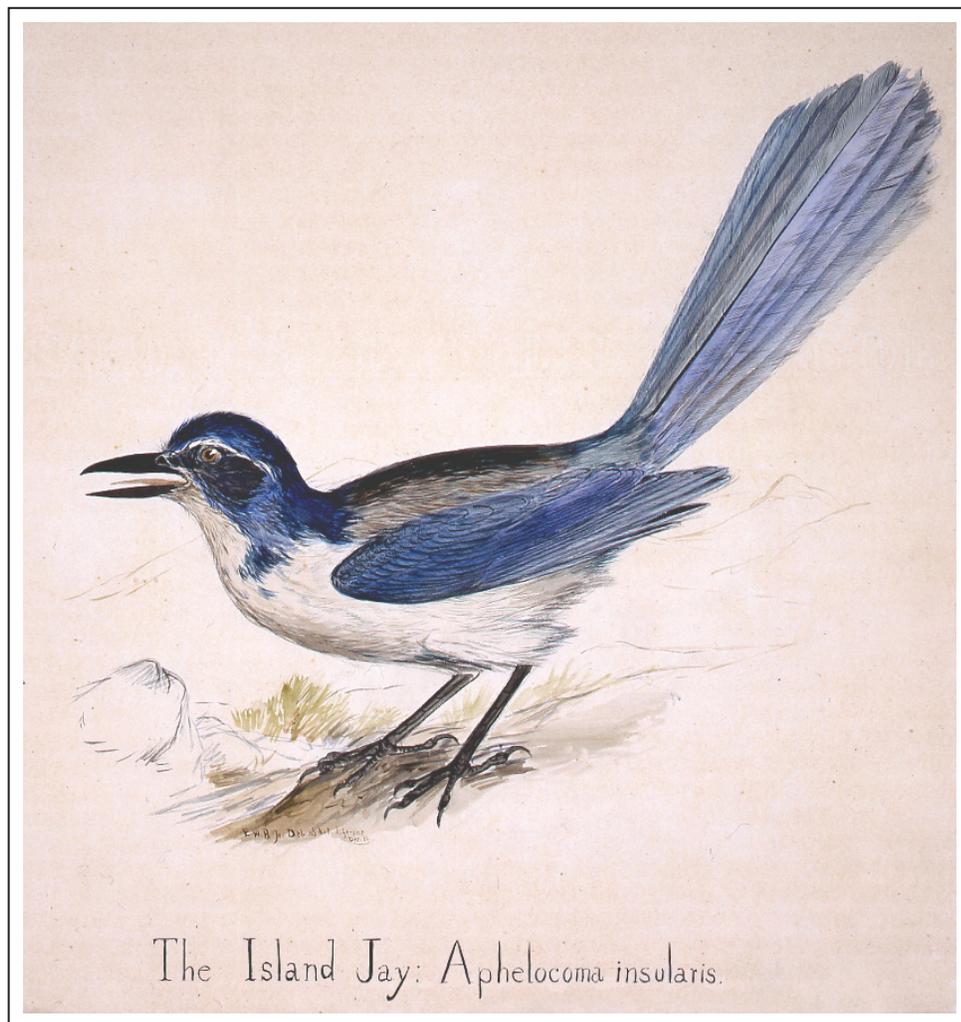


FINAL REPORT ON THE
HISTORIC AND PREHISTORIC RECORD FOR THE
OCCURRENCE OF ISLAND SCRUB-JAYS (*APHELOCOMA
INSULARIS*) ON THE NORTHERN CHANNEL ISLANDS,
SANTA BARBARA COUNTY, CALIFORNIA



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SANTA BARBARA COUNTY, CALIFORNIA**

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I. INTRODUCTION

Island scrub-jays (*Aphelocoma insularis*) are an endemic species of jay which is currently found only on Santa Cruz Island, the largest of the islands off the coast of southern California (Figure 1a). Island scrub-jays (ISSJ) are also the only insular species of bird found in the Continental United States and are the most morphologically and genetically distinct species of bird found on the Channel Islands (Delaney and Wayne 2005, Delaney et al. 2008, Johnson 1972, Pitelka 1951, Swarth 1918). They are characterized by pronounced morphological (larger size, longer bill, broader skull, longer tarsi, longer tail, and darker coloration; Curry and Delaney 2002, Isitt 1989, Pitelka 1951) and genetic differentiation (Delaney and Wayne 2005, Delaney et al. 2008, Peterson 1990, 1992), along with a series of life-history differences such as territory size, age at first breeding, yearling breeder survival, mean clutch size, and adult survival (Atwood 1980, Atwood et al. 1990, Collins and Corey 1994, Curry and Delaney 2002, Kelsey and Collins 2000).

Recent genetic studies have found significant genetic divergence between ISSJ and adjacent mainland populations of the western scrub-jay (*Aphelocoma californica*; Delaney and Wayne 2005, Delaney et al. 2008, Peterson 1992). Peterson (1992) observed a significant amount of genetic divergence between ISSJ and western scrub-jays (WESJ) using allozymes but was unable to determine with any degree of accuracy the length of time that these two species were separated from one another to result in the observed level of genetic differentiation. Delaney and Wayne (2005) used microsatellite loci from mitochondrial DNA (mtDNA) to genotype ISSJ and WESJ and found that ISSJ had less microsatellite and haplotype variation than did WESJ. The lack of any shared haplotypes between ISSJ and WESJ suggests an absence of geneflow. Island and western scrub-jays also differed significantly in allele frequencies with 21 unique alleles observed at three microsatellite loci in ISSJ (Delaney and Wayne 2005). Using molecular data obtained from mtDNA, two estimates of divergence time between ISSJ and WESJ were developed. The first divergence estimate for ISSJ was $150,961 \pm 4,327$ years (Delaney and Wayne 2005) while the second estimate was 208,602 years (114,366-325,066 years; Delaney et al. 2008). The recent mtDNA results confirm that there has been a significant amount of genetic divergence between island and western scrub-jay populations and that this divergence has resulted from a long period of isolation and evolutionary divergence (Delaney et al. 2008). These divergence estimates suggest that ISSJ probably colonized the northern Channel Islands well before the Santarosae landmass last broke up ~10,000 years ago. Thus, ISSJ must have been present on the Santarosae landmass when it was present during the last glacial maximum (~18,500 radiocarbon years before present) and that its populations on San Miguel, Santa Rosa and Anacapa islands died out following the separation of these islands from the Santarosae landmass.

Today ISSJ are only known from Santa Cruz Island and have never been recorded on any of the other Channel Islands, even as a vagrant. Scrub-jays in general are non-migratory and according to Pitelka (1951) are incapable of long flights due in part to having weakly developed humeri. The non-migratory nature of ISSJ is supported by the fact that

(1) they have not been able to cross the 9 km water barrier that currently separates Santa Cruz Island from Santa Rosa Island, (2) there are no records of migrant scrub-jays reaching any of the Channel Islands including Santa Cruz Island; and (3) there are no shared haplotypes between island and western scrub-jays which suggests an absence of gene flow. The present 30 km water barrier between Santa Cruz Island and the adjacent mainland has been a sufficient barrier to WESJ dispersal from the mainland to the northern Channel Islands. The geologic record confirms that at no point during the Pleistocene were any of the northern Channel Islands connected to the adjacent mainland (Junger and Johnson 1980). Thus jays from the mainland would have had to have crossed a water barrier in order to initially reach Santa Cruz Island at some time in the past.

The purpose of the following study was to determine what is known and what is currently unknown about the prehistoric and historic distribution of the ISSJ on the northern Channel Islands. Prehistoric (fossils in paleontological sites), protohistoric (faunal remains in archaeological sites), and historic (observations or collected specimens) data sources are reviewed to see (1) if there are any records of ISSJ for Anacapa, Santa Rosa or San Miguel islands, and (2) if there are records of ISSJ on Santa Cruz Island or other Channel Islands prior to the species discovery by Henry W. Henshaw in June 1875 (Henshaw 1876). Ethnographic information about how Native Peoples (Chumash) viewed and used birds was also reviewed to see if there was any information that might bear on the question of whether ISSJ were present in the past on islands other than Santa Cruz Island. Finally, data relative to prehistoric and historic conditions on the northern Channel Islands from changes in sea level, paleoenvironments, fire history, and prehistoric (pygmy mammoth) and historic (feral herbivores) grazing were evaluated to assess how these factors likely affected the distribution and abundance of ISSJ on the northern Channel Islands since the last glacial maximum.

Figure 1. Site vicinity map of the Northern Channel Islands. (A) Map of present-day islands comprising the Northern Channel Islands. (B) Map of Santarosae landmass showing extent of exposed lands at 16 ka, 12 ka, and 10 ka, and slopes >30 degrees (orange).



II. METHODS

The principal goal of this project was to determine what is known and what is unknown about the historic and prehistoric distribution of the ISSJ on the Northern Channel Islands (NCI). To get at this question, an intensive review was conducted of the published and unpublished record regarding the avifauna of the Channel Islands. Information that was examined as part of this research included published and unpublished data pertaining to the paleontological, archaeological, ethnographic, historic and ornithological record for birds on the Channel Islands. While the primary focus of this research was with the avifauna of Santa Cruz and Santa Rosa Islands, data pertaining to birds on the other islands was included if it helped in establishing the extent of what is known and what is unknown about a particular aspect of this historic and prehistoric record for birds on the islands.

A. Avian Paleontological Record

Published and unpublished data were used to examine the fossil record of birds on the Channel Islands. In the case of the published record, most data related to the avian fossil record come from excavations conducted at a series of Pleistocene-aged paleontological sites on San Miguel Island (Guthrie 1980, 1992b, 1993a and b, 1998a, 2002, 2005). Data from a prehistoric barn owl (*Tyto alba*) roost at Daisy Cave (SMI-261A; Guthrie 1980) on San Miguel Island were also incorporated into the compiled avian fossil record for that island. Data for Santa Rosa Island comes from several published papers (Howard 1944, 1962, 1964; Orr 1968) and from compilation of Santa Rosa Island avian fossils housed in the Paleontology collection at the Santa Barbara Museum of Natural History. These fossils are from Pleistocene-aged paleontological sites on Santa Rosa Island that were excavated by Phil Orr in the 1940s and 1950s (Orr 1968) and by Dan Guthrie in 1987 and 1991 (Guthrie 1992a). Limited fossil bird data were also obtained from published sources for Anacapa Island (Howard 1964, Guthrie 1985b, Lipps 1964, Miller et al. 1961), Santa Barbara Island (Lipps et al. 1968), and San Nicolas Island (Howard 1955). The avian fossil record from these three islands is poor due in part to the fact that these three islands do not appear to have good fossil bearing Pleistocene-aged deposits and that sites excavated to date have yielded only a small amount of fossil bird bone. No Pleistocene-aged avian fossil data were found for Santa Cruz, Santa Catalina or San Clemente islands. Data obtained from these published and unpublished sources were compiled and is summarized by species by island.

B. Avian Archaeological Record

Published faunal analysis data were used to establish what is known about the avian record from archaeological sites on the Channel Islands. Data for this compilation come from a series of archaeological sites excavated on San Miguel, Santa Rosa and Santa Cruz Islands along with three sites (SNI-11, SCAI-17, and SCLI-43) on the southern Channel Islands (Bleitz 1993, Porcasi 1999). There is very little avian faunal analysis data for archaeological sites on Santa Rosa, Anacapa and Santa Barbara Islands. This is due in

part to the fact that many of the early archaeological excavations on the islands were only focused on the recovery of artifacts and human skeletal remains and not on the recovery of faunal material. Also these early excavations were not using fine mesh screens adequate to sample for the smaller avian remains that can be found in archaeological sites. Data compiled from this review of published faunal analysis data are summarized by species by island. Data from sites in which avian material was not identified to species are not included in the faunal analysis data compiled for this study. To assess the relative importance of land birds to Native Peoples, data for all birds, including marine and aquatic birds, are included in the compiled avian faunal analysis data.

C. Avian Ethnographic Record

Given that birds are known to have played an integral role in the lives of California's Native Peoples, published ethnographic literature was examined to see how the Chumash viewed and used birds. Published information related to Chumash place names, language, myths, ceremonies, dances and music, religious practices, clothing and ornamentation, regalia and ritual paraphernalia, and oral traditions were examined to see if there were any data related to whether jays figured into Chumash culture. Information like this is important because it could help to show whether Island Chumash recognized jays and thus whether jays were likely present on one or more of the Channel Islands during Chumash occupation. If Chumash on the islands had a name for jays, if they had any myths or oral traditions in which jays were characters, or if jays were known to serve as talisman for individuals, then this might indicate that ISSJ were present during proto-historic times on one or more of the NCI. For this reason it was important to review the ethnographic literature for any data that might help to shed light on whether this species was present on the NCI during occupation by Native Peoples.

D. Avian Historic Record

A variety of published and unpublished sources were examined for information pertaining to the occurrence of ISSJ on the Channel Islands (Appendix 1). These sources included published and unpublished diaries, logs, journals, field notes, correspondence, and manuscripts related to the history, geology, archaeology and natural history of the islands. Bibliographies contained in published sources about the history of the Channel Islands were reviewed to develop a list of potentially useful articles and unpublished materials to be tracked down and examined. These initial key historical resources include: (1) articles on the history of the islands (Allen 1996; Daily 1987, 1989 a and b, 1990; Doran 1980; Eaton 1980; LaMotta et al. 2006; Livingston 2006; Roberts 1991); (2) papers published in the proceeding volumes of the six Channel Islands Symposiums (Browne et al. 2002, Garcelon and Schwemm 2005, Halvorsen and Maender 1994, Hochberg 1993, Philbrick 1967, Power 1980); and (3) historical summaries of research work conducted on the islands (Glassow 1996; Junak 1996, 2008; Junak et al. 1993, 1995; Miller 1996). All of these sources were instrumental in the early stages of this historical research. Bibliographies in these sources provided numerous references to primary and secondary documents that would be important to review and thus were used to develop a bibliog-

raphy of published and unpublished materials that should be examined as part of this historical database review (Appendix 1).

These published and unpublished historical sources were tracked down in archives and libraries in museums, colleges and universities, historical societies, and research institutes. Institutions that were visited during the course of compiling historical information related to the avifauna of the Channel Islands included the Academy of Natural Sciences in Philadelphia, American Museum of Natural History in New York, British Museum of Natural History in London and Tring, California Academy of Sciences in San Francisco, Museum of Comparative Zoology at Harvard, Museum of Ventura County (Ventura Museum of History and Art), Museum of Vertebrate Zoology and Bancroft Library at the University of California Berkeley, Natural History Museum of Los Angeles County, Santa Barbara Historical Society, Santa Barbara Museum of Natural History library and Channel Islands Archive, U. S. National Museum and Smithsonian Archives in Washington D.C., Western Foundation of Vertebrate Zoology in Camarillo, and Yale Peabody Museum and libraries at Yale. Finally the unpublished Channel Islands Encyclopedia which Marla Daily of the Santa Cruz Island Foundation is preparing was queried for any information written about jays and feral herbivores on the northern Channel Islands in 19th and early 20th century news paper articles, diaries, and unpublished manuscripts.

E. Ornithological Record

Three principal sources of information were evaluated as part of the ornithological database review for information pertaining to the historic distribution and status of ISSJ. First, museum specimen and egg records of ISSJ were compiled (Appendix II). Specimen records were gathered by (1) using ORNIS to look for records of this species in museum collections; (2) physically examining specimens of this species in collections during museum visits; and (3) reviewing Museum catalogue registers and card files. ISSJ specimen records were part of a comprehensive database of ~10,000 bird specimens collected from the Channel Islands during the past 144 years (Collins 2002). Records of ISSJ egg sets were obtained from Lloyd Kiff's unpublished "Channel Island Bird Egg Set Inventory" (Kiff 1989), and from examination of egg sets, catalogue ledgers and egg set card files in museum collections visited in the United States and at the British Museum of Natural History. Second, historical accounts, unpublished notes and records of Channel Island specimens in museum collections which were collected by naturalists, ornithologists, mammalogists, geologists, archaeologists, and explores during the 19th century were reviewed to determine whether any of these early naturalists and explorers recorded ISSJ on the NCI prior to the species discovery on Santa Cruz Island in 1875. Third, published papers and unpublished manuscripts and field notes containing information about ISSJ were examined and all relevant text pertaining to this species was compiled and is contained in Appendix III. Three bibliographies of California ornithology from 1797 through 1938 were reviewed to locate published papers pertaining to ISSJ and to the avifauna of the Channel Islands (Grinnell 1909, 1924, 1939).

III. RESULTS

A. Channel Islands Avian Paleontological Record

Avian Paleontological Work on the Channel Islands

Most of the work on the fossil avifauna of the Channel Islands has taken place on San Miguel and Santa Rosa Islands by Dan Guthrie and Phil Orr (Guthrie 1980, 2002, 2005, Orr 1968). To date a total of 33 Pleistocene-aged vertebrate fossil sites (21 on San Miguel Island and 12 on Santa Rosa Island) have been excavated. Pleistocene fossil sites examined for the other islands include 4 sites on Anacapa Island (Lipps 1964), four sites on Santa Barbara Island (Lipps et al. 1968), and one site on San Nicolas Island (Howard 1955). No Pleistocene vertebrate fossil sites with avian remains appear to have been excavated on Santa Cruz, Santa Catalina or San Clemente islands. Radiocarbon (¹⁴C) dates from bone collagen indicate that sites on San Miguel Island date from at least two periods, one from around 12,000 BP and a second from between 25,000 and 40,000 BP (Guthrie 1992b, 2005). These depositional periods appear to correspond with times when sea level was close to present day levels (Curry, 1965, Vedder and Howell 1980).

Table 1 summarizes the avian fossils that have been recovered and identified to date from Pleistocene-aged sites on the Channel Islands. A total of 17,881 avian fossils from 80 species of birds have been recovered to date from 39 fossil localities on five of the Channel Islands (Table 1). Of this material 97.5% of the fossils are from 21 sites on San Miguel Island, 1.1% of the fossils are from 12 sites on Santa Rosa Island, and 1.4% of the fossils are from six sites on Anacapa, Santa Barbara and San Nicolas islands (Table 1). Guthrie's work on San Miguel Island is by far the most intensive to date related to defining the fossil avifauna of the Channel Islands (Guthrie 1980, 1985a, 1992b, 1993a and b, 1998a and b, 2002, 2005, unpubl. ms). He has also conducted additional excavations on Santa Rosa (Guthrie 1992a) and Anacapa islands (Guthrie 1985b) but has not published on the results of those excavations. Avian fossils that Guthrie recovered from his work on Santa Rosa and Anacapa islands are included in the species and island totals in Table 1.

Avian Fossil Records from the Channel Islands

Of the 80 species of birds recorded to date from Pleistocene-aged fossil localities on the Channel Islands, 22 species (27.5%) are land birds (vultures, raptors, owls, doves/pigeons, woodpeckers and passerines) and 58 species (72.5%) are marine/aquatic/shore/wading birds (Table 1). Passerines comprise only 1.9% of the avian remains (339 specimens [121 unidentified] of 11 species) while marine/aquatic/shore/wading birds comprise 98.1% of the avian remains (17,542 specimens of 58 species); (Table 1). The most abundantly occurring avian remains are from alcids (14,879 specimens from 8 species) and aquatic/marine birds (2,648 specimens from 49 species). Four species comprise 93.5% of all avian fossils recovered from the islands: an extinct flightless goose *Chendyte lawi* (1,985 specimens), an extinct puffin *Fratercula dowi* (8,207 specimens), an extinct nesting population of ancient murrelets *Synthiboramphus antiquus* (2,043 specimens), and Cassin's auklets *Ptychoramphus aleuticus* (4,477 specimens). These four species

Table 1. Avian fossils recovered from Pleistocene-Holocene paleontological sites on the California Channel Islands.

Scientific Name	Common Name	San Miguel Island ^a		Santa Rosa Island ^b		Anacapa Island ^c		Santa Barbara Island ^d		San Nicolas Island ^e	
		Number of Bones	Number of Sites	Number of Bones	Number of Sites	Number of Bones	Number of Sites	Number of Bones	Number of Sites	Number of Bones	Number of Sites
Order Gaviiformes											
<i>Gavia immer</i>	Common Loon	5	2								
<i>Gavia pacifica</i>	Pacific Loon	8	5								
Order Podicipediformes											
<i>Aechmophorus sp.</i>	Western/Clark's Grebe	5	4								
<i>Podiceps nigricollis</i>	Eared Grebe	30	7	1	1						
<i>Podiceps auritus</i>	Horned Grebe	3	2								
Order Procellariiformes											
<i>Phoebastria albatrus</i>	Short-tailed Albatross	22	8	2	2						
<i>Fulmarus glacialis</i>	Northern Fulmar	18	9								
<i>Puffinus sp.</i>	Shearwater sp.			1	1						
<i>Puffinus griseus</i>	Sooty Shearwater	50	8	1	1	8	3				
<i>Puffinus opisthomelas</i>	Black-vented Shearwater	25	8	1	1						
<i>Puffinus tenuirostris</i>	Short-tailed Shearwater	29	7								
<i>Oceanodroma leucorhoa</i>	Leach's Storm-Petrel	5	1			1	1				
<i>Oceanodroma furcata</i>	Fork-tailed Storm-Petrel	1	1								
<i>Oceanodroma homochroa</i>	Ashy Storm-Petrel	10	4								
Order Pelicaniformes											
<i>Pelicanus occidentalis</i>	Brown Pelican	8	1								
<i>Morus reyna</i>	extinct Gannet	5	2	2	2	1	1				
<i>Phalacrocorax penicillatus</i>	Brandt's Cormorant	38	8	2	2						
<i>Phalacrocorax pelagicus</i>	Pelagic Cormorant	10	5								
Order Ciconiiformes											
<i>Ardea herodias</i>	Great Blue Heron	3	1								
<i>Plegadis chihii</i>	White-faced Ibis	1	1								
<i>Gymnagyps californicus amplus</i>	California Condor	9	4	2	2	1	1				
Order Anseriformes											

Table 1 (cont.)

Scientific Name	Common Name	San Miguel Island ^a		Santa Rosa Island ^b		Anacapa Island ^c		Santa Barbara Island ^d		San Nicolas Island ^e	
		Number of Bones	Number of Sites	Number of Bones	Number of Sites	Number of Bones	Number of Sites	Number of Bones	Number of Sites	Number of Bones	Number of Sites
	Goose sp.			6	3						
<i>Chen caerulescens</i>	Snow Goose	19	7	6	2						
<i>Branta bernicla</i>	Brant			3	3						
<i>Branta canadensis</i>	Canada Goose	53	6	39	9						
<i>Branta hutchinsii</i>	Cackling Goose			44	3						
<i>Anser albifrons</i>	White-fronted Goose	3	2	6	1						
<i>Anas platyrhynchos</i>	Mallard			8	3						
<i>Anas crecca</i>	Green-winged Teal			2	1						
<i>Anas americana</i>	American Wigeon			3	1						
<i>Anas clypeata</i>	Northern Shoveler			1	1						
<i>Melanitta fusca</i>	White-winged Scoter	9	5								
<i>Melanitta perspicillata</i>	Surf Scoter	13	6								
<i>Mergus serrator</i>	Red-breasted Merganser	2	2	2	1						
<i>Chendytes milleri</i>	extinct goose					3	1			80	1
<i>Chendytes lawi</i>	extinct goose	1840	16	5	3	135	3				
Order Falconiformes											
<i>Haliaeetus leucocephalus</i>	Bald Eagle	29	8	4	2			1			
<i>Buteo jamaicensis</i>	Red-tailed Hawk	38	7	3	3						
<i>Polyborus pliancus prelutosus</i>	Crested Caracara	17	5	10	2						
<i>Falco peregrinus</i>	Peregrine Falcon	3	1								
<i>Falco sparverius</i>	American Kestrel	1	1								
Order Charadriiformes											
<i>Pluvialis squatarola</i>	Black-bellied Plover	2	2								
<i>Charadrius semipalmatus</i>	Semipalmated Plover	2	2								
<i>Haematopus bachmani</i>	Black Oystercatcher	1	1								
<i>Catoptrophorus semipalmatus</i>	Willet	2	2								
<i>Numenius phaeopus</i>	Whimbrel	3	2								

Table 1 (cont.)

Scientific Name	Common Name	San Miguel Island ^a		Santa Rosa Island ^b		Anacapa Island ^c		Santa Barbara Island ^d		San Nicolas Island ^e	
		Number of Bones	Number of Sites	Number of Bones	Number of Sites	Number of Bones	Number of Sites	Number of Bones	Number of Sites	Number of Bones	Number of Sites
<i>Limosa fedoa</i>	Marbled Godwit	1	1								
<i>Arenaria melanocephala</i>	Black Turnstone	2	2								
<i>Calidris alba</i>	Sanderling	1	1								
<i>Calidris canutus</i>	Red Knot	1	1								
<i>Phalaropus fulicaria</i>	Red Phalarope	18	4	1	1						
<i>Larus californicus</i>	California Gull	9	5								
<i>Larus delawarensis</i>	Ring-billed Gull	2	1								
<i>Larus occidentalis</i>	Western Gull	3	1								
<i>Larus philadelphia</i>	Bonaparte's Gull	4	2								
<i>Larus spp. (large)</i>		10	4	3	2	1	1				
<i>Rissa tridactyla</i>	Black-legged Kittiwake	3	3								
<i>Uria aalge</i>	Common Murre	91	10	2	1						
<i>Cepphus columba</i>	Pigeon Guillemot	1	1								
<i>Synthboramphus antiquus</i>	Ancient Murrelet	2042	13	1	1						
<i>Synthboramphus hypoleucus</i>	Xantus's Murrelet	47	5			1	1				
<i>Ptychoramphus aleuticus</i>	Cassin's Auklet	4467	17	8	8	2	1				
<i>Cerorhinca monocerata</i>	Rhinoceros Auklet	2	1	1	1	7	2				
<i>Fratercula dowi</i>	extinct puffin	8202	17			5	2				
<i>Fratercula cirrhata</i>	Tufted Puffin	4	3								
Order Columbiformes											
<i>Columba fasciata</i>	Band-tailed Pigeon			3	2						
Order Strigiformes											
<i>Tyto alba</i>	Barn Owl	17	7	6	1						
	Small Owl sp.?			1	1						
<i>Athene cucularia</i>	Burrowing Owl	9	3	1	1						
<i>Asio, cf. A. piscus</i>	extinct owl	3	3	9	3						
Order Piciformes											

Table 1 (cont.)

