrines. These islands tend to have more cliffs with ledges and potholes for nesting substrate and an abundance of breeding seabirds as a prey base. Suitable nesting habitat is less common on most of the

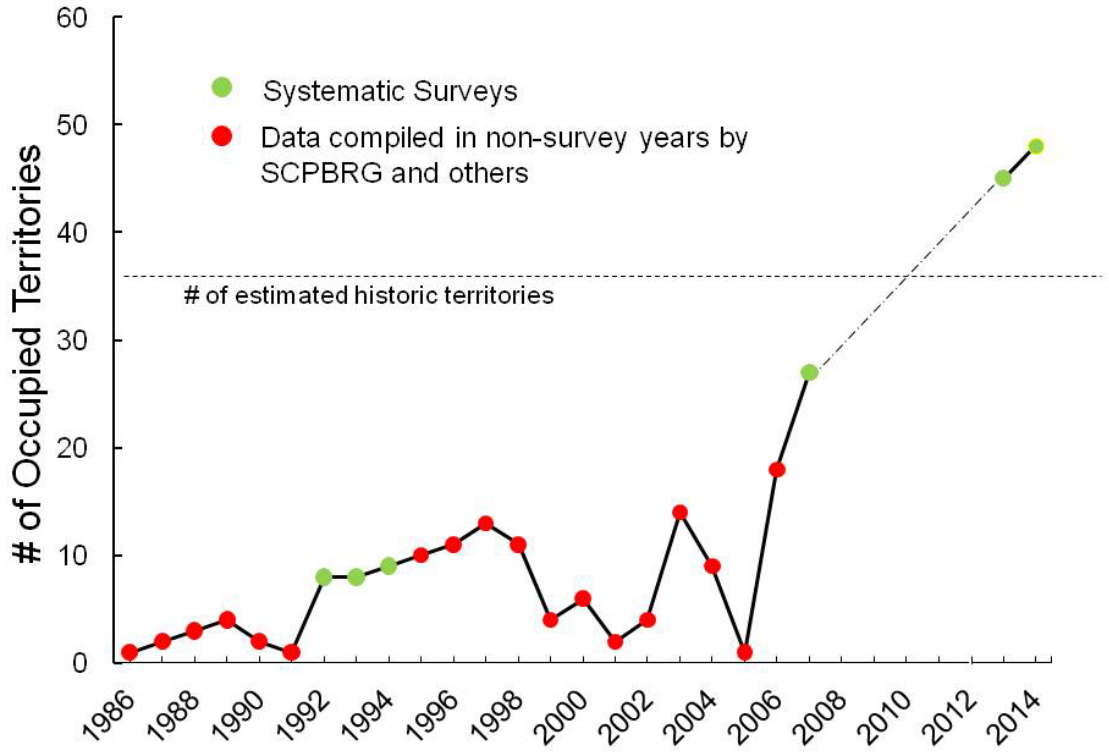

Figure 15. Number of known occupied peregrine falcon territories on the California Channel Islands from 1986 to 2014. Green points represent data from years when there were systematic surveys; red points are from years when there were no systematic surveys as reported in Appendix IV of Latta (2012).

southern Channel Islands, which may be the reason for fewer breeding pairs. Future peregrine surveys on the southern Channel Islands may be able to locate additional territories by expanding survey efforts into less suitable habitat.

Nest success in occupied territories with known outcomes increased from 54.5% (24 of 44 territories) in 2013 to 77.8% (28 of 36 territories) in 2014, and productivity increased from 1.43 chicks/occupied territory in 2013 (Sharpe 2014a) to 1.67 chicks/occupied territory in 2014. Averaged across our 2013 and 2014 surveys, nest success was 66.2% and productivity was 1.55 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.