Scientific Name	Common Name	San Miguel Island ^a		Santa Rosa Island ^b		Anacapa Island ^c		Santa Barbara Island ^d		San Nicolas Island ^e	
		Number of Bones	Number of Sites	Number of Bones	Number of Sites	Number of Bones	Number of Sites	Number of Bones	Number of Sites	Number of Bones	Number of Sites
<i>Colaptes auratus</i>	Northern Flicker			1	1						
Order Passeriformes											
<i>Passeriformes</i> unidentified	Unidentified passerines	120	1	1	1						
<i>Aphelocoma insularis</i>	Island Scrub-Jay			1	1						
<i>Corvus brachyrhynchos</i>	American Crow			1	1						
<i>Corvus corax</i>	Common Raven	18	4	1	1						
<i>Eremophila alpestris</i>	Horned Lark	2	1								
<i>Pheucticus melanocephalus</i>	Black-headed Grosbeak			2	2						
<i>Passerella iliaca</i>	Fox Sparrow	11	1								
<i>Melospiza melodia</i>	Song Sparrow	4	2	3	2						
<i>Zonotrichia leucophrys</i>	White-crowned Sparrow	2	1	2	1						
<i>Zonotrichia</i> sp.		9	1		1						
<i>Zonotrichia cf. atricapilla</i>	Golden-crowned Sparrow			1	1						
<i>Sturnella neglecta</i>	Western Meadowlark	3	2	1	1						
<i>Xanthocephalus xanthocephalus</i>	Yellow-headed Blackbird			1	1						
Total Number of Species		66		45		11		1		1	
Total Number of bones		17,430		205		165		1		80	

a. Data from Appendix 1 (Guthrie 2005) and SMI-261 A from Table 4 (Guthrie 1980).

b. Data for Santa Rosa Island comes from Orr (1968), Howard (1944, 1962, 1964), and from a review of catalogued specimens in the SBMNH Paleontology collection.

c. Data from Lipps (1964), Guthrie (1985b) and from a review of catalogued specimens in the SBMNH Paleontology collection.

d. Data from Lipps et al. (1968).

e. Data from Howard (1955).

are believed to have had nesting colonies on San Miguel Island during the Pleistocene based on the presence of eggshells, undeveloped bones of immature individuals, and the abundance of bone which is concentrated in discrete areas (Guthrie 2005). Only Cassin's auklets have nesting colonies at San Miguel Island today. The puffin and flightless goose are extinct and ancient murrelets only occur as an occasional seasonal transient to the islands and no longer nest at San Miguel Island. Most of the species represented in the avian fossils recovered from Channel Island paleontological sites are species that occur today at the islands as seasonal migrants, winter visitors or resident breeders (Table 1). Seven species are extinct from the present-day avifauna of the islands including a flightless goose (*Chendytes lawri* and/or *Chendytes milleri*), a gannett (*Morus reyna*), a condor (*Gymnogyps californicus amplus*), a crested caracara (*Polyborus planicus prelutosus*), a puffin (*Fratercula dowi*), an ancient murrelet nesting population (*Synthliboramphus antiquus*), and an owl (*Asio piscus*; Table 1).

Land birds represented in the avian fossils recovered to date from paleontological sites on the islands include an extinct condor, 5 raptors (bald eagle, red-tailed hawk, crested caracara, peregrine falcon, American kestrel), 3-4 owls (barn owl, small unidentified owl, burrowing owl, and an extinct *Asio* owl), one pigeon (band-tailed pigeon), one woodpecker (northern flicker), and 11 passerines (Table 1). Of the identified passerine material, most species are either common island residents such as common raven, horned lark, song sparrow, and western meadowlark, or are common seasonal transients or winter visitors to the islands such as black-headed grosbeak, fox sparrow, white-crowned sparrow, golden-crowned sparrow, and yellow-headed blackbird (Table 1). Based on the above assessment of the avian fossil record, it is clear that the avian land bird fossil record for the Channel Islands is poorly known. Only a couple of sites on San Miguel Island (SMI 20 and 261A) have yielded a moderate number of land bird bones however, this material has not all been identified. Both of these sites are believed to represent Holocene barn owl roost sites (Guthrie 2005). Passerine bones have also recently been recovered from a small outcrop of bone bearing soil excavated at the Arlington Springs site on Santa Rosa Island in June 2008 (J. Johnson, pers. com.). This small bone bed is also probably the result of bones accumulating from barn owl pellets being deposited at the base of a Holocene barn owl roost. The passerine bones in the Arlington Springs site on Santa Rosa Island along with the 121 unidentified passerine bones from several Holocene barn owl roosts on San Miguel Island have yet to be critically evaluated for species identification. These additional fossil land bird remains could further help to clarify the fossil land bird fauna of the islands once the material is completely identified and tabulated.

Fossil Occurrence of Island Scrub-Jay: Only a single bone of an ISSJ has been identified from the 17, 881 avian fossils examined to date from the Channel Islands. That bone, a left femur (SBMNH Paleo No. 423; Figure 2), was recovered by Dan Guthrie from Site SRI-V-3 on the east side of the mouth of Arlington Canyon along the northwest shore of Santa Rosa Island. The ISSJ bone was found in an owl pellet layer in a late Pleistocene-Holocene fossil matrix (Tecolote Member) situated about 15 feet above the floor of the canyon (Guthrie 1992a). This fossil owl pellet layer also contained bones of the extinct mouse

(*Peromyscus nesodytes*; D. Guthrie in litt.). Two radiocarbon dates have been obtained from SRI-V-3. The upper part of this site, which contained the ISSJ bone, dates at $10,240 \pm 180$ BP, while a sample from near the base dates at $28,240 \pm 940$ BP (Guthrie 1998a). According to Orr (1968) the Tecolote Member originated during the Wisconsin glacial period with radio carbon dates from $>37,000$ years ago at the lowest level of this member to 10,400 years BP at the top of this member. Thus the ISSJ bone recovered from SRI-V-3 is of Holocene to late Pleistocene age. There are currently no other fossil records of ISSJ from Santa Rosa or Santa Cruz Islands. The relative lack of Pleistocene fossil sites on Santa Cruz Island is one reason why ISSJ have not been reported from the fossil record for this island. Clearly one would expect to find remains of this species in fossil sites on Santa Cruz Island assuming that there are fossil owl pellet sites which contain a reasonable amount of preserved land bird bone.



Figure 2. Fossil island scrub-jay femur (SBMNH Paleo 423) from a late Pleistocene site (SRI-V-3) at the mouth of Arlington Canyon on the northwest shore of Santa Rosa Island. Femurs in this image include a recent island-scrub-jay (top), a fossil island scrub-jay (middle) and a recent western scrub-jay (bottom).

B. Channel Islands Avian Archaeological Record

Archaeological sites on the Channel Islands contain remains of animals that Native Peoples were harvesting for food, for artifact manufacturing, for regalia and clothing, and for trade. While many sites have been excavated on each of the islands, relatively few have used methods adequate to recover all faunal remains including the remains of small and medium-sized species (e.g., land birds). Most of the early archaeological excavations on the islands tended to only collect the largest faunal elements (skulls and/or some of the larger postcranial elements from the largest species), and faunal remains that were modified for use as tools or as artifacts, or that showed evidence of having been butchered or burned. The rest of the faunal remains were usually discarded or were overlooked as they were not considered of interest to archaeologists. It is not until fairly recently that archaeologists have taken an interest in faunal remains found in archaeological sites on the islands and have begun to use sampling methods (e.g., 1/16 inch mesh screens) that are able to recover medium and small-sized faunal remains. Until recently, avian remains in Channel Islands archaeological sites have usually received less attention than have other more dominant elements of the diet of prehistoric peoples (e.g., marine and terrestrial mammals, fish, and shellfish). Recently there have been a number of Channel Island archaeological sites that have recovered and analyzed extensive amounts of avian bone (Bleitz 1993, Bleitz-Sanburg 1987; Colton 1994, 1995, 2001; Guthrie 1978, 1980, 1993a and b, 1998a; Noah 2005; Porcasi 1999; Rick 2004, 2007). Data on birds recovered from these sites form the basis for the archaeological bird remains that are synthesized in Table 2.

Avian data included in Table 2 comes from published Channel Island archaeological excavations that used adequate chronological sampling, and that had a reasonable amount of identified avian remains. Sites in which avian remains were not identified to species were not included in the data synthesized in Table 2. A total of 19 archaeological sites on the Channel Islands contained a sufficient amount of identified avian remains to be used in the following compilation of avian archaeological remains. San Miguel (8 sites) and Santa Cruz (6 sites) Islands had more sites with adequate samples of identified avian remains than did the other Channel Islands. Despite extensive excavations on Santa Rosa Island by Phil Orr in the 1940s and 1950s (Orr 1968), only two recently excavated sites (SRI-2 and 6) have used adequate chronological sampling and have a sufficient number of identified avian remains to be included in the following compilation (Erlandson et al. 1999; Rick 2003, 2004). Three sites on the southern Channel Islands contain a sufficient amount of identified avian remains (Porcasi 1999) to be included in the following compilation. These sites include Eel Point on San Clemente Island (CA-SCLI-43), Little Harbor on Santa Catalina (CA-SCAI-17), and Thousand Springs (CA-SNI-11) on San Nicolas Island. The avian archaeological record for Santa Rosa, Anacapa and Santa Barbara Islands is very poorly known.

Avian Archaeological Records from the Channel Islands

Avian remains from 8 sites on San Miguel Island, 6 sites on Santa Cruz Island, 2 sites on Santa Rosa Island and 1 site each on San Nicolas, Santa Catalina and San Clemente

Table 2. Avifauna documented from analysis of faunal remains recovered from Channel Island archaeological sites.

Scientific Name	Common Name	SMI ^a	SRI ^b	SCRI ^c	SNI ^d	SCAT ^e	SCLI ^f
Aves sp.	Birds-undifferentiated	513	162	3,759		1003	1080
Order Gaviiformes							
<i>Gavia</i> sp.	Loon-undifferentiated			2		9	3
<i>Gavia immer</i>	Common Loon	41		2		5	7
<i>Gavia pacifica</i>	Pacific Loon	39			2	2	
<i>Gavia stellata</i>	Red-throated Loon	3				2	
Order Podicipediformes							
<i>Aechmophorus</i> sp.	Western/Clark's Grebe	4	1	1		4	
<i>Podiceps</i> sp.	Grebes-undifferentiated			2		1	
<i>Podiceps nigricollis</i>	Eared Grebe	73		3	8	1	
<i>Podiceps auritus</i>	Horned Grebe	2					
<i>Podiceps grisegena</i>	Red-necked Grebe	1					2
Order Procellariiformes							
<i>Phoebastria</i> sp.	Albatross-undifferentiated			4		12	217
<i>Phoebastria albatrus</i>	Short-tailed Albatross	54			150	4	1
<i>Phoebastria nigripes</i>	Black-footed Albatross			2	3	1	
<i>Fulmarus glacialis</i>	Northern Fulmar	6		6	179	61	63
<i>Peterodroma</i> sp.	Gadfly Petrels-undifferentiated					1	
<i>Puffinus</i> sp.	Shearwater-undifferentiated			1		11	12
<i>Puffinus griseus</i>	Sooty Shearwater	10					3
<i>Puffinus creatopus</i>	Pink-footed Shearwater			1		2	10
<i>Puffinus opisthomelas</i>	Black-vented Shearwater	38					
<i>Puffinus tenuirostris</i>	Short-tailed Shearwater					2	2
<i>Puffinus bulleri</i>	Buller's Shearwater						3
<i>Oceanodroma</i> sp.	Storm-Petrels-undifferentiated					2	
<i>Oceanodroma leucorhoa</i>	Leach's Storm-Petrel	16				1	
<i>Oceanodroma homochroa</i>	Ashy Storm-Petrel	7					
<i>Oceanodroma melania</i>	Black Storm-Petrel	2					
Order Pelicaniformes							
<i>Pelecanus</i> sp.	Pelican-undifferentiated	2		48		1	8
<i>Pelecanus occidentalis</i>	Brown Pelican	16		3			
<i>Phalacrocorax</i> sp.	Cormorant-undifferentiated	42	6	330		22	20
<i>Phalacrocorax auritus</i>	Double-crested Cormorant	2		412	12	3	37
<i>Phalacrocorax penicillatus</i>	Brandt's Cormorant	451		67	65		
<i>Phalacrocorax pelagicus</i>	Pelagic Cormorant	147		4			
Order Ciconiiformes							
<i>Ardea herodias</i>	Great Blue Heron				2		
<i>Catharus aura</i>	Turkey Vulture					1	
<i>Gymnogyps californicus amplus</i>	California Condor	1					
Order Anseriformes							
	Goose-undifferentiated			3		6	1
<i>Branta bernicla</i>	Brant	2		2			
<i>Branta canadensis</i>	Canada Goose				1	1	

Historic and Prehistoric Record for Island Scrub-Jays on the Northern Channel Islands

Table 2 (cont.)

Scientific Name	Common Name	SMI ^a	SRI ^b	SCRI ^c	SNI ^d	SCAT ^e	SCLI ^f
<i>Anser albifrons</i>	White-fronted Goose			3			
<i>Chen caerulescens</i>	Snow Goose	75		4		1	
<i>Chen rossi</i>	Ross's Goose	1					
<i>Anas</i> sp.	Duck-undifferentiated			32		4	
<i>Anas platyrhynchos</i>	Mallard			8		3	
<i>Anas crecca</i>	Green-winged Teal			1			
<i>Anas cyanoptera</i>	Cinnamon Teal					2	
<i>Anas americana</i>	American Wigeon			1			
<i>Anas acuta</i>	Northern Pintail					1	
<i>Anas clypeata</i>	Northern Shoveler	1					
<i>Aythya affinis</i>	Lesser Scaup					1	
<i>Melanitta</i> sp.	Scoter-undifferentiated			7			
<i>Melanitta fusca</i>	White-winged Scoter	1		2			
<i>Melanitta perspicillatus</i>	Surf Scoter	3					
<i>Mergus serrator</i>	Red-breasted Merganser			1			
<i>Chendytes lawi</i>	extinct goose	94		23			
Order Falconiformes							
<i>Pandion haliaetus</i>	Osprey	1		2		2	
<i>Accipiter cooperii</i>	Cooper's Hawk					1	
<i>Buteo</i> sp.	Hawk-undifferentiated			6		3	
<i>Buteo jamaicensis</i>	Red-tailed Hawk	8					1
<i>Falco</i> sp.	Falcon-undifferentiated					1	
<i>Falco peregrinus</i>	Peregrine Falcon			1	4		
<i>Falco sparverius</i>	American Kestrel	1					
Order Gruiformes							
	Rail-undifferentiated			2			
<i>Fulica americana</i>	American Coot	2				2	
<i>Grus canadensis</i>	Sandhill Crane	1					
Order Charadriiformes							
	Plover-undifferentiated			1			
<i>Pluvialis dominica</i>	American Golden-Plover	1					
<i>Catoptrophorus semipalmatus</i>	Willet	2					
<i>Heteroscelus incanus</i>	Wandering Tattler	1					
<i>Calidris alba</i>	Sanderling	1					
<i>Gallinago gallinago</i>	Common Snipe					1	
<i>Phalaropus lobatus</i>	Red-necked Phalarope	1					
<i>Phalaropus fulicaria</i>	Red Phalarope	2					
<i>Larus</i> sp.	Gull-undifferentiated	10	3	362		48	33
<i>Larus heermanni</i>	Heermann's Gull	1		2			2
<i>Larus californicus</i>	California Gull	3		13	10		1
<i>Larus occidentalis</i>	Western Gull	3		6	34		
<i>Larus glaucescens</i>	Glaucous-winged Gull			1	11	1	
<i>Larus philadelphia</i>	Bonaparte's Gull	1					

Table 2 (cont.)

Scientific Name	Common Name	SMI ^a	SRI ^b	SCRI ^c	SNI ^d	SCAT ^e	SCLI ^f
<i>Rissa tridactyla</i>	Black-legged Kittiwake	8		1		1	
<i>Alcids</i> sp.	Alcids-undifferentiated	3		11			
<i>Uria aalge</i>	Common Murre	6		4		6	
<i>Cepphus columba</i>	Pigeon Guillemot	10		3			
<i>Synthboramphus</i> sp.	Murrelet-undifferentiated			1			
<i>Synthboramphus hypoleucus</i>	Xantus's Murrelet	29		1			
<i>Ptychoramphus aleuticus</i>	Cassin's Auklet	313		25	23	16	34
<i>Cerorhinca monocerata</i>	Rhinoceros Auklet	20		19	5	15	2
<i>Fratercula cirrhata</i>	Tufted Puffin	2		1		2	
Order Columbiformes							
<i>Zenaidura macroura</i>	Mourning Dove			2			
Order Strigiformes							
<i>Tyto alba</i>	Barn Owl	42					
<i>Athene cunicularia</i>	Burrowing Owl	12					
<i>Asio flammeus</i>	Short-eared Owl	2					
Order Piciformes							
<i>Colaptes auratus</i>	Northern Flicker					2	
Order Passeriformes							
<i>Passeriformes</i> sp.	Songbird-undifferentiated	103		34			
<i>Aphelocoma insularis</i>	Island Scrub-Jay			12			
<i>Corvus brachyrhynchos</i>	American Crow						1
<i>Corvus corax</i>	Common Raven	23		2		8	9
<i>Mimus polyglottos</i>	Northern Mockingbird			2			
<i>Passerella iliaca</i>	Fox Sparrow	1					
<i>Zonotrichia</i> sp.		6					
<i>Sturnella neglecta</i>	Western Meadowlark	10					
<i>Euphagus cyanocephalus</i>	Brewer's Blackbird	4					
Number of archaeological sites		8	2	6	1	1	1
Total Number of Species		56	3	41	15	37	19
Total Number of bones		2,280	172	4,962	509	1279	1552

a. Avian records compiled from SMI-1, 163, 261, 468, 470, 481, 525 and 603 (Guthrie 1980, 1998a; Rick 2007; and Rick et al. 2005b).

b. Avian records compiled from SRI-2 and 6 (Erlandson et al. 1999, Rick 2004).

c. Avian records compiled from SCRI-191, 192, 236, 240, 330 and 474 (Colton 2001, Glassow et al. 2008, Noah 2005).

d. Avian records from SNI-11 (Bleitz 1993).

e. Avian records from SCAI-17 (Porcasi 1999).

f. Avian records from SCLI-43 (Porcasi 1999).

Islands were used for the data compiled in Table 2. A total of 10,754 avian faunal elements from 82 species of birds have been recovered to date from 19 archaeological sites on six of the Channel Islands (Table 2). More than half (60.6%) of these avian remains were unidentified. Santa Cruz Island has the largest percentage of avian remains (46.1%) followed by San Miguel Island (21.2%) while the other islands have percentages ranging from 14.4% (San Clemente Island) to 1.6% (Santa Rosa Island).

Of the 82 species of birds recorded to date from 19 archaeological sites on six of the Channel Islands, 20 species (20.4%) are land birds (vultures, raptors, owls, doves/pigeons, woodpeckers and passerines) and 62 species (79.6%) are marine/aquatic/shore/wading birds (Table 2). Passerines comprise only 2.0% of the avian remains (215 specimens [137 unidentified] of 8 species), and marine/aquatic/shore/wading birds comprise 37.4% of the avian remains (3,929 specimens; Table 2). The most abundantly occurring avian remains are from cormorants (1,620 specimens from 3 species), tube-nosed birds (887 specimens from 12 species), gulls (555 specimens of 6 species), alcids (551 specimens from 6 species), and albatrosses (448 specimens of 2-3 species). The ten most commonly occurring species are Brandt's cormorant (583 specimens), double-crested cormorant (466 specimens), undifferentiated gulls (456 specimens), undifferentiated cormorants (420 specimens), Cassin's auklet (414 specimens), northern fulmar (315 specimens), undifferentiated albatross (233 specimens), short-tailed albatross (209 specimens), pelagic cormorant (151 individuals), and *Chendytes lawi* (117 specimens). Two extinct species (a condor and an extinct flightless goose) were recovered from several Early Period-Holocene sites (Table 2) while six species (e.g., red-necked grebe, short-tailed albatross, gadfly petrel [*Pterodroma* sp.], turkey vulture, Ross's goose, and sandhill crane) are either very rare or are unrecorded in the present-day island avifauna. Most species recorded in Channel Island archaeological sites are species which are known to occur as migrants, winter visitors or as resident breeders on the islands today. Clearly marine birds, cormorants, aquatic birds, gulls and alcids comprise the majority of avian remains recovered to date from Channel Island archaeological sites (Table 2).

Land birds represented in the avian remains recovered to date from archaeological sites on the islands include 2 vultures (turkey vulture, condor), 5 raptors (osprey, Cooper's hawk, red-tailed hawk, peregrine falcon, and American kestrel), 3 owls (barn owl, burrowing owl, and short-eared owl), one dove (mourning dove), one woodpecker (northern flicker), and 8 passerines (Table 2). Common raven was the most common species with a total of 42 bones recovered from archaeological sites on four of the islands (Table 2). Four of the passerine species (island scrub-jay, common raven, northern mockingbird, western meadowlark) are currently common resident breeders on one or more of the islands, three species (fox sparrow, *Zonotrichia* sp., and Brewer's blackbird) are common transients and winter visitors, and one species (American crow) is a rare visitor to the islands. Clearly the landbird fauna of the islands is poorly known based on the archaeological record. Very few archaeological excavations on the islands have recovered passerine remains and even fewer have actually identified these remains to genus or species. The largest number of passerine bones found in an archaeological site (n=124 bones) come from the Daisy

Cave site (SMN-261) on San Miguel Island (Guthrie 1980, 1998). This site held bones from four identified passerine species as well as an additional 103 unidentified passerine bones. Unidentified passerine bones recovered to date from archaeological sites on San Miguel (n=103 bones) and Santa Cruz Islands (n=34 bones) warrant further examination to see if some of this material can be identified to species. Careful reexamination of recovered unidentified passerine remains could help to further clarify the subfossil (archaeological) landbird fauna of the islands once these unidentified remains are identified and tabulated. Based on the above assessment, it is clear that passerine birds were of little economic or dietary importance to Native Peoples that inhabited the Channel Islands.

Archaeological Occurrence of Island Scrub-Jay: Only 12 ISSJ bones have been identified from the 10,754 avian remains examined from 19 archaeological sites on the Channel Islands (Table 2). These 12 bones were recovered during the excavation of House 8 at Shawa (SCRI-192), a Historic Period site (~1780s-1810 AD; J. Arnold in litt., A. Noah in litt.) on the southwest coast of Santa Cruz Island (Noah 2005). These bones represent a partial skeleton of a single individual bird, consisting of a left and right proximal femur, most of a left tibiotarsus, 8 vertebrae and a portion of a sternum (Noah 2005, A. Noah in litt.). The ISSJ bones were from the same Historic Period provenience (unit 7S,25W, 15-20 cm level) which contained historic artifacts that bracket the date for this level between 1782 AD, when the Santa Barbara Presidio and mission were established, and ~1812, when the last Shawa residents entered the mission system (A. Noah in litt.). These 12 bones represent the only archaeological occurrence that I have been able to find for ISSJ on the Channel Islands. It is possible that these ISSJ bones are from a bird that was harvested for its blue feathers that might have been used in dance regalia or other ritual paraphernalia (Noah 2005). Chumash are known to have used feathers of all colors on banners hung from ceremonial enclosures during ceremonies (Hudson and Blackburn 1985, 1986). There is also a record of “blue jay” feathers (probably Steller’s jay) having been used in a headband found in Bower’s Cave in Los Angeles County (Elasser and Heizer 1963). Clearly ISSJ were of little economic or dietary importance to the Island Chumash on Santa Cruz Island based on how rare their remains are in archaeological sites on this island.

The current archaeological record does not provide any data to help clarify whether ISSJ were present on Santa Rosa Island during prehistoric times. This is not surprising given that there are no excavations to date on this island that have used techniques adequate to recover smaller avian remains (e.g., passerine bone). Until passerine bone is recovered and identified from a number of archaeological sites on Santa Rosa Island, it will not be possible to determine if ISSJ were present on this island during prehistoric times.

C. Avian Ethnographic Record

Birds are known to have figured prominently in Chumash culture. Aquatic birds such as geese and ducks, cormorants, shearwaters and fulmars, gulls, and alcids were harvested as a source of food. A few species of birds were harvested for their skins

(cormorants, condors), which were used for waterproof capes and dresses (Hudson and Blackburn 1985). Bird feathers and skins were used in a variety of other material culture items including clothing and regalia used in dances, rituals, and ceremonies. Bones from some species of birds were also made into artifacts such as bone awls, bone whistles and flutes, and bone scrapers (Gifford 1940, Orr 1947). Birds are represented in Chumash place names, myths, ceremonies, symbolism and medicinal practices (Timbrook and Johnson unpubl. ms). Birds had spiritual significance to Native Peoples with some species serving as personal talismans associated with an individual's spirit guide or "dream helper."

Chumash Food and Artifacts

A number of birds were used by the Chumash as a source of food or for artifacts. In general, species that figured prominently in the diet of the Island Chumash were usually colonial nesting or roosting species such as cormorants, Cassin's auklets, and gulls, or wintering aquatic species such as loons, grebes, ducks and geese. While many other species were also harvested to be eaten, their contribution to the overall diet of the Island Chumash was probably not significant. Land birds in particular do not appear to have been important as a source of food to the Island Chumash, as shown in the previous section. Artifacts made from bird bones include bone tubes, whistles and flutes (brown pelican, albatross, great blue heron, red-tailed hawk, snow goose, and kittiwake), bone awls (cormorants), and bone scrapers (albatross and goose; Gifford 1940, Orr 1947, Timbrook and Johnson unpubl. ms.).

There are no ethnographic or archaeological records of jays (WESJ, ISSJ, or Steller's jays) being used for food or for bone artifacts by either the mainland or island Chumash Peoples. The ISSJ bones recovered from SCRI-192 showed no evidence of having been cooked, which suggests that this particular specimen was probably not harvested as food. Rather, the skeletal elements that were present suggest that this individual was probably harvested for its feathers (Noah 2005).

Chumash Clothing, Ornamentation and Regalia

The Chumash are known to have used blankets and capes to keep warm during colder weather. Some of these garments were made out of bird skins (cormorants) that were either sewn or woven together (Hudson and Blackburn 1985). Bird feathers and feather down were also twisted into plant fiber to make cordage which was then woven into a cape or blanket (Hudson and Blackburn 1983, 1985). There are no ethnographic data to confirm whether jay feathers or skins were used in blankets and capes. Given the small size of jays and the thin/fragile nature of their skins, it is unlikely that jays were used for making blankets or garments. It is more likely that jay feathers could have been used as decorative elements on these types of garments. However, there are no artifacts or ethnographic accounts to confirm that Island Chumash were using ISSJ feathers as decorative elements on blankets or capes.