When calculating nest success and productivity there are different ages at which chicks can be considered "successful". Steenhof (1987) typically determined nestlings to be successful when they were at least 80% of the average age of fledging, or about 34 days old. However, the peregrine monitoring plan (U.S. Fish and Wildlife Service, 2003) suggested using an age of $\geq$ 28 days, which fell within the suggested age of banding, because it is often difficult to count all the young in a nest with certainty without visiting the eyrie. Therefore, we determined nest success and productivity based upon nestlings that had reached 28 days of age, although we returned to territories through fledging, when possible, to try to verify survival to fledging.

The potential impact of DDE on the productivity of peregrines on the Channel Islands is of 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 2014a), and 14.41% in 2014 using the "SS" method, which should be the same method used in the previous Channel Island studies, and only 3 territories had >17% thinning. Many of the samples from this season were comprised

of only a few eggshell fragments, so while there is evidence that eggshell thickness has increased since the 1990s, we have to take into consideration that there can be a large variation in eggshell thickness within clutches and that shell thickness decreases and variation increases with second and third clutches (Burnham et al. 1984).

Given the eggshell thinning, 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 2014a), and 2014. These prey collections may indicate the breadth of the diet, but not necessarily the proportional component of the diet. However, the data elucidate the potential pathways through which peregrines could acquire DDE. We would expect birds that feed largely on marine fish to have higher DDE body burdens than birds that feed on other terrestrial food sources. Therefore, alcids and gulls, which made up approximately 33% of the prey items identified in 2014, would likely have more DDE in their tissues than other families of birds in the peregrine diet. 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. Alcids and gulls collected around the Channel Islands have had DDE body burdens of 2 ppm or higher (Garcelon et al. 1989, Hunt 1994), so these species could be the primary sources of DDE to Channel Island 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 also have high DDE loads (Blasius and Goodmanlowe 2008, Finkelstein and Kurle 2014).

There are no clear relationships between productivity and eggshell thinning among the islands, so it is debatable whether DDE is having a measurable impact on peregrine productivity. Bald eagles, which were similarly impacted by DDE, are now breeding successfully on the Channel Islands (Sharpe 2014b), therefore we would expect that peregrines would be having fewer reproductive problems as well.

We believe that the peregrine population will continue to expand into available breeding habitat that is currently unoccupied, especially on the northern Channel Islands. Although 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. More frequent 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.

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Appendix I. 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:_____

If Nest is Identified:
Distance to Nest_____m Bearing to Nest_____ Aspect of Nest_____
Nest Location: Latitude:_____ Longitude:_____
Nest Location:
Ledge on Cliff____ Stick Nest on Cliff____ Cavity/Pothole on Cliff____ Open Hillside____
Level Ground____ Other____

Possible to view the nest site well enough to see eggs or young? Yes No
If unable to see nest site, please explain:_____

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

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

Stage of Reproduction at time of visit: Courtship Incubation Nestling Fledgling Unknown
Eggs Observed:_____ # Young Observed:_____

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			
Age of Young:	<28 Days	≥28 Days	Unknown
# Fledglings Confirmed:			

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
MC27a	Lobos Canyon	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

Appendix IV. Continued

State Code	Territory Name	Island	Year of First Known Occupancy[a]
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
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

Appendix IV. Continued

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 2014.