One of the most important ways that birds were used by the Chumash was as decorative elements on ceremonial or dance regalia (Timbrook and Johnson unpubl. ms).

Several types of skirts were worn by dancers when performing dances at religious and secular gatherings. One type was made with four or five layers of overlapping feathers attached to a net of nettle or milkweed fiber cordage. Feathers that were known to have been used on Chumash feathered net skirts include hawk, golden eagle, vulture, gull, magpie, crow and woodpecker (Grant 1964, Hudson and Blackburn 1985, Timbrook and Johnson unpubl. ms.). A second type of dance skirt was made from feather down twisted together with milkweed or nettle fiber cordage, with many such strands suspended from a waistband. The tips of these knee-length down cords were typically decorated with the feathers of various birds (Hudson and Blackburn 1985). Given the colorful nature of jay feathers (bright blue), it is expected that they would have been used as decorative elements on such ceremonial or dance regalia. However, there are no archaeological or ethnographic records that can confirm the use of jay feathers in this way by the Chumash. The ISSJ bones recovered from a site on Santa Cruz Island suggests that this specimen was probably harvested for its feathers (Noah 2005).

The most common type of dance headdress was the topknot style worn on the top or back of the head. A tuft of long tail feathers, usually magpie, was surrounded by a ring of split feathers (Hudson and Blackburn 1985). These headdresses were said to be black in color, so ISSJ would not have been used to make them.

Feather bands were worn by Chumash dancers as headbands on the forehead, down the back, and as a bandolier (Elasser and Heizer 1963). Long feather bands were also hung from poles as banners or flags at outdoor dance enclosures (Hudson and Blackburn 1985, 1986). These feather headdresses and banners were typically made by placing large numbers of northern flicker tail feathers side-by-side and sewing them together. However, other species were also used in this way, at least by close neighbors of the Chumash. Wing and tail feathers from a variety of birds (crow, brown pelican, condor, red-shouldered hawk, snowy egret, bald eagle, Steller's jay, western scrub-jay, band-tailed pigeon, and grouse) were used in the construction of 33 feather headbands and banners found at Bowers Cave in northern Los Angeles County (Elasser and Heizer 1963). There are no known feather headdresses or feather banners in existence from the northern Channel Islands. Thus no artifacts exist to confirm whether Chumash on the islands used ISSJ feathers in these types of material culture items. Given the bright color of ISSJ feathers and the fact that WESJ feathers were found in some of the feather banners from Bowers Cave, it may be that feathers from this species were included in feather headdresses and feather banners worn by Chumash Peoples on one or more of the northern Channel Islands.

Birds were also used in Chumash ornaments and jewelry worn by both men and women. These included hairpins of bird bone, hollow cut segments of bird bone made into necklace beads, pieces of mammal bone or wood decorated with feathers, and bird claws (particularly eagle talons) threaded and worn as pendants (Gifford 1940, Hudson and Blackburn 1985, Orr 1947, Timbrook and Johnson unpubl. ms.). No extant artifacts or ethnographic accounts confirm whether Chumash used ISSJ or WESJ bones or feathers in

their ornaments or jewelry. It seems likely that, at least on Santa Cruz Island, jay feathers may have been used on ornaments and jewelry, but jay bones would have been too fragile for use as jewelry or pendants.

Chumash Dances, Oral Traditions, and Rituals

The ethnographic literature contains no information that confirms whether jays (1) figured into any Chumash stories or myths; (2) were associated with any dances; or (3) held any special religious or ritual importance to the Chumash on the Channel Islands. The Chumash are known to have had a number of dances that were named after animals such as the blackbird dance, the condor dance, the crane dance and the fox dance (Hudson et al. 1977, Hudson and Blackburn 1985, Hudson and Underhay 1978). There are no Chumash dances or ceremonies known to be associated with jays. Neither are there any known Chumash stories or myths in which jays are included as principal or secondary characters (Blackburn 1975, Hudson and Blackburn 1986, Hudson et al. 1977).

Birds did figure into a number of Chumash public and private religious practices. Feathers (turkey vulture, crow, condor, raven, or eagle) were used to embellish poles at Chumash shrines (Hudson and Blackburn 1986). Feather down was left as offerings at shrines, scattered to bring rain, and used to feed ritual objects (Timbrook and Johnson unpubl. ms.). Birds' claws (eagles), skulls and bills, stuffed bird heads (hawk and eagle), and dried birds (hummingbird) were among objects worn suspended as a pendant from a cord around one's neck as a personal talisman (Hudson and Blackburn 1986). The Chumash also carved effigies (zoomorphic representations) in the shape of birds such as pelicans and cormorants to serve as personal talismans, to help bring their owners success in fishing (Hudson et al 1978; Timbrook and Johnson unpubl. ms.). No effigies that resemble jays have been found on the islands or the mainland, nor are jay feathers known to have been scattered to bring rain, left as offerings at Chumash shrines, or used to embellish shrine poles. Given the size, color and relative abundance of ISSJ on Santa Cruz Island, it is conceivable that the Chumash could have used ISSJ feathers to embellish poles at their shrines, and ISSJ parts (skulls, mandibles, wings, tails or stuffed heads) as personal talismans. Although the ethnographic and archaeological record does not confirm any of these types of uses of ISSJ by the Island Chumash, jays might have been used in some of these ways given what is known about bird parts in the material culture of Chumash Peoples on the adjacent mainland

Socio-political and religious aspects of Chumash culture are not well known. The Chumash did have a cult organization similar to the Chingichngish religious-ceremonial organization among the Gabrieliño and Luiseño. Members of this cult were known as *'antap*, and their primary responsibility was to perform the dances and other rituals at large public ceremonies. Members were baptized into the cult as children, and through a period of apprenticeship learned the esoteric language, sacred songs and dances, and other aspects of ritual that characterized it (Blackburn 1974:104). Among peoples known to be organized into clans (related families identified with and lineally descended from a common ancestor, often an animal or mythical being), pieces or parts of an animal

associated with a particular clan were often kept by clan members. When a clan member died, a part of the animal associated with that clan might be buried with him/her. Although the Chumash are not believed to have had totemic clans, the fact that island fox (*Urocyon littoralis*) skulls have been found with several human burials or in human cemeteries on Santa Cruz and Santa Rosa Islands indicates some sort of special relationship between the individuals and that animal. One possibility is that these individuals may have been members of the 'antap cult who performed the fox dance on the islands (Collins 1991). There is no archaeological or ethnographic evidence of a jay clan, of any ceremonies associated with jays, or of pieces or parts of jays being buried with individuals on any of the Channel Islands. However, given the prominent nature of this species on Santa Cruz Island, it is possible that jays might have figured into the socio-political and religious aspects of the Island Chumash.

Most Chumash individuals had spirit guides or “dream helpers” to help them make contact with the supernatural and to assist them through life. Dream helpers were often unsought and typically came to an individual through *Datura*-induced visions (Applegate 1978; Timbrook and Johnson unpubl. ms). The dreamer was careful to respect and obey his dream helper, and in time of need a dream helper could be called upon for support (Applegate 1978). Dream helpers were typically animal spirits, but could also be ghosts or personified natural forces. Typically it was the larger, more important, and more dangerous animals (i. e., eagle, bear, mountain lion, and rattlesnake) that served as dream helpers. However, “less consequential creatures like fox, blackbird, frog, or lizard” also appeared as dream helpers among some tribes in south central California (Applegate 1978). An essential part of the dream helper complex is the talisman or 'atishwin as it was called by the Chumash. “The talisman is the physical representation of the helper; it not only symbolizes the relationship of an individual to his dream helper, it is an actual channel of power” (Applegate 1978:53). The talisman was often a piece or part (i. e., fur, claw, skull, teeth) of one's dream helper. Possession of a talisman was thought to confer supernatural power on its owner by directly linking an individual with his/her dream helper (Hudson and Blackburn 1986). Talismans were often buried with an owner at the person's death as a way of helping him/her on the journey to the Land of the Dead (Applegate 1978; Blackburn 1975). This may be an explanation for some of the island fox burials described above. Currently there is no ethnographic or archaeological evidence to show that the Island Chumash used ISSJ as dream helpers. However, given the abundance and prominence of ISSJ on Santa Cruz Island, it is possible that they may have served as dream helpers for some Island Chumash.

Chumash Language

Language is also important in helping to determine if ISSJ were recognized by the Island Chumash. Native Peoples gave names to plants, animals, and places in the world around them (Merriam 1979), to features of the landscape, and to elements of their myths (Applegate 1974). Vocabularies for the Chumash at La Purisima (Purisimeño), Santa Barbara (Barbareño), Santa Ynez (Ineseño), San Buenaventura (Ventureño), San Luis

Obispo (Obispeño), and Santa Rosa Island (Roseño) were recorded by Henshaw (1955) and are further described in a number of other sources (Applegate n.d., 1972, 2007; Beeler 1976, 1979; Beeler and Klar 1977; Klar 1973; Kroeber 1910; Pinart 1952). Dialects for the Chumash tribes that inhabited Santa Cruz (Cruzeño), Santa Rosa (Roseño) and San Miguel (Migueleño) Islands are not as well documented as mainland languages (Beeler and Klar n.d., Henshaw 1955, Klar 2002). The best known is the Santa Cruz Island dialect (Beeler and Klar n.d.). Henshaw (1955) and Pinart (1952) provide a limited vocabulary for the Roseño dialect of Santa Rosa Island.

In 1884, Henry W. Henshaw interviewed Anacleto (“Aniceto”) Pailleletset, a Chumash Indian who was born on Santa Rosa Island ca 1812 but only lived on the island for less than two years before he was taken to Santa Barbara. He was baptized on June 21, 1816, and grew up on the mainland (J. Johnson pers. com.), where he later worked for the de la Guerra family for 72 years (Henshaw 1955). Anacleto probably lived with his parents on the mainland until their deaths. His father Apolinar (*Ualanunatste*), who is thought to have come from the village *Lakayamu* located at the west end of Santa Cruz Island, died in 1821 (J. Johnson pers. com.). His mother Beatriz, who came from the village *Elehuasqui* (*Helwashkuy*) on the south side of Santa Rosa Island near Ford Point, died in 1825 (J. Johnson pers. com.). Anacleto was about 9 years old when his father died and was about 13 years old when his mother died. Anacleto would likely have been exposed to the Cruzeño and Roseño dialects spoken by his parents for the first 13 years of his life. However, following the death of his mother, Anacleto probably began working for the de la Guerra family. From that point on he would have been exposed to a number of other mainland Chumash dialects and may not have had much additional exposure to the island dialects. At the time he was interviewed by Henshaw, Anacleto was 70-80 years old and was said to have spoken the Barbareño dialect as his usual speech when he wasn’t speaking Spanish. He had apparently not used the Santa Rosa Island dialect on a day-to-day basis while on the mainland and as a result his memory of this island dialect was heavily influenced by the mainland dialects that he did speak on a daily basis (Henshaw 1955). Henshaw suspected that some of the terms that Anacleto gave him were actually from Barbareño and Ineseño dialects. The transcription of Anacleto’s island speech also includes characters which appear closer to the Cruzeño dialect than to the Roseño dialect (Beeler and Klar n.d.).

Only one recorded Chumashan place name refers to jays. A place at the mouth of De la Cuesta Canyon near Buellton in Santa Barbara County was called *s’uw mach’a’y*, meaning ‘the scrub jay eats’ in Ineseño (Applegate 1974, 1975). Jays are not associated with any other place names within the Chumash territory or on any of the northern Channel Islands. The Chumash named many of the birds that they encountered, often using words that reflected the sound a particular bird makes. The Chumash recognized two species of jays, a crested jay (Steller’s jay) and a chaparral jay (scrub jay) (Merriam 1979). Chumash and Luiseño names for scrub-jays were *ch’a’y* in Barbareño and Ineseño, *chi-chi* in Ventureño, and *chah-ish* in Luiseño (Applegate n.d., 2007; Merriam 1979; Whistler 1980). The Cruzeño lexicon includes words for a variety of birds (blackbird, crow, eagle, goose,

heron, hummingbird, mourning dove, owl, pelican, quail, and sea gull), but no specific words for any species of jay (Beeler and Klar n.d.). The putative Roseño vocabulary that Anacleto provided Henshaw in 1884 did not give a word for chaparral jay (scrub-jay) but referred to blue-crested jays (Steller's jays) as *tcu-we-we* (Henshaw 1955). Other Chumash words for Steller's jay include *pu-pu* in Barbareño, *kao-kao* in Ineseño, and *wo-i-wo'-yo* in Obispeño (Henshaw 1955, Merriam 1979).

It is possible that Anacleto had learned the word he gave Henshaw for blue-crested jay while he was growing up on the mainland and that it is from one of the mainland Chumash languages. On the other hand, he may have learned the term from his parents, who likely spoke an Island Chumash language (Cruzeño and/or Roseño dialect). If the term was passed down from his parents, then it most certainly would have been the word used by the Island Chumash to refer to ISSJ, since Steller's jays have never been recorded on any of the Channel Islands and Anacleto's parents would not have seen them there. If the Roseño dialect had a word for a species of jay on Santa Rosa Island, that suggests the possibility that ISSJ were present on SRI in the early 1800s when Native Peoples were still living there. However, Anacleto's father was originally from a village at Forney's on Santa Cruz Island (J. Johnson pers. com.). He may have learned a Cruzeño word for ISSJ while growing up on that island and later passed it on to Anacleto, who told it to Henshaw. Therefore the word *tcu-we-we* might have been a Cruzeño, not a Roseño, word for ISSJ. In light of these various possibilities, the actual origin of the word that Anacleto gave Henshaw for blue-crested jay cannot be confirmed.

D. Channel Islands Avian Historical Record

The Spanish and Mexican Period (1769-1848)

Since their discovery in 1542 by Juan Rodrigues Cabrillo, the NCI have been visited by at least four expeditions including Sebastian Rodriguez Cermeno in 1595, Sebastian Vizcaino in 1602, Miguel Costanso on the Portola expedition in 1769, and George Vancouver in 1795. These early expeditions generally focused on charting and naming the islands, describing encounters with the island inhabitants, and on writing about their travels. Written accounts of these early expeditions occasionally provide very brief statements regarding habitats seen on one or more of the islands. However, these descriptions tend to be very brief and provide no information about the wildlife fauna of the islands. This lack of any descriptive information regarding the fauna of the islands continued through the Mexican period. Bird and mammal specimens were being collected from areas along the mainland of California (Alta California) by the late 1700s (Beidleman 2006). Specimens were collected in California during the French La Perouse Expedition at Monterey in 1786, during the Spanish Malaspina Expedition in 1791, and during the British Vancouver Expedition with Archibald Menzes in 1792-1795 (Beidleman 2006). No birds appear to have been collected off any of the Channel Islands until the middle of the 19th century at the very end of the Mexican Period.

Early specimen collecting provides a window into the period of discovery when explorers, naturalists and the first ornithologists began to visit the islands. The period

of discovery for the avifauna of the Channel Islands begins in November 1841 with the arrival of William Gambel, the first frontier naturalist to reach California. Gambel spent the next year traveling in California collecting birds and plants which he shipped back to the Academy of Natural Sciences in Philadelphia. He made two brief visits to Santa Catalina Island in mid-February and April of 1842 but apparently did not collect any birds while on the island. During the first visit to Santa Catalina Island Gambel observed bald eagles (*Haliaeetus leucocephalus*) and osprey (*Pandion haliaetus*) nesting on the island (Gambel 1846) and during the second visit he reported hearing orange-crowned warblers (*Vermivora celata*) singing at the island (Gambel 1847). Aside from these brief statements about these three species, Gambel provides little additional information about other birds that he observed while on Santa Catalina Island in 1842 nor does it appear that he collected any birds while on the island. Gambel's closest encounter with the NCI came at night on June 15, 1842 while on the way to Monterey he sailed past Santa Cruz Island on the *Alert* (Bush 1983). He did not stop and land on any of the NCI nor is there any written record of whether he observed any birds while passing the NCI. It is possible that Gambel may have visited a number of the Channel Islands including some of the NCI while serving as a clerk for Commander Jones aboard the U.S.S. *Cyane* between 1843 and 1845. However, Gambel's field notes have never been found and archival materials related to the U.S.S. *Cyane* have not as yet been carefully reviewed to see if there is correspondence or other written materials about the Channel Islands by Gambel while he was serving on the *Cyane*.

In early October 1846, Captain Henry Kellett on the H. M. S. *Herald* and Lieutenant Commander James Wood on the tender H. M. S. *Pandora* made brief stops at several of the Channel Islands (Browne 1869). During these brief visits to the islands, they collected two island foxes (BMNH 50.1.26.23, 50.1.26.24) on Santa Rosa Island, an eared grebe (BMNH 50.1.31.8) at Santa Barbara Island, and a California gull at Santa Catalina Island (BMNH 50.1.31.3). In the written account of the voyage of the H.M.S. *Herald* (Seemann 1853), there are no additional details describing other wildlife observed or the condition of the vegetation on each of islands that were visited.

The Early American Period (1849-1900)

Beginning in the 1850s and continuing through much of the remainder of the 19th century the federal and state governments sent expeditions with surveyors, geologists, paleontologists, anthropologists and naturalists to the western United States for the purpose of making accurate maps, collecting geological and geographical data, and documenting natural history. During this period a number of naturalists associated with these expeditions reached one or more of the Channel Islands and either collected specimens or recorded data about the fauna that they encountered. Expeditions and survey programs that ended up reaching the Channel Islands included the U. S. Coast and Geodetic Survey, California Geological Survey, U. S. Geological Survey (Wheeler Survey), U. S. Fish Commission Surveys, and United States – Mexican International Boundary Survey. Only a few of the naturalists who reached the Channel Islands during this period were ornithologists (e.g., Alfred W. Anthony, James G. Cooper, Henry W. Henshaw, and

Edgar A. Mearns). Most of the others were trained in other fields and only incidentally collected specimens or recorded information about the fauna that they encountered while on the islands. The following subsections will summarize the work that was done relative to the avifauna of the islands during each of these expeditions/survey efforts.

United States Coast and Geodetic Surveys: A number of individuals who were working in various capacities for the U. S. Coast and Geodetic Survey (W. G. Blunt, William H. Dall, George Davidson, E. A. Eastman, Steham Forney, William G. W. Harford, William P. Trowbridge, and John Xantus) also were occasionally collecting specimens (birds, mammals, insects, archaeological artifacts, botanical specimens and/or shells). The first to collect specimens from the islands was William P. Trowbridge who worked for the Coast and Geodetic Survey from 1853 until 1856 establishing tidal observation stations along the Pacific Coast. In the fall of 1855 he accompanied Mr. C. J. W. Russell to Cuyler Harbor at San Miguel Island to set up and run a tidal station (Trowbridge 1856) which was run for a period of 14 days from 9 to 23 November 1855 (Pourtales 1856). During the time that he was present on San Miguel Island, Trowbridge collected two island foxes (Baird 1857) and six birds (eared grebe, *Cygnus* sp., black oystercatcher, black turnstone, barn owl, and burrowing owl; Baird 1858; USNM bird catalogue). The island foxes were used by Spencer F. Baird to describe the species (Baird 1857). The birds collected from San Miguel Island by Trowbridge were originally housed in the U. S. National Museum bird collection but were subsequently transferred to the University of Michigan, Museum of Zoology (Winchell 1861) where they were later discarded or given away to other schools for teaching (Payne 2000). Trowbridge does not appear to have collected birds from any of the other Channel Islands nor does he appear to have visited Santa Rosa or Santa Cruz Islands.

While in transit in mid-March 1859 from San Francisco to Cabo San Lucas, Baja California del Sur, Mexico, John Xantus collected a pigeon guillemot (*Ceppus columba*; USNM 23389) at San Nicolas Island. Spencer F. Baird of the Smithsonian Institution had suggested in a letter to John Xantus dated December 30, 1858 that he stop at the Channel Islands to collect specimens for the Smithsonian (Zwinger 1986). Baird thought that the fauna of the islands likely contained a number of indigenous species, and that as such the islands warranted a more thorough exploration. Baird suggested that Xantus explore the Channel Islands on his return from Cabo San Lucas in March 1860. Xantus only made a very brief visit to San Nicolas Island on his trip south to Cabo San Lucas and does not appear to have visited any of the islands following the completion of his tidal monitoring work for the U. S. Coast and Geodetic Survey in early August 1861 (Coan 1981). It is unfortunate that Xantus was unable to focus field work on the Channel Islands as he was well versed in the collection and preparation of specimens for museum collections. He made extensive collections for the Smithsonian from the Ft Tejon area of California and from the Cabo San Lucas area of Baja California, Mexico. He could have added greatly to our understanding of what the indigenous avifauna of these islands was like in the middle of the 19th century prior to the extensive degradation of island plant communities wrought by the introduction of feral herbivores.

Stehman Forney was a topographer employed as an Assistant with the U. S. Coast and Geodetic Survey beginning in 1865. While assigned to the west coast he was in charge of the topographic surveys of San Miguel (1871), Santa Rosa (1872-1873), Santa Cruz (1873-1875), Santa Barbara (1879), San Nicolas (1879), Santa Catalina (1878) and San Clemente Islands (1878-1879). While working on the topographic survey of San Miguel Island in 1871 from April 12th to October 31st, he along with several other U. S. Coast and Geodetic employees (G. Davidson, and W. G. W. Harford) collected a series of birds while on the island. Forney collected 8 birds (ashy storm-petrel, pelagic cormorant, wandering tattler, black turnstone, western gull, 2 Cassin's auklets, and rhinoceros auklet) which were given to Henry W. Henshaw in 1875 when the two met on Santa Cruz Island. Forney's specimens from San Miguel Island are currently housed in the bird collections at the British Museum of Natural History. Forney does not appear to have collected birds from any of the other islands that he spent considerable time on.

George Davidson, Superintendent of the U. S. Coast Survey along the west coast, helped Steham Forney establish his camp on San Miguel Island in 1871. During his stay on the island, Davidson collected 19 birds (double-crested cormorant, 2 pelagic cormorants, great egret, 2 bald eagles, 2 black oystercatchers, American oystercatcher, 3 western gulls, 3 pigeon guillemots, 2 Cassin's auklets, 2 tufted puffins) which were donated to the Philadelphia Academy of Sciences. Davidson also visited a number of the Channel Islands in the 1850s at the beginning of the U. S. Coast and Geodetic Surveys along the west coast. It does not appear that he collected any birds during these earlier visits to the islands since there are no Channel Island specimens in museum collections collected by Davidson during this period.

William G. W. Harford, a collector and naturalist with an interest in conchology and spiders, reached several of the Channel Islands with the help of the U. S. Coast Survey. In the fall of 1871 he reached San Miguel Island where he collected 13 birds (pelagic cormorant, Brandt's cormorant, 2 surf scoters, red-tailed hawk, 2 black oystercatchers, black turnstone, Heermann's gull, royal tern, pigeon guillemot, and 2 Cassin's auklets), 1 sea otter (*Enhydra lutris*), and some prehistoric artifacts. Harford reached Santa Rosa Island in June 1872 where he collected 2 deer mice (*Peromyscus maniculatus*; USNM 12342-12343), a few botanical specimens (Junak 1996), and additional prehistoric artifacts (Glassow 1996; USNM Accession No. 2747). He returned to Santa Rosa Island in 1873 and again in late 1874 (Junak 1996). Harford also visited Santa Cruz Island in November 1874 (Junak 1996) and with Albert Kellogg may also have visited Santa Barbara Island in February 1871 (Junak et al. 1993). Harford's specimens from San Miguel and Santa Rosa Islands are in the collections at the U. S. National Museum. No field notes have been found for any of Harford's trips to the islands and aside from the birds collected while on San Miguel Island, he does not appear to have collected birds during any of his other island visits.

William H. Dall, a malacologist, paleontologist, zoologist, anthropologist, coast pilot, and Alaskan pioneer, worked as an Assistant on the U. S. Coast and Geodetic Survey

from July 1, 1871 until September 19, 1884 (Woodring 1958). During his work with the U. S. Coast and Geodetic Survey he made zoological collections incidental to his surveying and charting duties. While most of his time was spent in Alaska, he did make at least one trip to the Channel Islands during which he collected a few birds and mammals. Inspired by the prehistoric artifacts that William G. W. Harford had collected during visits to San Miguel and Santa Rosa Islands in 1872-73 (Dall 1874, Putnman 1879), William H. Dall decided to visit the Channel Islands. He conducted a collecting trip to Santa Catalina Island from January 30 to February 4, 1874 where he collected six birds (2 grebes, 2 Cassin's auklets, rhinoceros auklet and a sparrow), several fish, a variety of mollusks and other invertebrates and some anthropological artifacts (Dall 1873a and b). Next he made a brief visit to San Miguel Island on February 9-10, 1874 during which he collected an island fox skull, insects, mollusks, archaeological artifacts, and human remains (Dall 1873a and b). Aside from the few birds that he collected while on Santa Catalina Island, there is no additional information in Dall's field notes about other avifauna encountered during his visits to these two islands (Dall 1873a). Dall does not appear to have visited Santa Rosa or Santa Cruz Islands nor did he collect birds from any of the other Channel Islands.

California Geological Survey (1863): James Graham Cooper, after whom the Cooper Ornithological Society is named, was a physician on the Pacific Railroad Surveys in 1853-1855, and a zoologist on the Geological Survey of California (Coan 1981). It was in this latter capacity that Cooper visited several of the Channel Islands in 1861 (Santa Catalina Island), 1862 (Santa Cruz Island) and 1863 (Santa Barbara, San Nicolas, Santa Catalina and San Clemente Islands). Cooper was one of the first scientists to visit and to collect birds on the Channel Islands. Between October 30 and November 3, 1861, he collected a total of 6 birds (surf scoter, black-bellied plover, blue-gray gnatcatcher, spotted towhee, and 2 white-crowned sparrows) while on Santa Catalina Island. During a boat transit between San Pedro and San Francisco, he spent several hours ashore on Santa Cruz Island in the vicinity of Prisoner's Harbor on May 22 or 23, 1862 (Whitney 1865). Cooper apparently only collected mollusks during this brief visit (Cooper 1862). In 1863, Cooper began a series of trips to the southern Channel Islands during which he collected specimens (Coan 1981). Between May 24th and June 12th, 1863, Cooper was on Santa Barbara Island where he collected 10 birds (double-crested cormorant, peregrine falcon, black oystercatcher, American oystercatcher, 5 Cassin's auklets, and song sparrow). He worked on Santa Catalina Island collecting birds and mollusks for a total of 17 days in 1863 (12-27 June and 10 July, 1863), on San Nicolas Island for two days (29 June - 1 July, 1863), and on San Clemente Island for five days (30 June - 4 July, 1863; Cooper 1863). During his trips to the islands in 1863, Cooper collected 1 bird at San Clemente Island (Heermann's gull), two birds at San Nicolas Island (short-tailed albatross, sooty shearwater), and 3 birds at Santa Catalina Island (short-tailed albatross, 2 rufous-crowned sparrows). Aside from the specimens that Cooper collected while on the islands, he left relatively little in the way of a written record of his findings (Cooper 1862, 1863). Cooper does not appear to have written any field notes while working on the islands and as such there is no additional information about the birds he encountered while on the islands other than the specimens he collected. Cooper does provide a listing of 54 species of birds

that he observed or collected while working on the southern Channel Islands in the early 1860s (Cooper 1870b). Additional information about some of the birds observed during these early trips to the islands can also be found in Cooper (1868, 1870a). It is unfortunate that Cooper never made it to the NCI to conduct more intensive surveys of the island avifaunas. If he had, then he would likely have been the first to observe ISSJ on Santa Cruz Island. And, if at that time ISSJ was indeed still present on Santa Rosa Island, he may have had an opportunity to document its occurrence there.

United States Geological Survey - Wheeler Survey (1869-1879): Henry W. Henshaw (Figure 3), naturalist for the Wheeler Survey (1872-1879), conducted a collecting trip to Santa Cruz Island on June 1-11, 1875 (Henshaw 1876). Mr. Henshaw along with mineralogist Oscar Loew, and physician and botanist Joseph T. Rothrock were transported to and from Santa Cruz Island by Lieut. Commander H. C. Taylor aboard the U. S. Coast Survey steamer *Hassler* (Loew 1876). During the Santa Cruz Island trip, Henshaw collected a total of 37 birds (BMNH, USNM; Henshaw 1876) including the first ISSJ. A decade later Henshaw used these specimens to describe a new species of jay, *Aphelocoma insularis*, which he listed as endemic to Santa Cruz Island (Henshaw 1886). Twenty-nine of the birds collected by Henshaw were accessioned into the ornithology collection at the Smithsonian Institution (USNM) while 18 specimens were integrated into Henshaw's private collection which was purchased by Dr. Goldman and given to the British Museum of Natural History (BMNH) in 1885 (Henshaw 1920). Nine specimens collected on San Miguel Island by S. Forney were apparently given to H. W. Henshaw when he visited Santa Cruz Island in 1875. Forney was working on a topographic survey of Santa Cruz Island at the time of Henshaw's visit. All of Forney's specimens that were in Henshaw's private collection are now housed in the bird collections at the British Museum of Natural History in Tring. At the time of Henshaw's visit to Santa Cruz Island, habitats on the island were already suffering from the adverse effects of intensive sheep grazing. It is unknown if any landbirds had disappeared from the island avifauna prior to Henshaw's 1875 visit since no detailed surveys had been conducted of the avifauna of this island. Henshaw's 1875 trip to Santa Cruz Island represents the first detailed work to document the avifauna of the island. Henshaw does not appear to have visited any of the other Channel Islands during his work on the Wheeler Survey.

United States Fish Commission Surveys (1888-1889): Between 1886 and 1896, Charles H. Townsend served as a naturalist aboard the U. S. Fish Commission's steamer *Albatross* (Palmer 1947). On May 8, 1888 he collected several birds at San Clemente Island. The following winter of 1889, the *Albatross* sailed between San Francisco and the Gulf of California where it made stops at many of the islands off Upper and Lower California (Townsend 1890). During January and February 1889 stops were made and a total of 77 birds were collected at 5 of the 8 Channel Islands (Townsend 1890). Townsend collected 5 species of birds (13 specimens) at Santa Rosa Island on January 7, 1889; 1 species (4 specimens) at San Nicolas Island and 9 species (33 specimens) at San Clemente Island on January 25, 1889; 10 species (19 specimens) at Santa Cruz Island on February 6-7, 1889, including 7 ISSJ; and 4 species (8 specimens) at Santa Barbara Island on February 13, 1889.

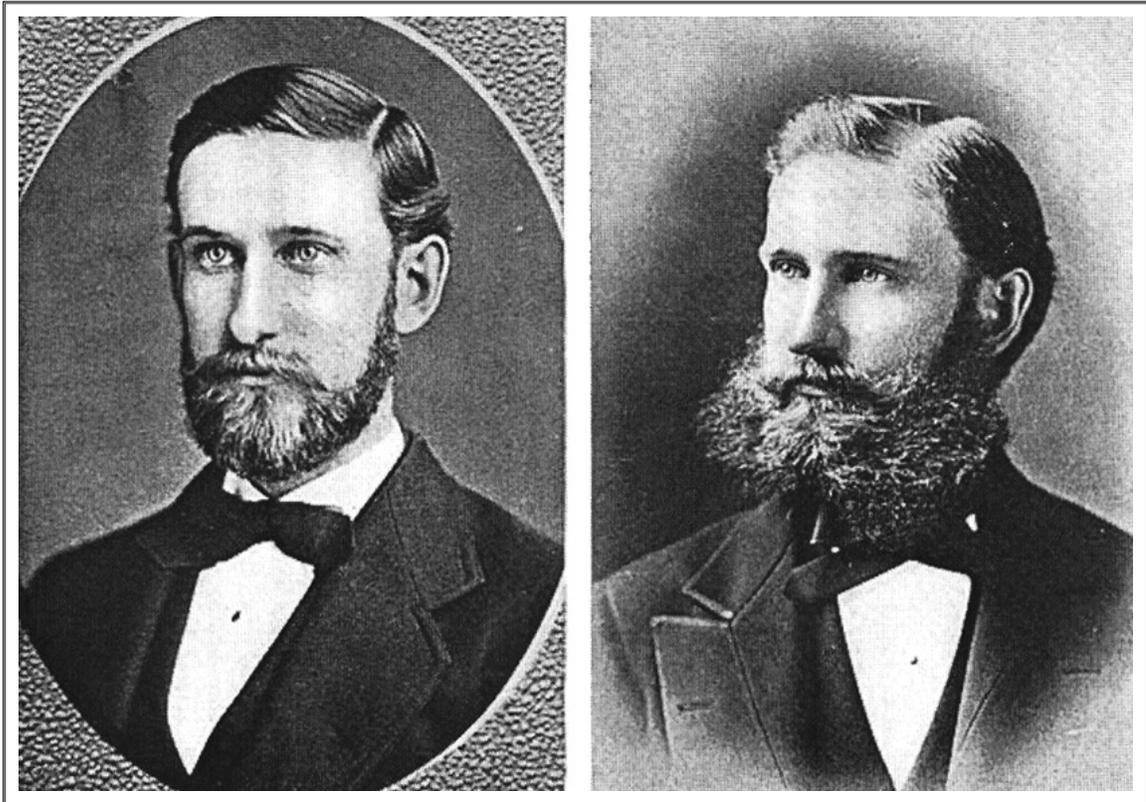


Figure 3. Henry W. Henshaw at age 23 and 28 when he was working as a naturalist on the Wheeler Survey (1873-1878). It was during this survey that Henshaw visited Santa Cruz Island in June 1875 and collected the first island scrub-jays (*Aphelocoma insularis*). Photographs are from Nelson (1932:403).

Using specimens that he collected from the islands, Townsend (1890) described three new subspecies of landbirds endemic to one or more of the Channel Islands (*Helminthophila* [=*Vermivora*] *celata sordida*, *Melospiza fasciata* [*melodia*] *clementae*, and *Otocoris* [=*Eremophila*] *alpestris insularis*). Townsend did not observe nor did he collect any ISSJ while on Santa Rosa Island on January 7, 1889.

United States – Mexican International Boundary Survey (1892-1894): Edgar A. Mearns, a medical officer and naturalist with the United States-Mexico International Boundary Commission from 1892 to 1894 (Hume 1942), joined Alfred W. Anthony, another prominent naturalist, for a trip aboard the U. S. revenue cutter *Wolcott* to San Clemente Island on August 22-29, 1894 (Mearns 1894a, 1907). While at San Clemente Island these two naturalists collected a total of 80 birds (61 landbirds and 19 shorebirds) and three mammals (Anthony 1894; Mearns 1894a and b; CMNH, USNM). They recorded a total of 31 species of birds at the island during this 1894 trip (Mearns 1907). Mearns described two endemic land birds (*Carpodacus clementis* [= *C. mexicanus clementis*] and *Lanius ludovicianus anthonyi*) using specimens collected from San Clemente Island as well as

from a number of the other Channel Islands (Mearns 1898). Neither of these two naturalists visited any of the other Channel Islands following their trip to San Clemente Island in the summer of 1894.

Antiquity Collectors and Naturalists not Associated with Formal Government Surveys:

During the latter half of the 19th century there were a number of individuals who visited one or more of the Channel Islands to collect antiquities, fossils, or other specimens (plants, insects, birds, mammals) for Museums or private collections. These individuals were not always associated with formal government surveys but some were gathering antiquities and specimens for sale or donation to museums. Several of the early antiquities collectors also occasionally collected birds or mammals, or mentioned in their notes other biota that they encountered while on an island. Some of the earliest individuals who were active at collecting antiquities and specimens on the Channel Islands included Gustav Eisen, Leon de Cessac, Stephen Bowers, Paul Schumacher, Lorenzo Yates and William G. W. Harford.

Dr. Eisen, a noted zoologist out of northern California, collected insects from the islands in 1873 and 1897. He does not appear to have collected any birds nor did he record any information about birds that he observed while on the island (Eisen 1897). Stephen Bowers, an antiquities collector, was active collecting archaeological artifacts on Santa Rosa Island in 1876 with Lorenzo Yates, San Miguel and Santa Cruz Islands in 1877, and San Nicolas and Santa Barbara Islands in 1889 (Benson 1997). Bowers does occasionally mention birds that he encountered while working on these islands (see field notes in Benson 1997) but does not appear to have collected any birds from the islands. He makes no mention in his field notes of having seen ISSJ while on Santa Cruz or Santa Rosa Islands in 1876-1877 (Benson 1997). Lorenzo Yates, a conocologist, geologist and paleontologist, visited Santa Rosa Island with Bowers in 1876 and Santa Cruz Island in 1891. He does not appear to have collected any birds while on these two islands but he does make brief lists of the birds he observed on Santa Rosa (8 species) and Santa Cruz (14 species) Islands (Yates 1876, 1891). Yates observed ISSJ (listed in his field notes as Steller's jays) on Santa Cruz Island in 1891 but makes no mention of having seen any jays while on Santa Rosa Island in 1876. As the focus of their work while on Santa Rosa Island was with the recovery of Indian artifacts, it is not surprising that Yates and Bowers make no mention of seeing jays while on Santa Rosa Island. They spent the majority of their time working at Indian villages along the shore of the island where they were collecting Indian artifacts and did not appear to have spent time in the more wooded habitats found in the interior of the island. William G. W. Harford, a naturalist from northern California, collected antiquities, botanical specimens, insects, and birds during trips made to San Miguel Island in 1871, Santa Rosa Island in 1872-1874, and Santa Cruz Island in 1874. He only collected birds during the 1871 trip to San Miguel Island. I have been unable to locate any of Harford's field notes for trips he made to the Channel Islands.

Paul Schumacher, an antiquities collector working for the Smithsonian Institution, was active collecting archaeological artifacts and antiquities in 1875 on five of the

Channel Islands (San Miguel, Santa Cruz, San Nicolas, Santa Catalina and San Clemente Islands). Schumacher also occasionally collected natural history specimens (birds and mammals) which are now housed in the collections at the Smithsonian Institution. The only bird collected by Schumacher from the Channel Islands was a common raven skull (USNM 15662) from Santa Catalina Island.

Leon de Cessac was a Frenchman who was active collecting antiquities and natural history objects for the Museum d'Histoire Naturelle Zoologie de Paris. He collected antiquities and archaeological specimens from archaeological sites on San Miguel, Santa Cruz, Anacapa and San Nicolas Islands in 1877-1878. Following his antiquities collecting on the islands, Cessac then spent the next two years collecting natural history specimens (birds and mammals) from throughout California. In 1879 Alfonse Pinart sent the *Ministere de l'Instruction publique* an inventory of the specimens that Cessac had collected while in California (300 geological and paleontological specimens, 500 birds and mammals, 300 reptiles, 5,000 insects, 20,000 mollusks, and 10,000 plants; Reichlen and Heizer 1964). However, Cessac (1882) claims to have sent the Museum d'Histoire Naturelle Zoologie de Paris, before his return to France, 35 mammal skulls and skeletons, 136 mammal skins, 1,500 bird skins, several thousand insects, 600 fossils, and 2,000 local plants. Recently I reviewed the catalogue ledgers from the Museum National d'Histoire Naturelle that list birds collected from California by Cessac (Jacques Cuisin in litt. December 6, 2007 + xerox copy of catalogue ledgers). Based on this review, there are currently a total of 895 of Cessac's birds in the Museum National d'Histoire Naturelle bird collection. None of Cessac's California birds were collected from any of the Channel Islands. Cessac (1882:11) did mention the following about specimen collecting on the Channel Islands: "As to the terrestrial fauna, it is the same in all the California islands as that on the continent, poorer, however, than the later. Now I had a number of specimens of the continental fauna: it seemed to me preferable to neglect momentarily this branch of the zoology. I feel sorry, however, I admit, not to have been able to obtain one type of fox which is considered unique to this island group." Thus, it appears that Cessac did not begin collecting natural history specimens until after he had finished with his antiquity work on the Channel Islands.

E. Ornithological Record

The recent historic record of ISSJ on the NCI can be documented using several sources of data. First is the record of ISSJ specimens and egg sets collected from the islands (Appendix II). Second is the record contained in published and unpublished information written about ISSJ (Appendix III). These two sources of data provide documentation on when the species was first recorded on Santa Cruz Island and if there are data to support its contemporary occurrence on Santa Rosa Island. Finally, reviewing the early historical record of visits to the islands by naturalists, ornithologists, surveyors, and other early explorers is an additional source of information that can help to determine the earliest dates for when ISSJ could have been observed on Santa Cruz and/or Santa Rosa Islands.

Specimen Collecting

Between 1875 and the present, a total of 486 ISSJ specimens (skins, skeletons, alcoholics and live mounts) and 132 egg sets were collected from Santa Cruz Island (Appendix II). Of the non-egg specimens most (93.6%) were scientific study skins and a smaller percentage (6.4%) were skeletons. ISSJ specimens are housed in 25 Museum collections from throughout the United States. Ten museums (AMNH, CAS, CSULB, FMNH, LACM, MCZ, MVZ, UCLA, UCSB, USNM) hold 81.9% of all known ISSJ specimens. The largest number of specimens are at the Los Angeles County Museum of Natural History (77 specimens), Museum of Vertebrate Zoology at the University of California, Berkeley (62 specimens), the California Academy of Sciences (52 specimens), and at three other institutions (FMNH, UCLA, USNM) each holding 36 specimens a piece. No ISSJ specimens are known to have been collected from Santa Rosa Island and there are no specimens of this species collected prior to Henshaw's discovery of the species on Santa Cruz Island in 1875.

H. W. Henshaw collected the first ISSJ at Santa Cruz Island in June 1875 (Henshaw 1876). He collected one specimen (USNM 72543) on 10 June 1875 and three specimens (USNM 72542, 72543, 79695) the following day. These four specimens represent the first documented historic occurrence of scrub-jays on Santa Cruz Island. It was not until more than a decade later that Henshaw described the ISSJ as a new species (*Aphelocoma insularis*) found only on Santa Cruz Island (Henshaw 1886). With this description and with the inclusion of this new species into the American Ornithologists' Union Checklist (AOU 1889, Chapman 1888), the rush was on to obtain specimens for public and private collections. Since this species could only be found on Santa Cruz Island, its commercial and scientific value was higher than that assigned its mainland counterpart the WESJ. The first mention of ISSJ in one of the catalogues used to establish an exchange value for specimens was in Webb (1895) when the species was listed but no exchange value was assigned. This is how the species was listed in subsequent exchange catalogues until 1899 when a price of \$5.00 was listed for ISSJ specimens (Frank Blake Webster Company 1899). By 1936, this exchange rate was \$3.50 per scientific study skin and \$6.00 per taxidermy live mount (Ward's Natural Science Establishment 1936).

The endemic status of this species to Santa Cruz Island coupled with the relatively high exchange rates afforded the species fueled a period of fairly intensive scientific collecting of specimens for private and public collections from 1892 to 1919 (Figure 4). ISSJ were only collected during 45 of the past 134 years (1875-2009) with the fewest number of specimens collected during the 1950s, 1990s and recently between 2000 to 2007 (Figure 4). A total of 48 people are known to have collected ISSJ since the species was discovered in 1875. Ten of these individuals are responsible for the collection of 65.4% of the known ISSJ currently in museum collections (Table 3). The eight collectors who collected the most ISSJ specimens include Clark P. Streater (16 specimens in 1892), Rollo H. Beck (21 specimens in 1895 and 1897), John W. and Joseph Mailliard (53 specimens in 1898), George Willett and Clarence B. Linton (74 specimens in 1907-1908), Henry. H. Kimball (23 specimens in 1914), Adriaan J. Van Rossem (29 specimens in 1920), and

Table 3. Top ten collectors of island scrub-jay (*Aphelocoma insularis*) specimens and egg sets.

Collectors	Number Collected	% of Total	Daily Maximum	Average No./Day
Specimen Collectors				
Clarence B. Linton	73	15.3	10	3.0
J. & J. W. Mailliard	53	11.1	8	3.9
John A. Hornung	38	8.0	5	1.9
Frank A. Pitelka	33	6.9	7	3.0
Adrian J. Van Rossem	29	6.1	5	2.4
Henry H. Kimball	23	4.8	4	1.8
Rollo H. Beck	21	4.4	14	7.0
Clark P. Streator	16	3.4	5	3.2
Alfred B. Howell	16	3.4	4	2.0
Charles T. Collins	10	2.1	6	2.0
Subtotal of Specimens	312			
% of Total Specimens	65.4%			
Egg Collectors				
Robert H. Canterbury	38	28.8	5	1.5
Fred Truesdale	16	12.1	5	2.3
Martin C. Badger	14	10.6	4	2.3
A. G. Vrooman	13	9.8	4	2.6
William L. Dawson	11	8.3	4	2.2
Dudley S. Degroot	8	6.1	5	2.0
Lawrence T. Stevens	7	5.3	2	1.4
William O. Dawson	7	5.3	3	1.4
John R. Pemberton	3	2.3	1	1.0
Ozro W. Howard	3	2.3	1	1.0
Subtotal of egg sets	120			
% of Total Egg Sets	90.9%			

Frank A. Pitelka (33 specimens in 1948). The maximum number of jays collected in a single day was 14 by Rollo H. Beck and 10 by Clarence Brockman Linton (Table 3) while other top jay collectors only had daily maximums which ranged from 4 to 8 jays per day (Table 3). On days that scrub jays were collected, the average number collected by these top jay collectors ranged from 1.8 to 7.0 birds per day with Rollo H. Beck having the highest average of 7.0 jays collected per day (Table 3). Early collectors appear to have been limited to only collecting the number of birds they could prepare in a day since they lacked the capability of being able to freeze birds while in the field.

Egg Collecting

Egg sets of this species were only collected during a 50 year period beginning in the late 1890s and ending by the late 1940s (Figure 4). During this period a total of 132 ISSJ egg sets were collected from Santa Cruz Island (Appendix II). The first ISSJ egg sets were collected by Rollo H. Beck on May 8, 1897 while the last set was collected by Lawrence T. Stevens on March 22, 1947. ISSJ egg sets were only collected during 15 years of the 50 year period (1897-1947) when eggs of this species were being collected. The peak period of egg collecting for this species was between 1915 and 1927 (Figure 4). As with specimen collecting, egg collecting for this island endemic appears to have been influenced by the exchange value assigned ISSJ egg sets. The first mention of this species in one of the oology catalogues used to establish an exchange value for egg sets was in Webb (1895) when the species was listed but no exchange value was assigned. This is how the species was listed in subsequent exchange catalogues until 1904 and 1905 when a price of \$3.00 was established for ISSJ egg sets (Lattin and Short 1905, Taylor 1904). By 1922, the exchange rate had dropped to \$2.30 per egg set (American Oologists' 1922).

Seventeen people collected ISSJ egg sets during the 50 years that egg sets were being collected. Most (90.9%) ISSJ egg sets were collected by ten egg collectors (Table 3) with the majority of these collected by Robert Canterbury (38 sets), Fred Truesdale (16 sets), Martin C. Badger (14 sets), A. G. Vrooman (13 sets), William L. Doson (11 sets), and Dudley S. DeGroot (8 sets). The maximum number of egg sets collected by the top ten collectors ranged from 1 to 5 egg sets in a single day. The average number of ISSJ egg sets collected for days when egg sets of this species were collected ranged from 1.0 to 2.6 sets per day (Table 3). Most egg sets were collected in April (75 sets) and March (50 sets).

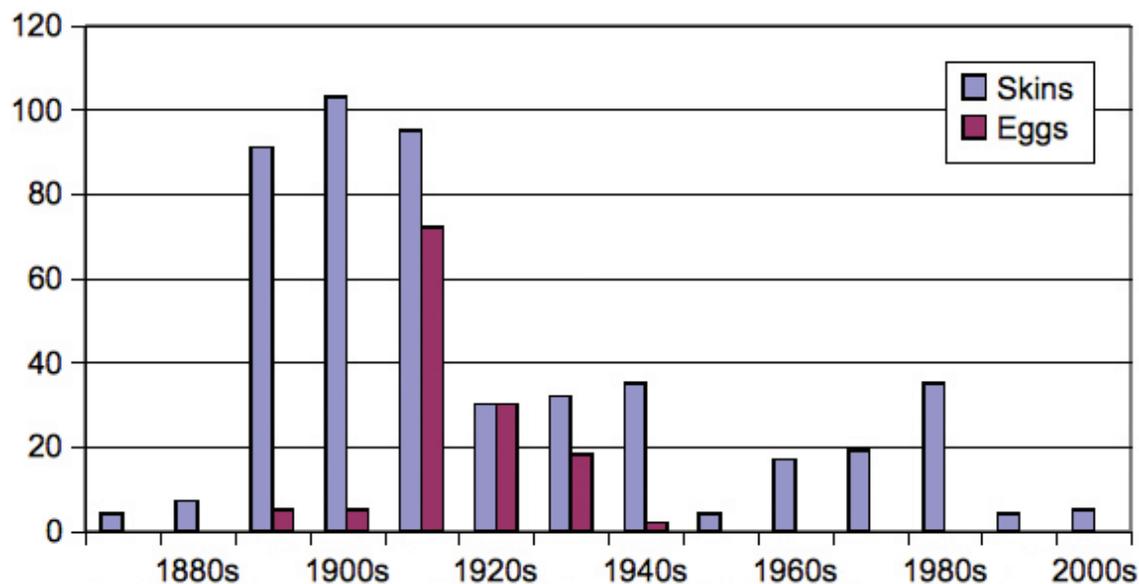


Figure 4. Period of island scrub-jay specimen and egg collecting from 1875 through 2007.

Based on collected egg sets, the egg dates for ISSJ were March 3rd through May 16th with one late season set collected on June 7th. Average clutch size based on the 132 egg sets collected is 3.8 eggs/set.

Published and Unpublished Ornithological Record (1876-1951)

Written information related to ISSJ was found in a total of 60 publications and 10 sets of unpublished field notes for the period from 1876 through 1951 (Appendix III). Henshaw (1876) provides the first written documentation for the occurrence of jays on Santa Cruz Island based on specimens that he collected there in June 1875 while working as a naturalist on the U. S. Geographical Survey under the command of Lieutenant George M. Wheeler (Wheeler Survey). The next published report about this species is Henshaw's (1886) original description of the species. Once ISSJ were described, the number of papers that mention or provide information about this species increases with 7 articles in the 1880s, 15 in the 1890s, 10 in 1900-1909, 12 in 1910-1919, 6 in the 1920s, and 3 each in the 1930s, 1940s, and 1950-1951 (Appendix III). Most of the early published information on ISSJ tends to be about the species physical characteristics, taxonomy, distribution, status, and breeding habits (Appendix III). Much of the early written information is anecdotal in nature and is generally not based on detailed scientific study. The first intensive scientific studies related to the biology of this species deal with pterylography, molt and aging (Pitelka 1945), and speciation and ecology (Pitelka 1951). Detailed studies focused on various aspects of the biology of this species begin to appear in the late 1970s and continue up to the present (see sources cited in Curry and Delaney 2002).

Following the original description of the species in 1886, Mr. Eli Whitney Blake Jr. visited Santa Cruz Island twice in 1886 and reported the species as "By far the commonest landbird of the island, and familiar to the verge of impudence" (Blake 1887). Mr. Blake also produced a watercolor painting of an ISSJ in December 1886 (Figure 5, SBMNH Channel Islands Archives). Townsend (1890) provides the next published record of ISSJ when he lists having collected 7 jays while at Santa Cruz Island on February 6-7, 1889. The next observations of ISSJ can be found in unpublished field notes from Lorenzo G. Yates, a geologist/conocologist active in the Santa Barbara Region during the 1870s-1890s, and Clark P. Streater, an ornithologist working for the Biological Survey of the U. S. Department of Agriculture. Lorenzo G. Yates made collecting trips to Santa Rosa Island March 22-April 19, 1876, and to San Miguel and Santa Cruz Islands July 23-29, 1891. Jays were absent from the list of 15 birds that Yates reported seeing while on Santa Rosa Island in 1876 (Yates 1876) but are included (listed as Steller's jay) on the list of 7 birds he reported seeing on Santa Cruz Island in 1891 (Yates 1891).