Sample ID	Island[a]	Territory	Sample Type	Collection Date	Notes
14-MC35-AE-1	SRI	Orr's Camp	Addled Egg	5/3/2014	Unhatched peregrine falcon egg
14-MC62-AE-1	SCI	Punta Gorda	Addled Egg	5/5/2014	Unhatched peregrine falcon egg
14-MC54-AE-1	ANA	Cathedral Cove	Addled Egg	5/17/2014	Unhatched peregrine falcon egg
14-MC54-AF-1	ANA	Cathedral Cove	Adult Feather	5/17/2014	Adult peregrine feather collected at eyrie
14-MC74-F-1	SNI	Cattail Canyon	Adult Feather	6/3/2014	Adult peregrine feather collected at eyrie
14-MC72-C-1	SBI	North Signal Peak	Chick Remains	5/17/2014	Peregrine chick collected at end of season
14-MC75-C-1	SCA	Silver Peak	Chick Remains	7/6/2014	Peregrine chick collected during banding
14-MC16-PR-1	SRI	Carrington Point	Prey Remains	5/2/2014	Collected from plucking location above nest
14-MC16-PR-2	SRI	Carrington Point	Prey Remains	5/2/2014	Collected from eyrie during banding
14-MC35-PR-1	SRI	Orr's Camp	Prey Remains	5/3/2014	Collected from eyrie during banding
14-MC18-PR-1	SCI	Gherini Knife Edge	Prey Remains	5/8/2014	Collected from eyrie during banding
14-MC18-PR-2	SCI	Gherini Knife Edge	Prey Remains	5/8/2014	Collected from eyrie during banding
14-MC62-PR-1	SCI	Punta Gorda	Prey Remains	5/5/2014	Collected from eyrie during banding
14-MC54-PR-1	ANA	Cathedral Cove	Prey Remains	5/17/2014	Collected from eyrie during banding
14-MC47-PR-1	SMI	Crook Point	Prey Remains	5/23/2014	Collected from eyrie during banding
14-MC56-PR-1	SMI	Carbon Point	Prey Remains	5/24/2014	Collected from eyrie during banding
14-MC28-PR-1	SMI	Bat Rock	Prey Remains	5/25/2014	Collected from eyrie during banding
14-MC57-PR-1	SMI	Salvador Point	Prey Remains	5/25/2014	Collected from eyrie during banding
14-MC17-PR-1	SMI	Hoffman Point	Prey Remains	5/26/2014	Collected from eyrie during banding
14-MC46-PR-1	SCI	Valley Anchorage	Prey Remains	5/29/2014	Collected from eyrie during banding
14-MC61-PR-1	SCI	Punta Diablo	Prey Remains	5/30/2014	Collected from eyrie during banding
14-MC30-PR-1	SCI	Sea Lion	Prey Remains	5/31/2014	Collected from eyrie during banding
14-MC38-PR-1	SCI	Black Point	Prey Remains	5/31/2014	Collected from eyrie during banding
14-MC19-PR-1	SCI	Laguna	Prey Remains	6/1/2014	Collected from eyrie during banding
14-MC72-PR-1	SBI	North Signal Peak	Prey Remains	5/17/2014	Collected from eyrie during banding
14-MC74-PR-1	SNI	Cattail Canyon	Prey Remains	6/3/2014	Collected from eyrie during banding
14-MC35-SF-1	SRI	Orr's Camp	Shell Fragments	5/3/2014	Collected from eyrie during banding
14-MC18-SF-1	SCI	Gherini Knife Edge	Shell Fragments	5/8/2014	Collected from eyrie during banding

Appendix V. Continued.

Sample ID	Island[a]	Territory	Sample Type	Collection Date	Notes
14-MC47-SF-1	SMI	Crook Point	Shell Fragments	5/23/2014	Collected from eyrie during banding
14-MC17-SF-1	SMI	Hoffman Point	Shell Fragments	5/26/2014	Collected from eyrie during banding
14-MC30-SF-1	SCI	Sea Lion	Shell Fragments	5/31/2014	Collected from eyrie during banding
14-MC38-SF-1	SCI	Black Point	Shell Fragments	5/31/2014	Collected from eyrie during banding
14-MC19-SF-1	SCI	Laguna	Shell Fragments	6/1/2014	Collected from eyrie during banding
14-MC74-SF-1	SNI	Cattail Canyon	Shell Fragments	6/3/2014	Collected from eyrie during banding
14-MC16-WB-1	SRI	Carrington Point	Whole Blood	5/2/2014	Collected from 1156-16822
14-MC16-WB-2	SRI	Carrington Point	Whole Blood	5/2/2014	Collected from 1156-16821
14-MC16-WB-3	SRI	Carrington Point	Whole Blood	5/2/2014	Collected from 1947-21630
14-MC35-WB-1	SRI	Orr's Camp	Whole Blood	5/3/2014	Collected from 1156-16823
14-MC35-WB-2	SRI	Orr's Camp	Whole Blood	5/3/2014	Collected from 1947-21631
14-MC47-WB-1	SMI	Crook Point	Whole Blood	5/23/2014	Collected from 1947-21635
14-MC47-WB-2	SMI	Crook Point	Whole Blood	5/23/2014	Collected from 1156-16826
14-MC47-WB-3	SMI	Crook Point	Whole Blood	5/23/2014	Collected from 1156-16827
14-MC56-WB-1	SMI	Carbon Point	Whole Blood	5/24/2014	Collected from 1947-21636
14-MC56-WB-2	SMI	Carbon Point	Whole Blood	5/24/2014	Collected from 1947-21637
14-MC57-WB-1	SMI	Salvador Point	Whole Blood	5/25/2014	Collected from 1947-21646
14-MC38-WB-2	SMI	Salvador Point	Whole Blood	5/25/2014	Collected from 1947-21647
14-MC28-WB-1	SMI	Bat Rock	Whole Blood	5/25/2014	Collected from 1947-21643
14-MC28-WB-2	SMI	Bat Rock	Whole Blood	5/25/2014	Collected from 1947-21644
14-MC17-WB-1	SMI	Hoffman Point	Whole Blood	5/26/2014	Collected from 1947-21648
14-MC18-WB-1	SCI	Gherini Knife Edge	Whole Blood	5/8/2014	Collected from 1947-21633
14-MC18-WB-2	SCI	Gherini Knife Edge	Whole Blood	5/8/2014	Collected from 1156-16824
14-MC46-WB-1	SCI	Valley Anchorage	Whole Blood	5/29/2014	Collected from 1156-16828
14-MC46-WB-2	SCI	Valley Anchorage	Whole Blood	5/29/2014	Collected from 1947-21649
14-MC46-WB-3	SCI	Valley Anchorage	Whole Blood	5/29/2014	Collected from 1947-21650
14-MC61-WB-1	SCI	Punta Diablo	Whole Blood	5/30/2014	Collected from 1947-21652
14-MC61-WB-2	SCI	Punta Diablo	Whole Blood	5/30/2014	Collected from 1947-21651

Appendix V. Continued

Sample ID	Island[a]	Territory	Sample Type	Collection Date	Notes
14-MC30-WB-1	SCI	Sea Lion	Whole Blood	5/31/2014	Collected from 1947-21653
14-MC38-WB-1	SCI	Black Point	Whole Blood	5/31/2014	Collected from 1947-21655
14-MC38-WB-2	SCI	Black Point	Whole Blood	5/31/2014	Collected from 1156-16829
14-MC38-WB-3	SCI	Black Point	Whole Blood	5/31/2014	Collected from 1156-16830
14-MC64-WB-1	SCI	West Point South	Whole Blood	5/31/2014	Collected from 1947-21654
14-MC19-WB-1	SCI	Laguna	Whole Blood	6/1/2014	Collected from 1156-16831
14-MC75-WB-1	SCA	Silver Peak	Whole Blood	7/4/2014	Collected from 1156-16839
14-MC74-WB-1	SNI	Cattail Canyon	Whole Blood	6/3/2014	Collected from 1156-16837
14-MC74-WB-2	SNI	Cattail Canyon	Whole Blood	6/3/2014	Collected from 1156-16838
14-MC74-WB-3	SNI	Cattail Canyon	Whole Blood	6/3/2014	Collected from 1947-21656
14-MC54-WB-1	ANA	Cathedral Cove	Whole Blood	5/17/14	Collected from 1156-16825

[a]ANA=Anacapa Island, SMI=San Miguel Island, SRI=Santa Rosa Island, SCI=Santa Cruz Island, SNI=San Nicolas Island, SCA=Santa Catalina Island, SCL=San Clemente Island.