Streater reported jays as "common and very tame" during his 1892 visit to Santa Cruz Island (Streater 1892b) and he writes in his field notes for an early July 1892 trip to Santa Rosa Island "*Aphelocoma* – Mr. John More informs me that there are Jays on the island" (Streater 1892a). If Mr. John Finley More was correct in his observation of this species on Santa Rosa Island, then ISSJ were part of the avifauna of Santa Rosa Island up until the later part of the 19th century. There is no way to confirm that Mr. More

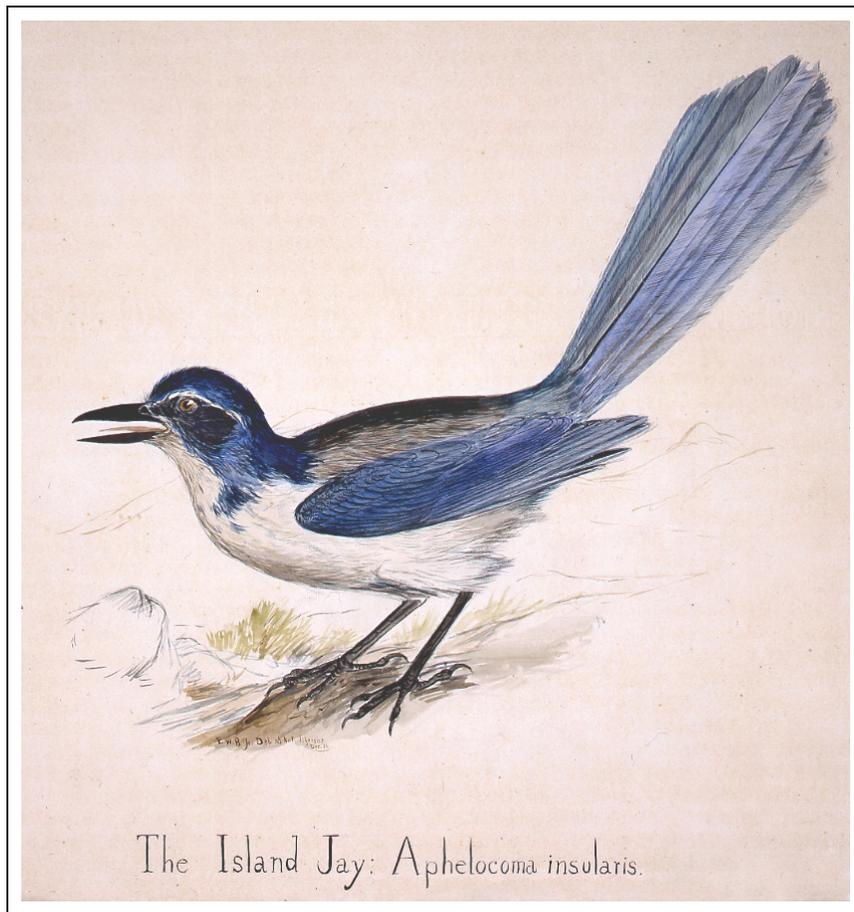


Figure 5. Painting of an island scrub-jay (*Aphelocoma insularis*) on Santa Cruz Island by Eli W. Blake Jr. in December 1886 (SBMNH Channel Islands Archive).

was indeed correct in his observation of jays on Santa Rosa Island. There is the outside possibility that he may have seen pinyon jays (*Gymnorhinus cyanocephalus*), a species that has been observed recently on several occasions on Santa Catalina Island (September 13 and 28, 1976 and December 17, 2006). Both species of jays are light blue in color and as such could be misidentified at a distance by someone not familiar with pinyon jays. Given that Mr. More also had a ranch on the adjacent mainland, he would have been familiar with WESJ, a species common and widespread in the Santa Barbara area during the late 1800s (Henshaw 1876, Jeffries 1889, Streater 1886). The fact that Streater lists this record as “*Aphelocoma*” suggests that Mr. More reported the jay he saw on Santa Rosa Island as a scrub-jay and not as a pinyon or Steller’s jay.

John Finley More, the youngest of six More brothers, had a long association with Santa Rosa Island (Figure 6). He was born in Medina County Ohio on August 19, 1839 (Gidney et al. 1917). He first visited California in 1861 at the age of 22 and remained in the state for 1.5 years before returning to Ohio to attend Oberlin College (Phillips 1927). He settled in Santa Barbara in December 1874 at the age of 35 (Phillips 1927). Soon after

arriving in Santa Barbara, Mr. More purchased land near Goleta and began farming. His ranch on the mainland grew to 500-600 acres in size. By the early 1880s Mr. More was spending time on Santa Rosa Island helping his older brother Alexander P. More manage his island sheep operation. On October 1, 1891 J. F. More leased Santa Rosa Island from his brother A. P. More for a period of three years at \$10,000 per year (*Los Angeles Times, Santa Barbara*, September 13, 1894). J. F. More managed the Santa Rosa Island sheep operations during this period for his brother. Following A. P. More's death in 1893, J. F. More served as administrator of his brother's estate until 1899 when he transferred his interest in the island to Mrs. Miller (*Los Angeles Times, Santa Barbara*, November 8, 1893 and December 2, 1898). J. F. More ran the Santa Rosa Island sheep operation for a period of 8-10 years and was involved with his brother's sheep operation on the island for more than 20 years. During this time he would have had ample opportunity to have observed jays on Santa Rosa Island if a small remnant population persisted. The disappearance of

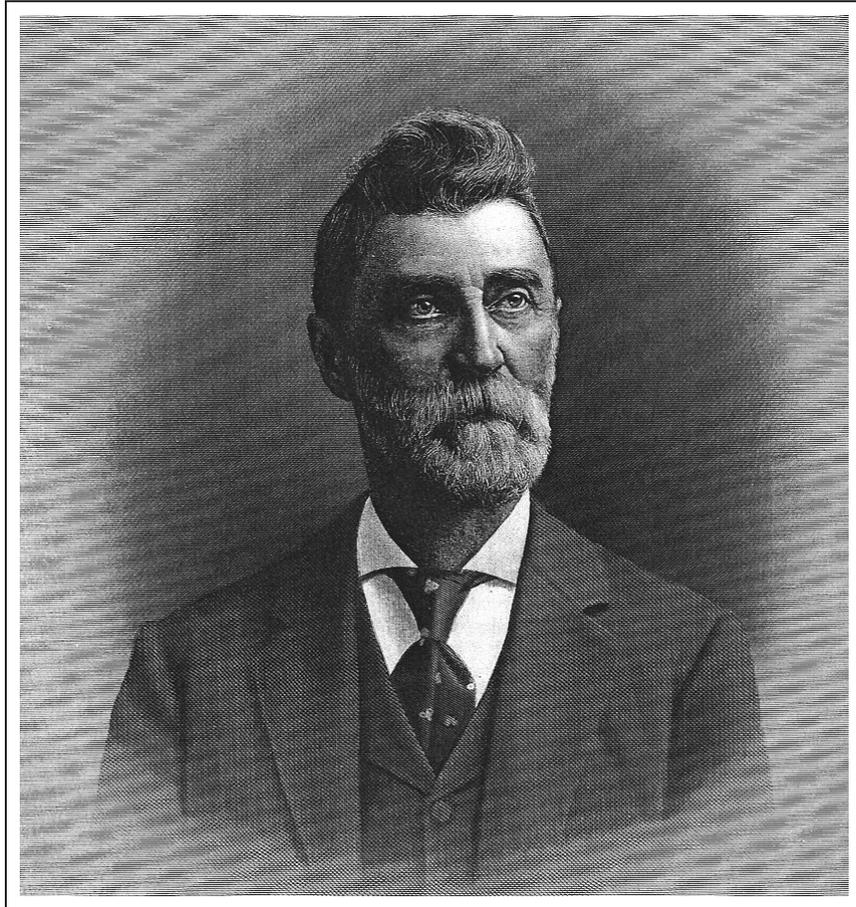


Figure 6. John F. More was the brother of Alexander P. More who owned Santa Rosa Island from 1865 until his death in 1893. It was John F. More who reported to Clark P. Streater in July 1892 that jays were present on Santa Rosa Island. Photograph from Gidney et al. (1917).

ISSJ from Santa Rosa Island by the late 1880s or early 1890s probably was the result of severe habitat degradation wrought by intensive sheep grazing that was taking place on Santa Rosa Island during the mid-to-late 1800s when 80,000 to 100,000 sheep were on the island.

Early Naturalists to Visit Santa Cruz or Santa Rosa Islands

A number of naturalists are known to have either passed by or to have visited Santa Cruz and/or Santa Rosa Islands between 1842 and 1898. Table 4 provides a list of who these early naturalists were, when they were on or near Santa Rosa or Santa Cruz Islands and if they documented the occurrence of ISSJ. For Santa Rosa Island there were at least six individuals who visited the island between 1846 and 1897 who would have had an opportunity to possibly document the occurrence of ISSJ at this island. Henry Kellett and James Wood were the first to visit Santa Rosa Island. They stopped at the island briefly in October 1846 and collected two foxes. They do not appear to have collected any birds from this island nor does it appear that they recorded any information about birds they observed on the island during their brief visit. William G. W. Harford, a naturalist from San Francisco who accompanied the U. S. Coast and Geodetic Survey, visited Santa Rosa several times in 1872 and again in 1873 and 1874 and is known to have collected archaeological artifacts, insects and botanical specimens (Glassow 1996, Junak 1996, Miller 1996). He does not appear to have collected any birds during his visits to Santa Rosa Island nor have I been able to find any notes in which he describes the biota he observed while on the island in 1872-1874. If he had collected any birds while he was on Santa Rosa Island in 1872-1874, and if these specimens were deposited into the collections at the California Academy of Sciences where a number of his early natural history specimens are known to have been sent, then they would have been destroyed when the Academy burned to the ground following the 1906 earthquake.

Stephen Bowers and Lorenzo Yates visited Santa Rosa Island from March 23 through April 17, 1876 in order to collect archaeological artifacts. During their stay on the island they traversed much of the northern half of the island but tended to focus most of their time at archaeological sites along the immediate coast (Benson 1997). As a result, they spent little time in interior areas of the island that would have contained habitat suitable for jays (e.g., areas supporting oak woodland and chaparral habitats). Their field notes only contain very brief mention of birds seen while on the island (Benson 1997, Yates 1876). ISSJ are not listed as having been seen in 1876 on Santa Rosa Island (Benson 1997, Yates 1876) but were seen on Santa Cruz Island in 1891 (Yates 1891). Since the focus of their trip to Santa Rosa Island was to collect archaeological artifacts, only very cursory information is presented about wildlife that they observed while on the island.

Charles H. Townsend visited Santa Rosa Island on January 7, 1889 and again on April 8, 1890 during which he collected a total of 13 birds (Townsend 1890). He did not collect any ISSJ. I have been unable to locate Townsend's field notes to see if he recorded any additional information about other birds he observed while on the island. Clark P. Streater, a naturalist/collector working for the Biological Survey of the U. S. Department

Table 4. Explorers, naturalists, ornithologists, antiquarians, and geologists who visited Santa Cruz and/or Santa Rosa islands in the 19th Century and who would have had an opportunity of recording the occurrence of island scrub-jays (*Aphelocoma insularis*).

Date of Visit	Observer/Observers	ISSJ Records	ISSJ Spec./Eggs	Field Notes	Sources
Santa Rosa Island					
1846: mid-Oct	Henry Kellett and James Wood	No	No/No	No	Seemann (1853), Browne (1869)
1872: 7, 15 Jun 1873 & late 1874	William G. W. Harford	No	No/No	No	Junak (1996), Mammal specimen records (1872)
1876: 23 Mar to 17 Apr	Rev. Stephen Bowers & Lorenzo Yates	No	No/No	Yes	Benson (1997), Yates (1876)
1889: 7 Jan 1890: 8 Apr	Charles H. Townsend	No	No/No	No	Townsend (1890), and Specimen records
1892: 1-3 Jul	Clark P. Streator	Yes?	No/No	Yes	Streator(1892a)
1897: Jun	Dr. Gustav Eisen	No	No/No	No	Eisen (1897)
Santa Cruz Island					
1842: 15 Jun	William Gamble	No	No/No	No	Bush (1983)
1862: 23 May	James G. Cooper	No	No/No	No	Cooper (1862, 1863), Whitney (1865)
1874: Nov	William G. W. Harford	No	No/No	No	Junak (1996)
1875: 1 May, and 1-11 Jun	Henry W. Henshaw	Yes	Yes/No	No	Henshaw (1876, 1886)
1877: 27 Aug to 1 Sep	Rev. Stephen Bowers	No	No/No	Yes	Benson (1997)
1885: 13 Apr	S. Lee	No	No/No	No	Specimen records
1885: 2 Jun	Alfonse Forrer	No	No/No	No	Specimen records
1886: 15-17 Mar	Clark P. Streator	Yes	Yes/No	Yes	Streator (1888)
1886: 4-24 Jul & 6Aug -3 Sep	Eli W. Blake, Jr.	Yes	No/No	No	Blake (1887)
1889: 6-7 Feb	Charles H. Townsend	Yes	Yes/No	No	Townsend (1890)
1889: 8-27 May	Watson A. Goodyear	Yes	No/No	No	Goodyear (1890)
1891: 23-29 Jun	Lorenzo Yates	Yes	No/No	Yes	Yates (1891)
1892: 9-20 Jul	Clark P. Streator	Yes	Yes/No	Yes	Streator (1892b)
1895: 2 Feb, 15 Mar, 1 Apr, 14 and 30 Dec	George F. Breninger	No	No/No	No	Specimen records
1895: 5-8 Jun	Rollo H. Beck	Yes	Yes/No	No	Beck (1899b)
1897: 30 Apr-17 May	Rollo H. Beck	Yes	Yes/Yes	No	Beck (1899a)
1898: 5 Apr-1 May	John W. Mailliard & Joseph Mailliard	Yes	Yes/Yes	No	Mailliard (1899, 1900)

of Agriculture, visited Santa Rosa Island on July 1-3, 1892. In his field notes Streater writes “*Aphelocoma*- Mr. John More informs me that there are Jays on the island.” This is the only historical record I have been able to find related to the possible occurrence of ISSJ on Santa Rosa Island. Finally, Dr. Gustav A. Eisen, another naturalist associated with the California Academy of Sciences, is known to have collected insects and archaeological artifacts during a visit to Santa Rosa Island in 1897 (Glassow 1996, Miller 1996). He does not appear to have collected any birds during this trip nor does he mention having seen any ISSJ while on the island (Eisen 1897.)

I know of only two naturalists (James G. Cooper and William G. W. Harford) who visited Santa Cruz Island prior to Henshaw’s discovery of ISSJ in 1875 (Table 4). James G. Cooper made a very brief stop in the Prisoner’s Harbor area on 22 or 23 May 1862 (Whitney 1865) but does not appear to have collected any birds or to have recorded any bird observations during this visit (Cooper 1862). William G. W. Harford and Albert Kellogg visited Santa Cruz Island in November 1874 to collect botanical specimens (Junak et al. 1995). Neither appears to have collected any birds or to have written down any observations of birds seen while on the island. Harford did collect birds during a visit to San Miguel Island in 1871. Following Henshaw’s 1875 discovery of ISSJ on Santa Cruz Island, there were at least 13 individuals (naturalists, ornithologists, geologists, and archaeologists) who visited the island between 1877 and 1898 (Table 4). Nine of these individuals recorded seeing ISSJ, 6 collected ISSJ specimens and 2 collected ISSJ egg sets (Table 4). The first to record ISSJ at the island following the species discovery were Clark P. Streater in March 1886 (Streater 1888) and Eli W. Blake Jr. in July-September 1886 (Blake 1887). Streater collected ISSJ specimens for the Smithsonian while Blake noted seeing the species on the island (Blake 1887) and in December 1886 made a watercolor painting of an ISSJ (Figure 5, SBMNH Channel Island Archives). Most naturalists-ornithologists who visited Santa Cruz Island after 1886 were there in order to collect bird specimens for Museum collections. Exceptions include geologists Watson A. Goodyear who reported seeing “bluejays” (probably ISSJ) on the island in May 1889 (Goodyear 1890) and Lorenzo Yates who listed jays as one of seven species of birds he observed while on the island in June 1891 (Yates 1891). Both of these individuals were geologists and both only made anecdotal notes about the birds they observed while on Santa Cruz Island. Neither was known to have collected any bird specimens for Museum collections.

IV. DISCUSSION

A. What is known about the historic and prehistoric status of Island Scrub-Jays on the Northern Channel Islands

The record of sea level changes during the late Pleistocene coupled with what is known about the submarine topography of lands that surround the NCI confirm that the NCI were last connected to one another during the last glacial maximum ~19.5 ka forming the super island known as Santarosae. This super island was present from ~19.5 ka until around 10.9 ka when rising sea levels began separating Santarosae into the present day islands that comprise the NCI. Santa Rosa and Santa Cruz Islands were last connected to one another at ~9.3 ka and San Miguel Island separated from Santa Rosa Island ~9.0 ka. Genetic data confirms that ISSJ have had a long period of isolation during which to diverge from adjacent mainland WESJ populations. Molecular clock estimates place this divergence time at over 200,000 years. Clearly ISSJ would have had an opportunity to reach other lands that comprise the NCI several times during the Pleistocene when sea levels were lower and the islands were interconnected. The last time that this occurred was during the last glacial maximum. ISSJ would have been present on lands that currently comprise Santa Rosa, San Miguel, and Anacapa Islands when these islands were last part of the Santarosae landmass.

A variety of biotic and abiotic factors were affecting ISSJ populations on the Santarosae landmass and on each of the NCI after this landmass broke up. Pygmy mammoth grazing/browsing pressure would have affected the location and extent of scrub and woodland habitats available for ISSJ during the late Pleistocene. Changes in climate during the late Pleistocene also influenced the extent of woodland and scrub habitats on the islands with wet periods supporting more woodland and scrub habitats than dry periods. Of particular note was the biomass burning that occurred on the NCI around 13.0-12.9 ka and which resulted in a dramatic change in terrestrial ecosystems on the NCI (Kennett et al. 2008). Before this event the islands were vegetated with woodlands (pine forests, and cypress-juniper forests), but after this event they were vegetated with grassland and scrub habitats, and scattered stands of oaks. Also pygmy mammoths were present on the islands before this mass burning event but died out soon after this event. Native Peoples arrived at the Channel Islands around the time that pygmy mammoths disappeared and upon their arrival immediately began affecting marine and terrestrial habitats at the islands. Increased wildfires on the islands during the late Holocene, after the arrival of Native Peoples, would have adversely affected the extent of scrub and woodland habitats that ISSJ would have preferred. Native Peoples were removed from the islands in the early 1800s. By the mid-1800s Europeans introduced feral herbivores to the NCI which led to overgrazing and vegetation stripping. Feral herbivore grazing during the last half of the 19th century probably degraded and/or destroyed the remnant stands of scrub and woodland habitat that may have supported a small population of ISSJ on Santa Rosa Island. The decline of scrub and woodland habitats on Santa Rosa Island during the late 1800s would have contributed to the extirpation of ISSJ from this island.

Prehistoric and Protohistoric Record of Island Scrub-Jays

Only one ISSJ fossil has been recovered from a paleontological site on the NCI. That specimen was found in a late Pleistocene-Holocene (29,180-10,060 ka) site (SRI-V-3) along the northwest shore of Santa Rosa Island. This fossil specimen confirms that ISSJ were present on Santa Rosa Island at the end of the Pleistocene. There is also a single archaeological occurrence of ISSJ bones from an historic period (1780s-1812 AD) archaeological site on Santa Cruz Island (SCRI-192). The occurrence of ISSJ bones in this Historic period site confirms that the species was present on Santa Cruz Island prior to its discovery there in 1875 by H. W. Henshaw. The ISSJ bones that were recovered from this site suggest that this specimen may have been harvested for its feathers rather than as a source of food.

Ethnographic Record of Island Scrub-Jays

There is no direct ethnographic evidence to confirm how Island Chumash viewed and used ISSJ. However, based on what is known about cultural practices of the Chumash on the adjacent mainland, it can be inferred that the Island Chumash may have harvested ISSJ for their feathers and that these feathers could have been used as decorative elements on a variety of material culture elements (capas, blankets, ceremonial or dance regalia, feather headdresses (feather bands), feather banners, ornaments, or jewelry). ISSJ could also have served as an individual's spirit guide or "dream helper," and as such pieces or parts of an ISSJ could have been kept as personal talisman. A putative Roseño vocabulary included a word *tcu-we-we* which was used to refer to blue-crested jays. Since Steller's jays have never been recorded on any of the Channel Islands, this could be a word that the Island Chumash used to refer to ISSJ. It is unclear whether this word is a Roseño or a Cruzeño word. If it was a Roseño word for ISSJ, then it suggests that ISSJ might have been present on SRI into the early 1800s when Chumash were still present on the island.

Historic Record of Island Scrub-Jays

Henry W. Henshaw's discovery of ISSJ on Santa Cruz Island in June 1875 represents the first record for the occurrence of this species. There is no record of Henshaw having visited Santa Rosa Island. With the exception of Clark P. Streator, other naturalists who visited Santa Rosa Island in the late 1800s did not mention ISSJ; however, naturalists who visited Santa Cruz Island prior to 1875 also did not mention ISSJ (Table 4). On Santa Rosa Island in July 1892, John F. More (Figure 6) informed Clark P. Streator that "there are jays on the island." J. F. More was involved with his brother's sheep grazing operation on the island, from the late 1870s to the early 1890s. His long tenure on Santa Rosa Island – incidentally, through a period of significant destruction of jay habitat (Figure 7) – lends credence to his claim. While by itself More's statement regarding jays on Santa Rosa Island cannot be substantiated, given there is fossil evidence of ISSJ on Santa Rosa Island (Figure 2), his statement about jays being on the island is plausible. ISSJ may have been present on Santa Rosa Island until the late 1800s. If jays were present at the time of More's 1892 statement, the absence of any additional sightings of jays or the collection of any ISSJ specimens from Santa Rosa Island after 1892 suggests that the population likely died out soon thereafter.

B. What is unknown about the historic and prehistoric status of Island Scrub-Jays on the Northern Channel Islands.

Prehistoric and Protohistoric Record of Island Scrub-Jays

There is very little data pertaining to the fossil record of landbirds on any of the Channel Islands and no information regarding the fossil landbird fauna of Santa Cruz or Anacapa Islands. There is only a single fossil occurrence of ISSJ from a late Pleistocene-Holocene site on Santa Rosa Island. The absence of Pleistocene fossil sites on Santa

Figure 7. Historic estimates for the number of sheep (*Ovis aries*) on the Northern Channel Islands from the 1840s to the present. See appendix IV for data used to compile this figure.

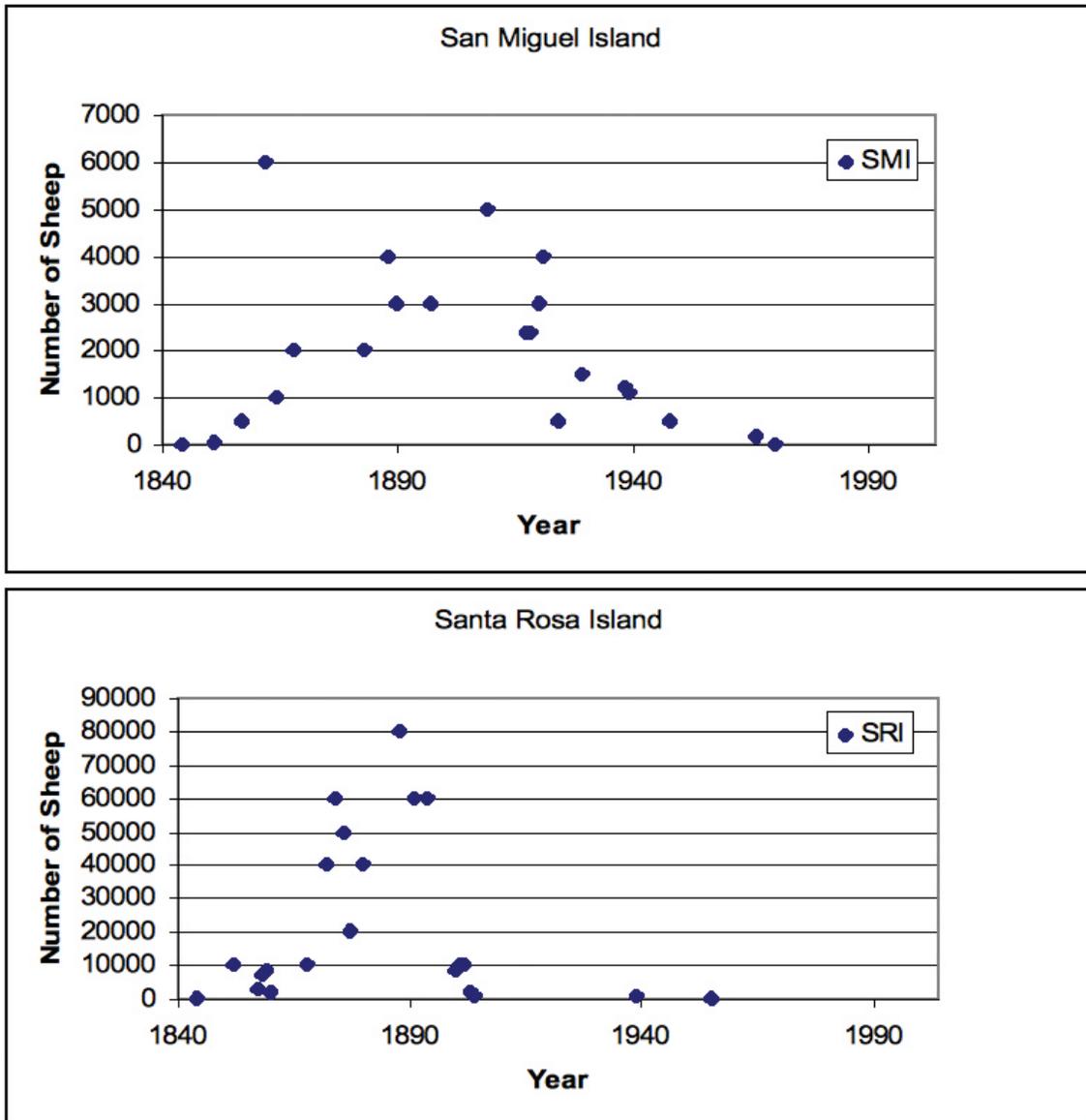
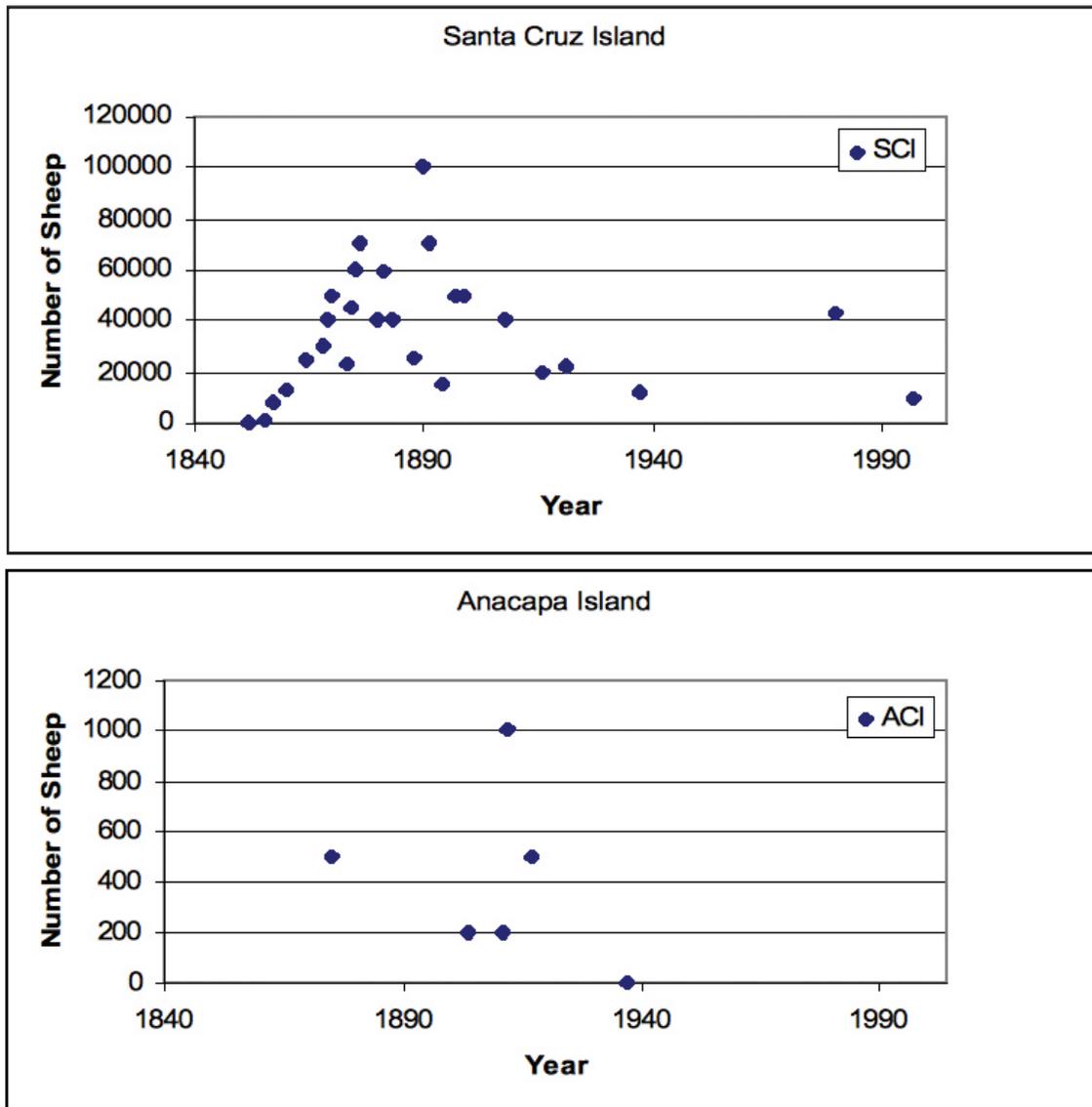


Figure 7 (cont.)



Cruz Island means that there is no fossil record for this species on that island. So the fossil record for the occurrence of ISSJ on the NCI is insufficient to confirm the species geographic range on the NCI during the late Pleistocene. The occurrence of this species in a fossil site on Santa Rosa Island does confirm that the species was present on this island in the Late Pleistocene-Holocene and that it had to have reached the island sometime during the last glacial maximum when lower sea levels connected all of the NCI into the super island Santarosae.

As with the fossil record, the archaeological record for the occurrence of ISSJ on the NCI is also very poorly known. There is a single occurrence of ISSJ bones from an historic period site (1780s-1812 AD) on Santa Cruz Island and no records for the occurrence of

this species in the faunal remains recovered so far from any other archaeological sites on the NCI. The archaeological record for this species is inadequate to draw conclusions beyond saying that the species was obviously present on Santa Cruz Island at least toward the end of Island Chumash occupation of Santa Cruz Island in the Late Holocene. The lack of ISSJ bones in Channel Island archaeological sites is not surprising as passerines tend to be rare in faunal remains recovered from archaeological sites on the islands. Also most archaeological excavations on the islands, until fairly recently, have not utilized sampling techniques capable of recovering small passerine bone. Most passerine bone recovered to date from archaeological sites on the islands has not been evaluated to determine species identifications. It is possible that once the unidentified passerine bone is carefully evaluated that additional occurrences of ISSJ could be recorded for other Channel Island archaeological sites.

Ethnographic Record of Island Scrub-Jays

The ethnographic record for how the Chumash used and/or viewed jays is poorly known. However, ethnographic information about how Chumash viewed and used birds and other animals in their material culture, language, myths, ceremonies, and religious practices can be used to infer how the Island Chumash may have interacted with ISSJ. The lack of much information about any of these aspects of Island Chumash society makes it difficult to confirm with any certainty how ISSJ figured into Island Chumash culture and if ISSJ were present on any islands other than Santa Cruz Island during the late Holocene.

Historic Record of Island Scrub-Jays

The historic record for the occurrence of ISSJ on islands other than Santa Cruz Island is poorly documented. Except for Streater's 1892 note regarding the possible occurrence of jays on Santa Rosa Island, there are no other historic records to confirm the occurrence of ISSJ on this island or on San Miguel or Anacapa Islands. Also there are no historic records for the occurrence of ISSJ on Santa Cruz Island prior to Henshaw's discovery of the species there in 1875. Part of the problem with the historic record is that there were relatively few naturalists or ornithologists visiting the islands until the late 1800s. By then, the degradation of island plant communities and their avifauna from overgrazing by introduced herbivores (cattle, sheep, and pigs) would have been significant. Feral herbivores would already have destroyed and/or dramatically altered native habitats on the islands by their grazing/browsing activity. This habitat destruction could have led to the extirpation of small, locally distributed populations of birds on one or more of the NCI prior to the arrival of the first ornithologists to these islands. Most of the Europeans who visited and wrote about the Channel Islands during the first half of the 19th century, made only occasional, anecdotal comments about a few of the more common birds seen while on the islands. No comments were made about seeing jays on any of the NCI during this early period of exploration and discovery. No detailed observational data was recorded about the avifauna of any of the NCI until Henshaw's visit to Santa Cruz Island in 1875 and Streater's collecting trips to San Miguel and Santa Cruz Islands in 1886 (Streater 1887, 1888), and Santa Rosa and Santa Cruz Islands in 1892 (Streater 1892a and b). Once ISSJ

were described as a new species in 1886 (Henshaw 1886), the scientific community began to collect specimens and egg sets of this species for museum and private collections and to record and publish data about the natural history of the species (Appendix III). At the time it was described, ISSJ were said to only occur on Santa Cruz Island (Henshaw 1886). However, the historic record hints at the likely occurrence of ISSJ on Santa Rosa Island into the late 19th century but the absence of specimens and additional verifiable observations of the species at this island makes John F. More's statement that "jays are present" on Santa Rosa Island unsubstantiated. I have found no additional historical data that can help to confirm whether ISSJ were present on Santa Rosa Island into the late 1800s.

C. Paleocology of the Northern Channel Islands and its Affect on Island Scrub-Jays

Since scrub-jays first reached the NCI more than 200,000 years ago, they have been influenced by a variety of biotic and abiotic factors including: (1) sea level change during glacial-interglacial cycles of the late Pleistocene; (2) paleoenvironmental change (precipitation, temperature, and vegetation) through the late Pleistocene-Holocene; (3) changes in terrestrial habitats from pygmy mammoth grazing during the late Pleistocene; (4) changes in terrestrial habitats from increased use of fire by Native Peoples during the Holocene; and (5) changes resulting from vegetation stripping by feral herbivores introduced to the islands by Europeans during the 1800s. Collectively these factors played a significant role in determining the biotic dispersal, survival and extinction of ISSJ populations on the NCI.

Sea level Change during the Late Pleistocene-Holocene

Glacial events during the last 200,000 years of the Pleistocene caused sea levels to rise and fall numerous times resulting in dramatic fluctuations in the amount of subaerial ecospace of islands off lying the southern California coast (Fairbanks 1989, Fleming et al. 1998, Johnson 1983, Sidall et al. 2003). A drop in sea level of -40 m would have been sufficient to connect the three largest islands of the NCI chain into the super island known as Santarosae (Johnson 1983). Based on a eustatic curve developed by Fleming et al. (1998) from a nominal ice model, it appears that sea levels declined sufficiently during the last 200,000 years to result in the formation of the Santarosae landmass 8-10 times. The first decline of about -80 m happened around 180 ka. The second decline of approximately -120 m lasted from 150 to 140 ka, and a third decline of approximate -76 m occurred at ~60 ka (Fleming et al. 1998). The last and deepest decline in sea levels during the Pleistocene occurred about 19.5 ka during the last glacial maximum (20 to 16.8 ka) when sea levels were about -120 ± 5 m lower than the current high-level stand (Fairbanks 1989, Fleming et al. 1998, Johnson 1983, Sidall et al. 2003). Occurrence of depressional contours on flattish shelf surfaces south of Santa Rosa Island suggest subaerial features (dunes?) coupled with the occurrence of main shelf-slope breaks at about -140 m at several of the Channel Islands suggest that sea levels may have been as low as -140 m during the last glacial maximum (Johnson 1983). When sea levels were -120 m below present day levels, the Santarosae landmass would have been 2,331 km² (Figure 1b), or about 4.6 times larger than the present-day size of the four NCI (Johnson 1983).

Changes in sea level during the late Quaternary led to changes in size and configuration of the NCI and in the width of the channels which separated these islands from the adjacent mainland and from each other (Junger and Johnson 1980). At the last glacial maximum when all of the NCI were connected as Santarosae (Orr 1968, Johnson 1983), the distance from the east end of the super island to the adjacent mainland was ~6-7 km (Figure 1b; Kennett et al. 2008, Wenner and Johnson 1980). Since ISSJ are believed to have diverged from the WESJ more than 200,000 years ago (Delaney and Wayne 2008), they would have had multiple opportunities to disperse across the Santarosae landmass. The last time that this occurred would have been when sea levels reached their lowest point during the last glacial maximum. At this lowest sea level stand ISSJ could have dispersed by land to suitable woodland and scrub habitats elsewhere on the Santarosae landmass including lands that are today separate islands (Anacapa, Santa Rosa and San Miguel Islands).

The NCI began to break up as sea levels began to rise about 19.5 ka. Between 19.5 and 14.5 ka sea levels rose ~25 m which would have resulted in a 17% (391 km²) reduction in the overall size of the Santarosae landmass (Kennett et al. 2008). Between 14.5 and 13.4 ka sea levels rose another ~15 m and by the end of the Younger Dryas (~10 ka) sea levels had risen sufficiently to result in another reduction in the Santarosae landmass of 16% (304 km²; Kennett et al. 2008). The islands that comprised the Santarosae landmass began to separate at ~10.9 ka for Anacapa Island, ~9.3 ka for Santa Cruz Island, and ~9 ka for San Miguel-Santa Rosa Islands (Figure 1b; Kennett et al. 2008). Sea levels continued to rise until they reached the current high stand with four separate islands comprising the NCI. These four present-day landmasses are San Miguel Island (35 km²), Santa Rosa Island (217 km²), Santa Cruz Island (249 km²), and Anacapa Island (2.9 km²). As sea levels rose, productive terrestrial habitats (scrub and woodland) available for ISSJ on the Santarosae landmass and then on each of the separate islands of the NCI would have declined with a reduction in the available exposed landmass of each island. At some point, available habitat for jays on Anacapa and San Miguel Islands may have been reduced to a size that would not have been able to support a viable population of ISSJ, leading to the local extirpation of the species.

Paleoenvironmental Change during the Late Pleistocene-Holocene

In addition to changes in the size and degree of isolation of island landmasses resulting from eustatic sea level changes during Pleistocene glacial-interglacial cycles, paleoenvironmental, and biotic factors were also influencing the extent of suitable jay habitat on islands that comprised the Santarosae landmass. Annual precipitation is one of the principal factors that affect the primary productivity of terrestrial ecosystems (Leith 1978, Polis and Hurd 1996). Data from a well-preserved sediment core in the Santa Barbara Basin (SBB) provides a record of environmental change in the southern California Bight during 160 ka of glacial-interglacial events of the late Pleistocene-Holocene (Heusser 1995, 1998; Kennett et al. 1995, 2008). Also pollen records from sediment cores and other samples taken on San Miguel (Anderson 2002, West and Erlandson 1994), Santa Rosa (Anderson 2002, Cole and Liu 1994, Johnson et al. 2007), and Santa Cruz Islands (Ander-

son 1998) provide a record of vegetation change on the NCI during the Holocene. Several sediment cores taken on Santa Rosa Island document changes in terrestrial environments on this island for the past ~12.5 ka (Anderson 2002, Cole and Liu 1994) while sediment cores taken on Santa Cruz Island document changes in terrestrial habitats for the past 2 ka (Anderson 1998). Taken together these core samples show that significant changes have occurred in terrestrial habitats in coastal southern California and on the NCI since the last glacial maximum. In particular, the SBB core documents a warm-cool-warm cycle during the Ållerød, Younger Dryas, and early Holocene periods (Behl and Kennett 1996, Kennett et al. 2008). During the late Pleistocene cooler periods were generally accompanied with lower precipitation while warmer periods were accompanied with higher precipitation. Mean temperature at the last glacial maximum decreased from 11° to 5° C and precipitation declined from 100 cm to 45 cm (Heusser 1995, Heusser and Sirocko 1997). The amount of annual precipitation probably affected the extent of woodland and scrub habitats on islands comprising the Santarosae landmass and this in turn would have affected the size of ISSJ populations on each of these island landmasses.

The most significant environmental change to terrestrial environments on the NCI during the late Pleistocene occurred at the Ållerød-Younger Dryas transition (~13-12.9 ka; Kennett et al. 2008). A cosmic impact in North America resulted in intense wildfires which swept across much of the continent including the NCI (Kennett et al 2008). The fire storm that swept across the NCI resulted in an abrupt change in the vegetation and in the fire regime on the islands (Kennett et al. 2008). Prior to this event, there had been a substantial buildup of fuel from Late Pleistocene conifer forests that were present on the islands. During the Bølling-Ållerød Interstadial (16.5 to 12.9 ka) the climate began to warm and to dry (Heusser and Sirocko 1997). Pollen from the SBB core showed that pine (*Pinus*) and juniper-cypress (*Juniperus-Cupressus*) was dominant during the last glacial maximum and persisted throughout the Bølling-Ållerød Interstadial. Oaks began to expand in the region after 16 ka probably in relation to an increase in warm, seasonally dry conditions during the Ållerød (Heusser 1995, 1998). Pollen recovered from an alluvial deposit in Arlington Canyon indicated that a pine and cypress forest existed on Santa Rosa Island at 10,860 ± 70 RCYBP (Johnson et al. 2007). During the Younger Dryas (13.1 to 11.3 ka) there was an abrupt decline in the abundance of juniper-cypress pollen which was common before but which disappeared after the 13-12.9 ka mass burning event of the onset of the Younger Dryas (Kennett et al. 2008). The decline in conifer forests on the NCI was followed by an increase in grass and herbs, “suggesting a regional shift to more open habitats dominated by grasslands, coastal sage, and chaparral communities with dispersed stands of oak” (Kennett et al. 2008:2539). This change in plant communities in coastal southern California reached its near-Holocene distributions by 10 ka (Heusser 1995). Clearly changes in terrestrial habitats on the NCI during the late Pleistocene have impacted ISSJ populations. The shift from conifer dominated habitats to grassland-scrub (coastal sage scrub and chaparral) communities with dispersed stands of oaks could have resulted in smaller ISSJ populations on islands like San Miguel, Santa Rosa and Anacapa which ultimately could have contributed to the extinction of jays on each of these islands. The small size and limited amount of suitable woodland habitat (oak woodland

and chaparral) for jays on Anacapa and San Miguel Islands probably contributed to the extinction of jays from both islands soon after they separated from the Santarosae landmass.

Pygmy Mammoths and Prehistoric Grazing

Columbian mammoths (*Mammuthus columbi*) initially reached the NCI by swimming sometime during the early- to mid-Wisconsin glaciation (i. e., well before 47 ka) when sea level stands were lower and the distance between the islands and the mainland were shorter (Agenbroad 1998, Thaler 1998). Following an initial period of isolation, a diminutive species of pygmy mammoth (*M. exilis*) subsequently evolved and became the dominant terrestrial vertebrate on the NCI during the late Pleistocene. Isolation, absence of large terrestrial predators, lower carrying capacity and reduced food supplies all played a role through natural selection in the evolution of small-sized mammoths on the Channel Islands (Agenbroad 2002a and b). Radio carbon dates for pygmy mammoth remains on the islands suggest that the species was present on the islands sometime prior to 40,000 yr B.P. (Agenbroad 2003) and that it survived on the islands until the onset of the Younger Dryas (~13-12.9 ka) when the species is believed to have gone extinct (Agenbroad et al. 2005, Kennett et al. 2008).

Pygmy mammoths would have modified plant communities on the NCI as a result of their grazing and browsing pressure. Scrub and woodland habits would likely have been confined to steeper areas of the Santarosae landmass that were inaccessible to pygmy mammoths. On the Channel Islands, pygmy mammoths were capable of negotiating slopes up to 32 degrees (Agenbroad 1998, 2002b). The shorter limbs and lower center of gravity of pygmy mammoths enabled them to access plant resources from steeper areas on the islands. The ability of pygmy mammoths to reach resources on steeper slopes than their mainland counterpart, the Columbian mammoth, was a selective advantage to this species particularly during periods of environmental stress resulting from droughts, wild fires, and overcrowding as the Santarosae landmass declined from rising sea levels during the late Pleistocene (Agenbroad 2002b). A reduction in the extent of habitat available to pygmy mammoths on the islands since the last glacial maximum would have resulted in resource limitations and food shortages that were undoubtedly exacerbated by destruction/alteration of habitats from over grazing by pygmy mammoths (Johnson 1972, 1980; Laws 1970). Sea level changes between 17.5 and 13 ka would have reduced island area on the Santarosae landmass by ~32% (Kennett et al. (2008). Remaining areas of the Santarosae landmass that were accessible to pygmy mammoths following this reduction in landmass would have been under intense grazing pressure such that accessible scrub and woodland habitats probably would have been converted to grasslands or more open grassland-scrub habitats. Denser wooded habitats (chaparral, pine forests, and oak woodlands) would have been restricted to steeper slopes (>30 degrees) that were inaccessible to pygmy mammoths (see Figure 1b). Thus, the amount of suitable woodland-scrub habitat for ISSJ on the Santarosae landmass would have been significantly reduced as a result of intensive grazing by pygmy mammoths throughout the late Pleistocene when mammoths were present on the NCI.

A population of ISSJs was able to persist throughout the late Pleistocene on Santa Cruz Island due in part to more extensive areas of steep terrain (e.g., slopes greater than 30 degrees; Figure 1b, Table 5) than found on the other northern Channel Islands. Today Santa Cruz Island has 20.7% of its area (12,760 acres) with slopes greater than 30 degrees while San Miguel Island has 2.8% (268 acres), Santa Rosa Island has 5.4% (2,869 acres), and Anacapa Island has 48.1% (350 acres) with slopes greater than 30 degrees (Table 5). The more extensive areas of steep terrain on Santa Cruz Island made more of this island inaccessible to pygmy mammoths. As a result, Santa Cruz Island would have been vegetated with more extensive areas of scrub and woodland habitats which are preferred by ISSJs. The Santa Rosa and San Miguel island landmasses contained significantly less steep terrain (slopes >30 degrees) than Santa Cruz Island (Figure 1b, Table 5) and as a result would have supported smaller more widely dispersed pockets of preferred scrub and woodland habitats when mammoths were present. These smaller pockets would have led to smaller ISSJ populations on both islands when mammoths were present. The extent of scrub and woodland habitat capable of sustaining an ISSJ population on San Miguel and Anacapa Islands when pygmy mammoths were present would likely have been too small to sustain a resident jay population for any length of time. However, the amount of suitable ISSJ habitat on Santa Rosa Island would probably have been sufficient to sustain a smaller population of jays throughout the late Pleistocene-Holocene even in the presence of intensive grazing by mammoths. Following the extinction of pygmy mammoths at ~13-12.9 ka, (Agenbroad et al. 2005), scrub and woodland habitats on the NCI would have increased in the absence of mammoth grazing pressure which in turn would have led to larger ISSJ populations on islands where jays had persisted.

Native Peoples and Fire

Following the disappearance of pygmy mammoths from the islands, Native Peoples arrived at the northern Channel Island ~13 ka (Johnson et al. 2002). Recent radio carbon dates for pygmy mammoths ($11,030 \pm 50$ RCBP) and human remains ($10,960 \pm 80$ RCBP) from Santa Rosa Island indicates that mammoths were probably still extant on the NCI when humans first arrived (Agenbroad et al. 2005, Johnson et al. 2002). Erlandson et al. (1996) reported early human occupation of Daisy Cave on San Miguel Island at $10,390 \pm 410$ RCBP. Thus, by 12,200 ka Native Peoples were present on the western Santarosae landmass (Erlandson 2007, Erlandson et al. 2008). More extensive evidence of humans on the Santarosae landmass is found between 10.2 and 9 ka (Rick et al. 2005, Erlandson et al. 2007). Native Peoples occupied the Santarosae landmass for a period of ~4,000 years before sea levels stabilized and the Santarosae landmass separated into the four separate islands that comprise the NCI.

During the mid-to-late Holocene, Native Peoples developed a maritime adapted culture on the Channel Islands and established a number of permanent villages on each of the islands. The principal source of food for the Native Peoples inhabiting the islands was obtained from the marine environment (fish, marine mammals, shellfish, and seabirds) however, they were also undoubtedly exerting some pressure on terrestrial habitats for some of their nutritional needs (e.g., plant bulbs, plant seeds and acorns).

Table 5. The extent of acreage of slopes above 30 degrees on the Northern Channel Islands between 16 ka and the present. Acreages for the Santarosae landmass were derived from bathymetric data, where 16 ka \geq -120 meters, 12 ka \geq -60 meters and 10 ka \geq -36 meters.

Island Landmass	Age	Island Area (Acres)	Slopes >30 degrees (Acres) ^a	Slopes >30 degrees (% of island total)
Present Day				
San Miguel	Present	9,525	268	2.8
Santa Rosa	Present	53,190	2,869	5.4
Santa Cruz	Present	61,766	12,760	20.7
Anacapa	Present	727	350	48.1
Prehistoric				
Santarosae	16 ka	538,450	16,247	3.0
Santarosae	12 ka	307,408	16,247	5.3
San Miguel-Santa Rosa	10 ka	138,047	3,137	2.3
Santa Cruz	10 ka	87,727	12,760	14.5
Anacapa	10 ka	3,597	350	9.7

a. Acreage of slopes >30 degrees for prehistoric periods may be underestimates for currently submerged lands due to coarse resolution of bathymetric data.

Terrestrial plants played a number of important roles for the Island Chumash. Plants were an important source of nutrients (plant bulbs, seeds and acorns), but were also important sources of building materials, fuel, clothing, medicines, ceremonial offerings, utensils, and ritualistic paraphernalia (Hudson and Blackburn 1982, 1983; Martin and Popper 2001). Food sources on the islands consumed by the Island Chumash included nuts (black walnut and acorns), fruits (prickly pear, manzanita, and lemonade berry), seeds (salbush, goosefoot, sage, tarweed, barley, and red maids), greens (goosefoot and *Phacelia*) and corms (Martin and Popper 2001). These plant resources would have augmented a primarily marine diet by providing carbohydrates, vitamins and minerals not otherwise available in marine animals (Martin and Popper 2001). Island Chumash do not appear to have relied on terrestrial animals (birds and mammals) on the islands for their nutritional needs as the vertebrate fauna of the islands was depauperate. It is unlikely that ISSJ were being adversely affected as a result of Native Peoples harvesting them for their feathers or occasionally as food. The virtual absence of ISSJ remains in archaeological sites on the NCI would seem to confirm that they were not being harvested on a regular basis by the Island Chumash.

During the last glacial maximum there is evidence of periodic fires occurring on San Miguel Island (Johnson 1972, 1977). Also charcoal in core samples from Soledad Pond

and Abalone Rocks Marsh on Santa Rosa Island confirm that there were small scale grass and brush fires occurring on this island throughout the Holocene and that the frequency of these fires appear to have increased during the Late Holocene and historic periods (Anderson 2002). A peak around the 1840s in the occurrence of charcoal fragments in the core sample taken at the Abalone Rocks Estuary suggests that fire may also have been used by the first ranchers to clear brush or that fires were caused as a result of “increased flammability of the now more-continuous grassy fuels” found on the island following the introduction on feral herbivores to the island in 1844. (Cole and Liu 1994:332).

The Chumash used fire for cooking, to keep warm, and to alter terrestrial habitats to produce higher yields of the native plants that they were harvesting (Timbrook et al. 1982). To use fire for cooking and to keep warm would have required a constant level of wood harvesting which would likely have altered woodland and scrubland habitats in the general vicinity of established villages and seasonal encampments. Chumash on the mainland are known to have intentionally set wildfires in order to enhance productivity of various food plants (Timbrook et al. 1982). While it is not known if the Island Chumash used fire in a similar way on the islands, it is likely that they did since cultural practices were shared between island and coastal mainland Chumash (J. Timbrook pers. com.). It is also possible that wildfires on the islands could have started accidentally from Native American campfires. Harvesting of wood for campfires and intentional and accidental wildfires resulting from the use of fire by Island Chumash are likely to have adversely affected the extent of woodland and scrubland habitats on the NCI for ISSJ. The severity of this affect on ISSJ populations would depend on the frequency and intensity of wildfires during the Holocene when Native Peoples were present. Data from core samples taken on the islands and from the SBB core seem to confirm that there was an increase in fires during late Holocene and historic periods (Anderson 1998, 2002; Cole and Liu 1994). This increase in fires on the islands was undoubtedly due to the direct or indirect use of fire historically by Native Peoples and more recently by Europeans to alter vegetation. Whether purposeful or accidental, fire on the islands would have had the potential to dramatically alter the extent of scrub and woodland habitats for ISSJ depending on its frequency and intensity.

Europeans and Feral Herbivores

The most recent factor that has probably contributed to the decline of ISSJ habitat on the NCI was the introduction of feral herbivores (sheep, cattle, pigs) in the 1840s-1850s and the resultant vegetation stripping that occurred as these herbivore populations grew during subsequent years. From these initial and subsequent introductions, the numbers of feral animals on each of the NCI grew significantly during the later half of the 19th century (Appendix IV). On San Miguel Island the number of sheep went from an initial introduction of 45 sheep in 1851 to a high of 6,000 by 1862 and down to 2,000-4,000 during the 1880s-1890s (Figure 7, Appendix IV). On Santa Rosa Island the number of sheep went from an initial introduction of 53 sheep in 1844 (Holland 1962) to over 60,000 in the early 1870s (Browne 1874, Thompson and West 1883), and 80,000 in the 1880s (Thayer 1888, Towne and Wentworth 1945, Appendix IV). At their peak in the

late 1880s, it was estimated that over 125,000 sheep roamed Santa Rosa Island. (Holland 1962; Stork and Tompkins 1958; Appendix IV). On Santa Cruz Island sheep went from an initial introduction of 200 animals in 1852 (Mason 1883, Kinsell 1891) to 30,000-40,000 in the late 1860s, to ~ 70,000 during the 1870s-1880s, to a peak of almost 100,000 by 1890 (Appendix IV). At these stocking rates, sheep would have severely depleted the vegetation on each of the northern Channel Islands.

Other factors that may also have contributed to the depletion of scrub and woodland habitats on the NCI during the second half of the 19th century included: (1) a series of severe droughts in 1863-1864, 1870-1872, 1877, and 1893-1904 (Johnson 1972); and (2) brush burning by the early stockmen to increase grasslands for their grazing operations on the islands. Both of these factors would have contributed to an increased rate of loss of scrub and woodland habitats on the NCI. Droughts coupled with intense grazing pressure would have led to more severe vegetation stripping and ultimately to the slaughter of feral herbivores due to the lack of available forage on the islands during drought years. Brush burning would have contributed to the loss of scrub and woodland habitats and would have led to increased rates of vegetation stripping of remaining areas of scrub and woodland habitats by feral herbivores. Extensive browsing from sheep and other feral herbivores (pigs, goats, cattle, and horses) during the 1860s-1880s would have led to the degradation and loss of suitable woodland and scrubland habitats for ISSJ on each of the NCI. ISSJ populations that remained on islands with the least amount of woodland and scrub habits (e.g., San Miguel, Santa Rosa and Anacapa) would have been impacted more quickly by overgrazing than would an island like Santa Cruz that had more extensive stands of scrub and woodland habitats and which was considerably larger than the other islands.

Assuming that a small remnant population of ISSJ persisted on Santa Rosa Island after Island Chumash were removed from the island in 1812, then habitat degradation wrought by stockmen and feral herbivores during the second half of the 1800s would have contributed to the decline and ultimately led to the extirpation of ISSJ from Santa Rosa Island. The relative abundance of sheep on Santa Cruz and Santa Rosa Islands during the second half of the 1800s follows a similar pattern (Figure 7) with Santa Cruz Island reaching population highs of ~ 100,000 sheep in 1890 and Santa Rosa Island reaching a high of 80,000 sheep in 1888 (Figure 7, Appendix IV). Loss of scrub and woodland habitats on Santa Rosa Island from intensive sheep grazing during the 1860s-1880s period (Figure 7) could have resulted in the extinction of a small remnant population of jays on Santa Rosa Island by the early 1890s. The impact of this grazing pressure from sheep on suitable ISSJ habitats (scrub and woodland habits) at Santa Rosa Island was more severe than on Santa Cruz Island due to the limited extent of these habitats on Santa Rosa Island. ISSJ would have been able to persist on Santa Cruz Island even though this island was subjected to a similar intensity of sheep grazing as that on Santa Rosa Island because there was more scrub and woodland habitat present on Santa Cruz Island due in part to the islands greater topographic relief and larger size. As a result, Santa Cruz Island would have supported

a much larger ISSJ population than would Santa Rosa Island when intensive sheep grazing was taking place during the second half of the 19th century.

John F. More's statement in the summer of 1892 to Clark P. Streator that jays were present on Santa Rosa Island suggests that ISSJ occurred on this island into the historic period when intensive feral herbivore grazing was taking place. While it is impossible to determine precisely when ISSJ disappeared from Santa Rosa Island, an approximate time frame can be suggested based on when J. F. More was visiting and working on the island. Mr. More began spending time at his brother's sheep ranch on Santa Rosa Island starting in the mid-to-late 1870s and served as the ranch manager for a period of time in the late 1880s until the mid-1890s. During this ~15-20 year period, J. F. More would have had ample time in which to have observed a small remnant jay population assuming this species was still present on the island. If jays were present on Santa Rosa Island as John More noted, he could have seen them there sometime during his tenure with the island between the mid-1870s and the late 1880s with the population dying out prior to the early 1890s. The fact that no other ornithologists visiting Santa Rosa Island from 1892 onward reported seeing jays on Santa Rosa Island suggests that ISSJ were gone from the island prior to or just after Clark P. Streator's visit in July 1892.

V. CONCLUSIONS

A review of published and unpublished data related to prehistoric (fossils), proto-historic (archaeological faunal remains), historic, and recent (specimen and egg sets and published papers) records found that island scrub-jays (*Aphelocoma insularis*) were first observed at Santa Cruz Island in 1875 by Henry W. Henshaw. Island scrub-jay (ISSJ) bones found in a Historic Period archaeological site (SCRI-192) confirm that this species was present on Santa Cruz Island prior to being discovered by Henshaw in 1875. No records were found for the occurrence of ISSJ on Anacapa or San Miguel Islands. A putative Roseño word for a blue-crested jay, *tcu-we-w*, may represent an Island Chumash (Cruzeño or Roseño) word for ISSJ. A single ISSJ femur from a Late Pleistocene-Holocene site on Santa Rosa Island (SRI-V-3) confirms that ISSJ were present on Santa Rosa Island during the late Pleistocene. John F. More's statement to Clark P. Streator in July 1892 at Santa Rosa Island that "there are jays on the island" indicates that ISSJ probably persisted on Santa Rosa Island into the late 1800s before going extinct. Degradation of woodland and scrub habitats on Santa Rosa Island as a result of overgrazing by feral herbivores (sheep, cattle and pigs) and subsequent vegetation stripping during the second half of the 1800s probably resulted in the extinction of ISSJ from Santa Rosa Island. A variety of biotic and abiotic factors were identified that likely affected the distribution and abundance of ISSJ on the northern Channel Islands during the Pleistocene including sea level change, paleoclimate change, habitat alteration by pygmy mammoth grazing, wildfires on the northern Channel Islands resulting from a cosmic impact at the Allerød-Younger Dryas transition (~13-12.9 ka), use of fire on the islands by Native Peoples and stockmen to alter vegetation, and loss of scrub and woodland vegetation from feral herbivore overgrazing. Sea level changes during glacial-interglacial periods of the Pleistocene resulted in the formation of the Santarosae landmass which was comprised of the four northern Channel Islands. ISSJ would have been able to easily disperse across the Santarosae landmass from Santa Cruz Island when this large island landmass was present. As sea levels rose and the Santarosae landmass began to breakup into the four islands that comprise the present day northern Channel Islands, ISSJ would have been confined to pockets of suitable habitat found on each of the four islands. The populations on San Miguel and Anacapa Islands likely died out quickly due in part to small population size which resulted from the limited amount of suitable scrub and woodland habitat on these two islands. ISSJ remained on Santa Cruz and perhaps on Santa Rosa Islands with the smaller remnant population on Santa Rosa Island going extinct following intensive vegetation stripping resulting from overgrazing by sheep and cattle during the 1860s-1890s.

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APPENDIX I

Publications, Unpublished Manuscripts and Field Notes
Reviewed for Information Pertaining to the Historic Record
of Island Scrub-Jays (*Aphelocoma insularis*) on the
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APPENDIX II

Database of Island Scrub-Jay (*Aphelocoma insularis*)

Specimens and Egg Sets Collected Between 1875 and 2004

Island Scrub-Jay (*Aphelocoma insularis*) specimens collected from Santa Cruz Island (1875-2004).

Museum	Catalog No.	Year	Month	Date Collected	Collector	Sex	Age	Specimen Type
USNM	72544	1875	June	10 Jun 1875	Henshaw HW 19	M	adult	Study Skin
USNM	79695	1875	June	11 Jun 1875	Henshaw HW 733		adult	Study Skin
USNM	72542	1875	June	11 Jun 1875	Henshaw HW 20	M	adult	Study Skin
USNM	72543	1875	June	11 Jun 1875	Henshaw HW 731	F	adult	Study Skin
USNM	117650	1889	February	6 Feb 1889	Townsend CH	F	adult	Study Skin
USNM	117651	1889	February	6 Feb 1889	Townsend CH	M		Study Skin
USNM	117652	1889	February	6 Feb 1889	Townsend CH	F		Study Skin
USNM	117653	1889	February	6 Feb 1889	Townsend CH			Study Skin
USNM	117654	1889	February	6 Feb 1889	Townsend CH	M	adult	Study Skin
USNM	117655	1889	February	7 Feb 1889	Townsend CH			Study Skin
USNM	117656	1889	February	7 Feb 1889	Townsend CH	F		Study Skin
USNM	139612	1892	July	14 Jul 1892	Streator CP	F	adult	Study Skin
USNM	139613	1892	July	14 Jul 1892	Streator CP			Study Skin
USNM	139614	1892	July	14 Jul 1892	Streator CP	M		Study Skin
USNM	139615	1892	July	15 Jul 1892	Streator CP	M		Study Skin
USNM	139616	1892	July	16 Jul 1892	Streator CP	M	adult	Study Skin
USNM	139617	1892	July	16 Jul 1892	Streator CP	M		Study Skin
USNM	139618	1892	July	18 Jul 1892	Streator CP	M		Study Skin
USNM	139619	1892	July	18 Jul 1892	Streator CP	F		Study Skin
USNM	139620	1892	July	18 Jul 1892	Streator CP	M		Study Skin
USNM	139621	1892	July	18 Jul 1892	Streator CP	F	adult	Study Skin
USNM	142136	1892	July	18 Jul 1892	Streator CP	F		Study Skin
USNM	139607	1892	July	9 Jul 1892	Streator CP	M		Study Skin
USNM	139608	1892	July	9 Jul 1892	Streator CP	F	adult	Study Skin
USNM	139609	1892	July	9 Jul 1892	Streator CP	M		Study Skin
USNM	139610	1892	July	9 Jul 1892	Streator CP	F		Study Skin
USNM	139611	1892	July	9 Jul 1892	Streator CP	M		Study Skin
MCZ	331470	1895	June	8 Jun 1895	Beck RH	F		Live Mount
BMNH	1898.7.12.131	1895	June	8 Jun 1895	Beck RH	M	juvenile	Study Skin
BMNH	1900.7.20.129	1895	June	8 Jun 1895	Beck RH	F		Study Skin
BMNH	1900.7.20.131	1895	June	8 Jun 1895	Beck RH	M	juvenile	Study Skin
FMNH	6540	1895	June	8 Jun 1895	Beck RH	M		Study Skin
FMNH	142505	1895	June	8 Jun 1895	Beck RH	M		Study Skin
FMNH	142506	1895	June	8 Jun 1895	Beck RH	M		Study Skin
FMNH	142507	1895	June	8 Jun 1895	Beck RH	F		Study Skin
MVZ	107224	1895	June	8 Jun 1895	Beck RH	F		Study Skin
ROM	50362	1895	June	8 Jun 1895	Beck RH	M		Study Skin
ROM	50363	1895	June	8 Jun 1895	Beck RH	M		Study Skin
USNM	150930	1895	June	8 Jun 1895	Beck RH	M	adult	Study Skin
USNM	150932	1895	June	8 Jun 1895	Beck RH	M		Study Skin
USNM	150933	1895	June	8 Jun 1895	Beck RH			Study Skin
AMNH	372257	1897	May	10 May 1897	Beck RH	M		Study Skin
AMNH	372260	1897	May	10 May 1897	Beck RH	F		Study Skin
AMNH	756238	1897	May	10 May 1897	Beck RH	M		Study Skin
AMNH	756239	1897	May	10 May 1897	Beck RH	F		Study Skin
MCZ	318571	1897	May	10 May 1897	Beck RH	F		Study Skin
ROM	50365	1897	May	10 May 1897	Beck RH	F		Study Skin
DMNH	6577	1897	May	8 May 1897	Beck RH			Study Skin
BMNH	1900.7.20.128	1898	April	14 Apr 1898	Mailliard J	M	adult	Study Skin
DMNH	6578	1898	April	15 Apr 1898	Atherton FJ			Study Skin
CAS	48331	1898	April	15 Apr 1898	Mailliard J 3156	F		Study Skin
CAS	48346	1898	April	15 Apr 1898	Mailliard J and JW 3153	F		Study Skin
MCZ	103309	1898	April	15 Apr 1898	Mailliard J and JW 3154	M		Study Skin
CAS	25730	1898	April	16 Apr 1898	Mailliard J 3161	F		Study Skin
CAS	48325	1898	April	16 Apr 1898	Mailliard J 3163	M		Study Skin
CMNH	63818	1898	April	17 Apr 1898	Mailliard J	F		Study Skin

Historic and Prehistoric Record for Island Scrub-Jays on the Northern Channel Islands

Island Scrub-Jay (*Aphelocoma insularis*) specimens collected from Santa Cruz Island (1875-2004).

Museum	Catalog No.	Year	Month	Date Collected	Collector	Sex	Age	Specimen Type
CAS	48326	1898	April	17 Apr 1898	Mailliard J 3174	M		Study Skin
CAS	48335	1898	April	17 Apr 1898	Mailliard J and JW 3176	F		Study Skin
MCZ	103310	1898	April	17 Apr 1898	Mailliard J and JW 3179	M		Study Skin
CAS	48334	1898	April	17 Apr 1898	Mailliard J and JW 3181	M		Study Skin
MVZ	82441	1898	April	17 Apr 1898	Mailliard J and JW 6590	M		Study Skin
FMNH	40679	1898	April	17 Apr 1898	Mailliard JW 3177	M		Study Skin
FMNH	40678	1898	April	17 Apr 1898	Mailliard JW 3183	F		Study Skin
CAS	11339	1898	April	19 Apr 1898	Mailliard J 3200	F		Study Skin
SDNHM	23952	1898	April	19 Apr 1898	Mailliard J and JW	F		Study Skin
CAS	48342	1898	April	19 Apr 1898	Mailliard J and JW 3201	F		Study Skin
BMNH	1900.7.20.130	1898	April	20 Apr 1898	Mailliard J	F	adult	Study Skin
CAS	11340	1898	April	20 Apr 1898	Mailliard J 3110	M		Study Skin
CAS	48333	1898	April	20 Apr 1898	Mailliard J 3209	F		Study Skin
CAS	48345	1898	April	20 Apr 1898	Mailliard J and JW 3208	F		Study Skin
CAS	48340	1898	April	20 Apr 1898	Mailliard J and JW 3212	M		Study Skin
AMNH	372258	1898	April	21 Apr 1898	Mailliard J	M		Study Skin
CAS	48327	1898	April	21 Apr 1898	Mailliard J 3222	M		Study Skin
CAS	48322	1898	April	21 Apr 1898	Mailliard J 3223	M		Study Skin
CAS	48321	1898	April	21 Apr 1898	Mailliard J 3224	M		Study Skin
CAS	48343	1898	April	21 Apr 1898	Mailliard J and JW 3221	F		Study Skin
CMNH	63819	1898	April	22 Apr 1898	Mailliard J	M		Study Skin
CAS	48328	1898	April	22 Apr 1898	Mailliard J 3226	M		Study Skin
CAS	48320	1898	April	22 Apr 1898	Mailliard J 3230	M		Study Skin
ROM	50360	1898	April	22 Apr 1898	Mailliard J and JW	M	adult	Study Skin
CMNH	63820	1898	April	23 Apr 1898	Mailliard J	F		Study Skin
CMNH	63821	1898	April	23 Apr 1898	Mailliard J	M		Study Skin
CAS	25732	1898	April	23 Apr 1898	Mailliard J 3238	M		Study Skin
CUMV	10567	1898	April	23 Apr 1898	Mailliard J and JW	M		Study Skin
CAS	48338	1898	April	23 Apr 1898	Mailliard J and JW 3241	M		Study Skin
CMNH	63822	1898	April	24 Apr 1898	Mailliard J	M		Study Skin
CAS	48329	1898	April	24 Apr 1898	Mailliard J 3256	M		Study Skin
CMNH	63823	1898	April	24 Apr 1898	Mailliard J and JW	M		Study Skin
CAS	48341	1898	April	24 Apr 1898	Mailliard J and JW 3250	F		Study Skin
CAS	48339	1898	April	24 Apr 1898	Mailliard J and JW 3254	M		Study Skin
CAS	48323	1898	April	25 Apr 1898	Mailliard J 3261	M		Study Skin
CAS	25731	1898	April	26 Apr 1898	Mailliard J 3267	F		Study Skin
CAS	25729	1898	April	26 Apr 1898	Mailliard J 3268	M		Study Skin
CAS	25733	1898	April	26 Apr 1898	Mailliard J 3269	M		Study Skin
CAS	48330	1898	April	26 Apr 1898	Mailliard J 3270	M		Study Skin
SDNHM	23953	1898	April	26 Apr 1898	Mailliard J and JW	M		Study Skin
CAS	48336	1898	April	29 Apr 1898	Mailliard J and JW 3277	M		Study Skin
CAS	48337	1898	April	29 Apr 1898	Mailliard J and JW 3278	M		Study Skin
AMNH	372259	1898	April	8 Apr 1898	Mailliard J	F		Study Skin
CAS	48332	1898	April	8 Apr 1898	Mailliard J 3140	F		Study Skin
CAS	48324	1898	April	8 Apr 1898	Mailliard J 3142	M		Study Skin
MVZ	102974	1898	April	8 Apr 1898	Mailliard J and JW 3141	F		Study Skin
MVZ	33792	1903	September	1 Sep 1903	Grinnell J	F		Study Skin
MVZ	33793	1903	September	1 Sep 1903	Grinnell J	M		Study Skin
MVZ	33794	1903	September	1 Sep 1903	Grinnell J	M		Study Skin
MVZ	33795	1903	September	1 Sep 1903	Grinnell J	F		Study Skin
MVZ	33796	1903	September	1 Sep 1903	Grinnell J	F		Study Skin
MVZ	33797	1903	September	1 Sep 1903	Grinnell J	F		Study Skin
MVZ	33798	1903	September	1 Sep 1903	Grinnell J	F		Study Skin
MVZ	33791	1903	September	1 Sep 1903	Grinnell J 5431	F		Study Skin
MVZ	33799	1903	September	3 Sep 1903	Grinnell J	M		Study Skin
MVZ	33800	1903	September	3 Sep 1903	Grinnell J	M		Study Skin

Island Scrub-Jay (*Aphelocoma insularis*) specimens collected from Santa Cruz Island (1875-2004).

Museum	Catalog No.	Year	Month	Date Collected	Collector	Sex	Age	Specimen Type
MCZ	304880	1906	April	5 Apr 1906	Howard OW 4880	M		Study Skin
LACM	3969	1906	April	5 Apr 1906	Lelande HJ	F		Study Skin
LACM	3970	1906	April	5 Apr 1906	Lelande HJ	M		Study Skin
LACM	3971	1906	April	5 Apr 1906	Lelande HJ	F		Study Skin
LACM	3972	1906	April	5 Apr 1906	Lelande HJ	M		Study Skin
MCZ	304879	1906	April	26 Apr 1906	Howard OW 4879	F		Study Skin
MCZ	304882	1906	April	28 Apr 1906	Howard OW	F		Study Skin
MCZ	304881	1906	April	28 Apr 1906	Howard OW 4881	M		Study Skin
DMNH	6579	1906	April	30 Apr 1906	Howard OW			Study Skin
MCZ	254537	1907	May	17 May 1907	Willett GW and Linton CB	M		Study Skin
LACM	7403	1907	November	20 Nov 1907	Willett GW and Linton CB	F		Study Skin
LACM	7406	1907	November	20 Nov 1907	Willett GW and Linton CB	M		Study Skin
LACM	22435	1907	November	20 Nov 1907	Willett GW and Linton CB	F		Study Skin
LACM	22437	1907	November	20 Nov 1907	Willett GW and Linton CB	F		Study Skin
LACM	22438	1907	November	20 Nov 1907	Willett GW and Linton CB	F		Study Skin
MCZ	316808	1907	November	20 Nov 1907	Willett GW and Linton CB 1183	F	adult	Study Skin
MCZ	182204	1907	November	21 Nov 1907	Willett GW and Linton CB	F		Study Skin
DMNH	42367	1907	November	22 Nov 1907	Linton CB			Study Skin
AMNH	756233	1907	November	23 Nov 1907	Linton CB 661	M		Study Skin
BMNH	1908.12.17.2	1907	November	23 Nov 1907	Linton CB 992	F	adult	Study Skin
ROM	87492	1907	November	23 Nov 1907	Willett GW 402	F	adult	Study Skin
LACM	7400	1907	November	23 Nov 1907	Willett GW and Linton CB	M		Study Skin
LACM	7413	1907	November	23 Nov 1907	Willett GW and Linton CB	F		Study Skin
LACM	7414	1907	November	23 Nov 1907	Willett GW and Linton CB	M		Study Skin
LACM	22436	1907	November	23 Nov 1907	Willett GW and Linton CB	F		Study Skin
LACM	22439	1907	November	23 Nov 1907	Willett GW and Linton CB	M		Study Skin
LACM	22441	1907	November	23 Nov 1907	Willett GW and Linton CB	F		Study Skin
LACM	22442	1907	November	23 Nov 1907	Willett GW and Linton CB	F		Study Skin
MCZ	308998	1907	November	23 Nov 1907	Willett GW and Linton CB 1127	F	adult	Study Skin
BMNH	1908.12.17.1	1907	November	24 Nov 1907	Linton CB 994	F		Study Skin
FMNH	142508	1907	November	24 Nov 1907	Willett GW and Linton CB 1110	M		Study Skin
MCZ	254533	1907	November	24 Nov 1907	Willett GW and Linton CB 1184	M	immature	Study Skin
AMNH	372262	1907	November	25 Nov 1907	Linton CB	F		Study Skin
BMNH	1908.12.17.3	1907	November	25 Nov 1907	Linton CB 996	F	adult	Study Skin
ROM	87491	1907	November	25 Nov 1907	Willett GW 408	M	adult	Study Skin
MCZ	254536	1907	November	26 Nov 1907	Willett GW and Linton CB 481	M		Study Skin
FMNH	142520	1907	November	27 Nov 1907	Linton CB 1004	M		Study Skin
MCZ	316577	1907	November	27 Nov 1907	Willett GW and Linton CB 1189	F	adult	Study Skin
AMNH	372261	1907	November	28 Nov 1907	Linton CB	M		Study Skin
AMNH	756234	1907	November	28 Nov 1907	Vrooman AG and Linton CB 662	F		Study Skin
LACM	7404	1907	November	28 Nov 1907	Willett GW and Linton CB	F		Study Skin
AMNH	372263	1907	November	29 Nov 1907	Linton CB	F		Study Skin
LACM	7408	1907	November	29 Nov 1907	Linton CB	F		Study Skin
LACM	7405	1907	November	29 Nov 1907	Willett GW and Linton CB	F		Study Skin
LACM	22440	1907	November	29 Nov 1907	Willett GW and Linton CB	M		Study Skin
ROM	22.4.20.444	1907	November	29 Nov 1907	Willett GW and Linton CB 1178	F		Study Skin
FMNH	70607	1907	November	29 Nov 1907	Willett GW and Linton CB 392	M		Study Skin
FMNH	142510	1907	December	1 Dec 1907	Linton CB 1109	F		Study Skin
UKMNH	25643	1907	December	1 Dec 1907	Willett GW and Linton CB	M		Study Skin
UKMNH	25644	1907	December	12 Dec 1907	Willett GW and Linton CB	F		Study Skin
LACM	7399	1907	December	14 Dec 1907	Linton CB	F		Study Skin
CAS	35513	1907	December	14 Dec 1907	Linton CB 1111	F		Study Skin
FMNH	142509	1907	December	14 Dec 1907	Linton CB 1125	M		Study Skin
CAS	48347	1907	December	14 Dec 1907	Linton CB 1172	M		Study Skin
DMNH	6581	1907	December	15 Dec 1907	Linton CB			Study Skin
LACM	7407	1907	December	15 Dec 1907	Linton CB	M		Study Skin

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Island Scrub-Jay (*Aphelocoma insularis*) specimens collected from Santa Cruz Island (1875-2004).

Museum	Catalog No.	Year	Month	Date Collected	Collector	Sex	Age	Specimen Type
CAS	35514	1907	December	15 Dec 1907	Linton CB 1108	M		Study Skin
FMNH	142512	1907	December	15 Dec 1907	Linton CB 1119	M		Study Skin
FMNH	142511	1907	December	15 Dec 1907	Linton CB 1126	F		Study Skin
MCZ	254534	1907	December	15 Dec 1907	Linton CB 1169	F	adult	Study Skin
MCZ	308999	1907	December	15 Dec 1907	Linton CB 1173	M	immature	Study Skin
BMNH	1908.12.17.6	1907	December	15 Dec 1907	Linton CB 991	M		Study Skin
BMNH	1908.12.17.5	1907	December	15 Dec 1907	Linton CB 993	M		Study Skin
FMNH	142521	1907	December	16 Dec 1907	Linton CB	F		Study Skin
LACM	7409	1907	December	16 Dec 1907	Linton CB	M		Study Skin
BMNH	1908.12.17.4	1907	December	16 Dec 1907	Linton CB 995	F	adult	Study Skin
MCZ	182205	1907	December	20 Dec 1907	Linton CB	M		Study Skin
FMNH	142513	1907	December	20 Dec 1907	Linton CB 1167	F		Study Skin
MCZ	254535	1907	December	23 Dec 1907	Willet GW and Linton CB 411	F		Study Skin
MCZ	182206	1908	September	30 Sep 1908	Linton CB 1643	F	immature	Study Skin
MCZ	316576	1908	October	1 Oct 1908	Linton CB 1645	F	adult	Study Skin
MCZ	182207	1908	October	3 Oct 1908	Linton CB 1644	F		Study Skin
MCZ	316575	1908	October	9 Oct 1908	Linton CB 1641	M	adult	Study Skin
MCZ	316573	1908	October	10 Oct 1908	Linton CB 1634	M	adult	Study Skin
MCZ	316574	1908	October	10 Oct 1908	Linton CB 1639	M		Study Skin
MCZ	182208	1908	October	10 Oct 1908	Linton CB 1642	F	adult	Study Skin
MCZ	182209	1908	October	12 Oct 1908	Linton CB 1638	F	immature	Study Skin
LACM	7401	1908	October	15 Oct 1908	Linton CB	M		Study Skin
ZMB	2000.8412	1908	October	16 Oct 1908	Linton CB	F	adult	Study Skin
FMNH	142514	1908	October	16 Oct 1908	Linton CB 1148	M		Study Skin
LACM	7398	1908	October	21 Oct 1908	Linton CB	F		Study Skin
LACM	7402	1908	October	21 Oct 1908	Linton CB	M		Study Skin
FMNH	142515	1908	October	23 Oct 1908	Linton CB 1149	M		Study Skin
ANSP	81462	1909	August	9 Aug 1909	Wright HW	M		Study Skin
UCLA	10092	1909	August	9 Aug 1909	Wright HW	M	juvenile	Study Skin
CAS	77491	1909	August	9 Aug 1909	Wright HW 680	F		Study Skin
CAS	77489	1909	August	9 Aug 1909	Wright HW 681	F		Study Skin
CAS	77490	1909	August	9 Aug 1909	Wright HW 683	F		Study Skin
CAS	77494	1909	August	9 Aug 1909	Wright HW 684	M		Study Skin
CAS	77492	1909	August	9 Aug 1909	Wright HW 685	M		Study Skin
CAS	77493	1909	August	9 Aug 1909	Wright HW 688	F		Study Skin
USNM	417008	1909	August	9 Aug 1909	Wright HW 989	F	adult	Study Skin
MCZ	316572	1909	September	29 Sep 1909	Linton CB 1646	F	adult	Study Skin
CMNH	99953	1911	April	25 Apr 1911	Howell AB	M		Study Skin
CMNH	162912	1911	April	25 Apr 1911	Howell AB	M		Study Skin
UCSB	2809	1911	April	25 Apr 1911	Howell AB	M		Study Skin
WFVZ	35996	1911	April	27 Apr 1911	Howell AB	M		Study Skin
CMNH	99954	1911	April	28 Apr 1911	Howell AB	M		Study Skin
CMNH	99955	1911	April	28 Apr 1911	Howell AB	F		Study Skin
MCZ	151571	1911	April	28 Apr 1911	Howell AB	M		Study Skin
UCLA	10093	1911	April	28 Apr 1911	Howell AB	F		Study Skin
MVZ	23329	1911	April	28 Apr 1911	van Rossem AJ	M		Study Skin
MVZ	23330	1911	April	28 Apr 1911	van Rossem AJ	M		Study Skin
ROM	50361	1911	April	28 Apr 1911	van Rossem AJ 24111	M	adult	Study Skin
SDNHM	32167	1911	April	29 Apr 1911	Howell AB LHM 461	M		Study Skin
USNM	590957	1911	April	29 Apr 1911	van Rossem AJ	M	adult	Study Skin
YPM	2226	1911	April	29 Apr 1911	van Rossem AJ	F		Study Skin
CMNH	99956	1911	April	30 Apr 1911	Howell AB	F		Study Skin
MVZ	102975	1911	April	30 Apr 1911	Howell AB 100	M		Study Skin
CMNH	99957	1911	May	1 May 1911	Howell AB	F		Study Skin
UCLA	10094	1911	May	1 May 1911	Howell AB	M		Study Skin
UCSB	2809	1911	May	May 1911	Howell AB	M		Study Skin

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Museum	Catalog No.	Year	Month	Date Collected	Collector	Sex	Age	Specimen Type
UCLA	10095	1911	May	5 May 1911	Howell AB	M		Study Skin
CMNH	99958	1911	May	21 May 1911	Howell AB	F		Study Skin
CAS	18169	1911	July	1 Jul 1911	Rowley JS			Study Skin
WFVZ	49044	1912	April	Apr 1912	Granville FL	F		Study Skin
WFVZ	49043	1912	April	Apr 1912	Wyman LE	M		Study Skin
SDNHM	32165	1912	April	12 Apr 1912	Granville FL LMH 4176	M		Study Skin
SDNHM	32166	1912	April	12 Apr 1912	Granville FL LMH 4177	M		Study Skin
WFVZ	35996	1912	April	27 Apr 1912				Study Skin
CAS	77488	1912	July	7 Jul 1912	Wright HW 70	F	adult	Study Skin
LACM	7410	1914	April	12 Apr 1914	Hornung J	F		Study Skin
LACM	7412	1914	April	12 Apr 1914	Hornung J	M		Study Skin
FMNH	142522	1914	April	28 Apr 1914	Hornung J	F		Study Skin
AMNH	756227	1914	June	2 Jun 1914	Kimball HH 492	F		Study Skin
AMNH	756230	1914	June	4 Jun 1914	Kimball HH 493	F		Study Skin
DMNH	6580	1914	June	5 Jun 1914	Kimball HH			Study Skin
MCZ	149431	1914	June	5 Jun 1914	Kimball HH 1169	M		Study Skin
AMNH	756231	1914	June	6 Jun 1914	Kimball HH 494	F		Study Skin
MCZ	149429	1914	June	7 Jun 1914	Kimball HH 1170	F		Study Skin
UCLA	24112	1914	June	8 Jun 1914	Kimball HH	M		Study Skin
MCZ	149427	1914	June	8 Jun 1914	Kimball HH 1180	F		Study Skin
AMNH	756227	1914	June	8 Jun 1914	Kimball HH 490	M		Study Skin
AMNH	756232	1914	June	8 Jun 1914	Kimball HH 495	F		Study Skin
MVZ	102976	1914	June	10 Jun 1914	Kimball HH	F		Study Skin
AMNH	756228	1914	June	11 Jun 1914	Kimball HH 491	M		Study Skin
UCLA	24122	1914	June	15 Jun 1914	Kimball HH	F		Study Skin
FMNH	142516	1914	June	16 Jun 1914	Kimball HH	M		Study Skin
MCZ	149428	1914	June	16 Jun 1914	Kimball HH	F		Study Skin
UCLA	24128	1914	June	18 Jun 1914	Kimball HH	F	juvenile	Study Skin
UCLA	24129	1914	June	18 Jun 1914	Kimball HH	F		Study Skin
UCLA	24130	1914	June	19 Jun 1914	Kimball HH	M		Study Skin
UCLA	24131	1914	June	19 Jun 1914	Kimball HH	M	juvenile	Study Skin
MCZ	149430	1914	June	19 Jun 1914	Kimball HH 1200	M		Study Skin
FMNH	142517	1914	June	25 Jun 1914	Kimball HH	M		Study Skin
FMNH	142518	1914	June	25 Jun 1914	Kimball HH	M		Study Skin
FMNH	142519	1914	June	25 Jun 1914	Kimball HH	F		Study Skin
LACM	7411	1914	December	14 Dec 1914	Hornung J	M		Study Skin
LACM	7415	1914	December	14 Dec 1914	Linton CB	F		Study Skin
SBMNH	857	1915	April	20 Apr 1915	Dawson WL	F		Study Skin
SBMNH	858	1915	April	20 Apr 1915	Dawson WL	M		Study Skin
SBMNH	856	1916	March	22 Mar 1916	Vrooman AG	M		Study Skin
AMNH	756235	1916	March	24 Mar 1916	Vrooman AG 6671	M		Study Skin
AMNH	756236	1916	March	24 Mar 1916	Vrooman AG 6672	F		Study Skin
AMNH	756237	1916	June	30 Jun 1916		M		Study Skin
LACM	2248	1917	November	25 Nov 1917	Hornung J	M		Study Skin
LACM	2240	1917	November	26 Nov 1917	Hornung J	M		Study Skin
LACM	2247	1917	November	26 Nov 1917	Hornung J	F		Study Skin
LACM	2243	1917	November	27 Nov 1917	Hornung J	F		Study Skin
LACM	2250	1917	November	27 Nov 1917	Hornung J	M		Study Skin
LACM	2245	1917	November	28 Nov 1917	Hornung J	F		Study Skin
LACM	2251	1917	November	28 Nov 1917	Hornung J	F		Study Skin
LACM	2252	1917	November	28 Nov 1917	Hornung J	M		Study Skin
LACM	2241	1917	November	29 Nov 1917	Hornung J	M		Study Skin
LACM	2244	1917	November	29 Nov 1917	Hornung J	M		Study Skin
LACM	2246	1917	November	29 Nov 1917	Hornung J	M		Study Skin
LACM	2254	1917	November	29 Nov 1917	Hornung J	F		Study Skin
LSUMZ	41106	1917	November	29 Nov 1917	Hornung J 1355	M		Study Skin

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Museum	Catalog No.	Year	Month	Date Collected	Collector	Sex	Age	Specimen Type
LACM	2239	1917	November	30 Nov 1917	Hornung J	M		Study Skin
LACM	2242	1917	November	30 Nov 1917	Hornung J	M		Study Skin
LACM	2253	1917	November	30 Nov 1917	Hornung J	F		Study Skin
LACM	2249	1917	December	1 Dec 1917	Hornung J	M		Study Skin
LACM	2910	1918	November	18 Nov 1918	Hornung J	M		Study Skin
LACM	2911	1918	November	28 Nov 1918	Hornung J	M		Study Skin
WFVZ	4053	1918	November	28 Nov 1918	Hornung J	M		Study Skin
LACM	2912	1918	November	29 Nov 1918	Hornung J	F		Study Skin
LACM	2913	1918	November	29 Nov 1918	Hornung J	F		Study Skin
LACM	2914	1918	November	30 Nov 1918	Hornung J	F		Study Skin
LACM	2915	1918	November	30 Nov 1918	Hornung J	M		Study Skin
LACM	2916	1918	December	1 Dec 1918	Hornung J	F		Study Skin
LACM	2917	1918	December	1 Dec 1918	Hornung J	F		Study Skin
LACM	2918	1918	December	1 Dec 1918	Hornung J	F		Study Skin
LSUMZ	41107	1918	December	1 Dec 1918	Hornung J 1980	F		Study Skin
LACM	2919	1918	December	2 Dec 1918	Hornung J	F		Study Skin
LACM	2920	1918	December	2 Dec 1918	Hornung J	F		Study Skin
LACM	2921	1918	December	3 Dec 1918	Hornung J	M		Study Skin
LACM	2922	1918	December	4 Dec 1918	Hornung J	M		Study Skin
LACM	2923	1918	December	5 Dec 1918	Hornung J	M		Study Skin
LACM	2924	1918	December	6 Dec 1918	Hornung J	F		Study Skin
UCLA	3684	1920	March	22 Mar 1920	van Rossem AJ H453	F		Study Skin
UCLA	3691	1920	March	22 Mar 1920	van Rossem AJ H460	F		Study Skin
UCLA	3692	1920	March	22 Mar 1920	van Rossem AJ H461	M		Study Skin
UCLA	3693	1920	March	22 Mar 1920	van Rossem AJ H462	F		Study Skin
UCLA	3724	1920	March	25 Mar 1920	van Rossem AJ H493	F		Study Skin
UCLA	3725	1920	March	26 Mar 1920	van Rossem AJ	F		Study Skin
UCLA	3726	1920	March	26 Mar 1920	van Rossem AJ H495	M		Study Skin
UCLA	3732	1920	March	26 Mar 1920	van Rossem AJ H501	M		Study Skin
UCLA	3733	1920	March	26 Mar 1920	van Rossem AJ H502	F		Study Skin
SDNHM	32168	1920	March	26 Mar 1920	van Rossem AJ LMH 2168	F		Study Skin
UCLA	3734	1920	March	27 Mar 1920	van Rossem AJ H503	F		Study Skin
UCLA	3735	1920	March	27 Mar 1920	van Rossem AJ H504	M		Study Skin
UCLA	3746	1920	March	28 Mar 1920	van Rossem AJ H515	F		Study Skin
UCLA	3756	1920	March	29 Mar 1920	van Rossem AJ H525	M	adult	Study Skin
UCLA	3757	1920	March	29 Mar 1920	van Rossem AJ H535	M		Study Skin
UCLA	3766	1920	March	30 Mar 1920	van Rossem AJ	M		Study Skin
UCLA	3765	1920	March	30 Mar 1920	van Rossem AJ H534	F	adult	Study Skin
UCLA	3791	1920	April	1 Apr 1920	van Rossem AJ H560	M		Study Skin
UCLA	3792	1920	April	1 Apr 1920	van Rossem AJ H561	M		Study Skin
UCLA	3793	1920	April	1 Apr 1920	van Rossem AJ H562	F		Study Skin
UCLA	3794	1920	April	1 Apr 1920	van Rossem AJ H563	M		Study Skin
UCLA	3795	1920	April	2 Apr 1920	van Rossem AJ H564	M		Study Skin
USNM	417007	1922	August	18 Aug 1922	Miller L 10754	M	juvenile	Study Skin
MVZ	81351	1922	August	19 Aug 1922	Miller AH	M		Study Skin
UCLA	6897	1922	August	20 Aug 1922	van Rossem AJ K525	F		Study Skin
UCLA	6898	1922	August	20 Aug 1922	van Rossem AJ K529	F	immature	Study Skin
UCLA	21848	1927	December	20 Dec 1927	Sheldon HH	F		Study Skin
UCLA	21850	1927	December	20 Dec 1927	Sheldon HH	F		Study Skin
UCLA	21851	1927	December	20 Dec 1927	Sheldon HH	M		Study Skin
MVZ	53266	1928	July	23 Jul 1928	Green R	M		Study Skin
MVZ	58406	1931	April	14 Apr 1931	Sheldon HH	M		Study Skin
MVZ	58407	1931	April	14 Apr 1931	Sheldon HH	F		Study Skin
MVZ	58408	1931	April	14 Apr 1931	Sheldon HH	F		Study Skin
MVZ	58409	1931	April	14 Apr 1931	Sheldon HH	F	juvenile	Study Skin
MVZ	58410	1931	April	14 Apr 1931	Sheldon HH	M		Study Skin

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Museum	Catalog No.	Year	Month	Date Collected	Collector	Sex	Age	Specimen Type
MVZ	58411	1931	April	18 Apr 1931	Sheldon HH	M		Study Skin
UMMZ	83264	1935	November	4 Nov 1935	Max Minor P	M		Study Skin
LACM	87647	1935	November	12 Nov 1935	Stager KE	M		Study Skin
LACM	87648	1935	November	12 Nov 1935	Stager KE	M		Study Skin
LACM	87649	1935	November	12 Nov 1935	Stager KE	F		Study Skin
LACM	87650	1935	November	12 Nov 1935	Stager KE	F		Study Skin
CAS	94694	1936	March	17 Mar 1936	Rett EZ	M		Study Skin
CAS	94695	1936	March	17 Mar 1936	Rett EZ	F	adult	Study Skin
ROM	87490	1936	March	18 Mar 1936	Rett EZ 1126	F	adult	Study Skin
CAS	94696	1936	March	19 Mar 1936	Rett EZ	M	adult	Study Skin
CAS	94697	1936	March	19 Mar 1936	Rett EZ	M	adult	Study Skin
CAS	94698	1936	March	19 Mar 1936	Rett EZ	F	adult	Study Skin
CAS	94699	1936	March	19 Mar 1936	Rett EZ	F	adult	Study Skin
CAS	94701	1936	March	19 Mar 1936	Rett EZ	F	adult	Study Skin
ANSP	146534	1936	March	19 Mar 1936	Rett EZ 3280	F		Study Skin
CAS	94700	1936	March	23 Mar 1936	Rett EZ	M	adult	Study Skin
ROM	90131	1936	March	25 Mar 1936	Hughes AW 1170	M	adult	Study Skin
ANSP	146533	1936	March	25 Mar 1936	Rett EZ 3283	M		Study Skin
WFVZ	13274	1937	April	18 Apr 1937	Rowley JS	F		Study Skin
WFVZ	13275	1937	April	18 Apr 1937	Rowley JS	M		Study Skin
WFVZ	49045	1937	April	18 Apr 1937	Rowley JS	M		Study Skin
SDNHM	17930	1938	May	6 May 1938	Green JE 4101	M		Study Skin
SDNHM	17931	1938	May	6 May 1938	Green JE 4102	F		Study Skin
LACM	50206	1938	August	2 Aug 1938	Ashcraft GP	M		Study Skin
LACM	50207	1938	August	2 Aug 1938	Ashcraft GP	M		Study Skin
LACM	50234	1938	September	14 Sep 1938	Ashcraft GP	M		Study Skin
LACM	50235	1938	September	14 Sep 1938	Ashcraft GP	M		Study Skin
LACM	19999	1941	March	24 Mar 1941	von Bloeker JC Jr	F		Study Skin
LACM	20002	1941	March	28 Mar 1941	von Bloeker JC Jr	M		Study Skin
MVZ	115981	1948	August	29 Aug 1948	Pitelka FA	M		Study Skin
MVZ	115982	1948	August	29 Aug 1948	Pitelka FA	F		Study Skin
MVZ	115997	1948	August	30 Aug 1948	Pitelka FA	M		Study Skin
MVZ	115998	1948	August	30 Aug 1948	Pitelka FA	F		Study Skin
MVZ	115999	1948	August	30 Aug 1948	Pitelka FA	F		Study Skin
MVZ	115983	1948	August	31 Aug 1948	Pitelka FA	M		Study Skin
MVZ	116000	1948	September	2 Sep 1948	Pitelka FA	M		Study Skin
MVZ	116001	1948	September	2 Sep 1948	Pitelka FA	F		Study Skin
MVZ	116003	1948	September	4 Sep 1948	Pitelka FA	M		Study Skin
MVZ	116004	1948	September	4 Sep 1948	Pitelka FA	F		Study Skin
MVZ	116005	1948	September	4 Sep 1948	Pitelka FA	M		Study Skin
MVZ	116006	1948	September	4 Sep 1948	Pitelka FA	M		Study Skin
MVZ	116007	1948	September	4 Sep 1948	Pitelka FA	F		Study Skin
MVZ	116008	1948	September	4 Sep 1948	Pitelka FA	F		Study Skin
USNM	424074	1948	September	4 Sep 1948	Pitelka FA 862	F		Study Skin
MVZ	115984	1948	September	6 Sep 1948	Pitelka FA	F		Study Skin
MVZ	116009	1948	September	6 Sep 1948	Pitelka FA	M		Study Skin
MVZ	116010	1948	September	6 Sep 1948	Pitelka FA	F		Study Skin
MVZ	116011	1948	September	6 Sep 1948	Pitelka FA	M		Study Skin
MVZ	115985	1948	September	7 Sep 1948	Pitelka FA	F		Study Skin
MVZ	115986	1948	September	7 Sep 1948	Pitelka FA	F		Study Skin
MVZ	115994	1948	September	7 Sep 1948	Pitelka FA	F		Study Skin
MVZ	115995	1948	September	7 Sep 1948	Pitelka FA	M		Study Skin
MVZ	115996	1948	September	7 Sep 1948	Pitelka FA	F		Study Skin
MVZ	115987	1948	September	9 Sep 1948	Pitelka FA	M		Study Skin
MVZ	116002	1948	September	11 Sep 1948	Pitelka FA	M		Study Skin
USNM	424073	1948	September	11 Sep 1948	Pitelka FA 907	M	adult	Study Skin

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Museum	Catalog No.	Year	Month	Date Collected	Collector	Sex	Age	Specimen Type
MVZ	115988	1948	September	12 Sep 1948	Pitelka FA	M		Study Skin
MVZ	115989	1948	September	12 Sep 1948	Pitelka FA	M		Study Skin
MVZ	115990	1948	September	12 Sep 1948	Pitelka FA	M		Study Skin
MVZ	115991	1948	September	13 Sep 1948	Pitelka FA	F		Study Skin
MVZ	115992	1948	September	13 Sep 1948	Pitelka FA	F		Study Skin
MVZ	115993	1948	September	13 Sep 1948	Pitelka FA	M		Study Skin
MVZ	120140	1950	March	5 Mar 1950	Miller AH	M		Study Skin
MVZ	120139	1950	March	7 Mar 1950	Miller AH	F	juvenile	Study Skin
MVZ	120141	1950	March	11 Mar 1950	Miller AH	M		Study Skin
USNM	424072	1950	March	11 Mar 1950	Miller AH 7662	F	adult	Study Skin
UCSB	1893	1964	July	19 Jul 1964	Bennett J	M		Study Skin
UCSB	1995	1964	July	19 Jul 1964	Bennett J	M		Study Skin
UCSB	3368	1965	June	Jun 1965	Laughrin LA			Head only
UCSB	3360	1965	June	Jun 1965	Laughrin LA			Tail only
UCSB	3307	1965	June	Jun 1965	Laughrin LA			Wing only
UCSB	3344	1965	June	Jun 1965	Laughrin LA			Wing only
LACM	66028	1967	February	25 Feb 1967	Stager KE	M		Study Skin
LACM	66029	1967	February	25 Feb 1967	Stager KE	F		Study Skin
CSULB	3492	1967	May	19 May 1967	Laughrin LA	M		Study Skin
CSULB	3493	1967	May	19 May 1967	Laughrin LA	M		Study Skin
CSULB	3494	1967	May	19 May 1967	Laughrin LA	F		Study Skin
ROM	104793	1969	June	23 Jun 1969	Power DM 69-46	F	immature	Study Skin
ROM	104794	1969	June	23 Jun 1969	Power DM 69-49	M	immature	Skeleton
UKMNH	106839	1970	June	13 Jun 1970	Huber LN SWS 6839	F		Study Skin
SWC	6837	1970	July	13 Jul 1970	Huber LN	M	immature	Study Skin
SWC	6838	1970	July	13 Jul 1970	Huber LN	M	immature	Study Skin
SWC	6839	1970	July	13 Jul 1970	Huber LN	F	adult	Study Skin
SWC	6840	1970	July	13 Jul 1970	Huber LN	F	immature	Study Skin
UCSB	6434	1976	February	21 Feb 1976	Schroeder DA	M		Study Skin
UCSB	6457	1976	February	21 Feb 1976	Schroeder DA	F		Study Skin
UCSB	6458	1976	February	21 Feb 1976	Schroeder DA	F		Study Skin
CSULB	5435	1976	May	16 May 1976	Atwood JL	F		Study Skin
CSULB	4948	1976	June	16 Jun 1976	Atwood JL	M		Study Skin
CSULB	5847	1976	September	18 Sep 1976	Atwood JL	M		Study Skin
CSULB	5644	1976	October	26 Oct 1976	Atwood JL	M		Skeleton
CSULB	5808	1976	October	26 Oct 1976	Atwood JL	M		Skeleton
CSULB	4788	1976	October	26 Oct 1976	Atwood JL	M		Study Skin
CSULB	5283	1977	May	1 May 1977	Atwood JL	M		Study Skin
CSULB	5284	1977	May	1 May 1977	Atwood JL	M		Study Skin
UCSB	7329	1977	September	24 Sep 1977	Schroeder DA			Study Skin
UCSB	7370	1977	September	24 Sep 1977	Schroeder DA	F		Study Skin
SBMNH	4243	1978	Spring	1978	Laughrin LA	M	immature	Study Skin
SBMNH	4760	1981	August	Aug 1981	Dailey M	M	adult	Skin/Trunk Skeleton
SBMNH	4761	1981	August	Aug 1981	Dailey M	F	adult	Study Skin
CSULB	7059	1982	May	23 May 1982	Isitt J	M		Skeleton
CSULB	7060	1982	May	23 May 1982	Isitt J	M		Skeleton
CSULB	7061	1982	May	23 May 1982	Isitt J	F		Skeleton
CSULB	7062	1982	May	23 May 1982	Isitt J	M		Skeleton
CSULB	7063	1982	May	23 May 1982	Isitt J	M		Skeleton
CSULB	7064	1982	May	24 May 1982	Isitt J	F		Skeleton
UCSB	14328	1982	August	9 Aug 1982	Martin T	F		Study Skin
SBMNH	5001	1985		1985	Laughrin LA	M	juvenile	Skin/Trunk Skeleton
SBMNH	5000	1985		1985	Laughrin LA	F	adult	Study Skin
SBMNH	5136	1987	March	23 Mar 1987	Collins PW	M	adult	Skin/Trunk Skeleton
FMNH	334032	1987	May	16 May 1987	Peterson AT 87-110	M		Skeleton
FMNH	334033	1987	May	16 May 1987	Peterson AT 87-111	M		Skeleton

Island Scrub-Jay (*Aphelocoma insularis*) specimens collected from Santa Cruz Island (1875-2004).

Museum	Catalog No.	Year	Month	Date Collected	Collector	Sex	Age	Specimen Type
FMNH	334034	1987	May	16 May 1987	Peterson AT 87-112	M		Skin/Trunk Skeleton
FMNH	334035	1987	May	16 May 1987	Peterson AT 87-113	M		Skin/Trunk Skeleton
FMNH	334036	1987	May	16 May 1987	Peterson AT 87-114	F		Skin/Trunk Skeleton
FMNH	334037	1987	May	16 May 1987	Peterson AT 87-115	F		Skin/Trunk Skeleton
FMNH	334038	1987	May	16 May 1987	Peterson AT 87-116	M		Skin/Trunk Skeleton
FMNH	334025	1987	May	16 May 1987	Schew B 87-111	M		Skeleton
FMNH	334027	1987	May	16 May 1987	Schew B 87-113	M		Skeleton
FMNH	334026	1987	May	16 May 1987	Schew B AMY87-112	F		Skeleton
FMNH	334028	1987	May	16 May 1987	Schew B AMY87-114	F		Skeleton
FMNH	334029	1987	May	16 May 1987	Schew B AMY87-115	F		Skeleton
FMNH	334030	1987	May	16 May 1987	Schew B AMY87-116	F		Skeleton
FMNH	334031	1987	May	16 May 1987	Schew B AMY87-117	M		Skeleton
SBMNH	3743	1987	May	23 May 1987	Collins PW	F		Skeleton
UCSB	22467	1988	October	30 Oct 1988	Holmgren MA	M		Skin/Trunk Skeleton
SDNHM	8498	1988	October	30 Oct 1988	Rea AM	M		Study Skin
CSULB	7053	1988	November	20 Nov 1988	Collins CT and Schew WA	F		Skeleton
CSULB	7054	1988	November	20 Nov 1988	Collins CT and Schew WA	F		Skeleton
CSULB	7055	1988	November	20 Nov 1988	Collins CT and Schew WA	F		Skeleton
CSULB	7056	1988	November	20 Nov 1988	Collins CT and Schew WA	F		Skeleton
CSULB	7057	1988	November	20 Nov 1988	Collins CT and Schew WA	F		Skeleton
CSULB	7058	1988	November	20 Nov 1988	Collins CT and Schew WA	F		Skeleton
SBMNH	5666	1991	May	21 May 1991	Collins PW	M	adult	Skin/Trunk Skeleton
SBMNH	5667	1991	May	21 May 1991	Collins PW	M	adult	Skin/Trunk Skeleton
SBMNH	5786	1991	May	21 May 1991	Collins PW	F	adult	Skin/Trunk Skeleton
SBMNH	5787	1991	May	21 May 1991	Collins PW	M	adult	Skin/Trunk Skeleton
LACM	114058	2001	September	13 Sep 2001	Collins CT	F		Skeleton
LACM	114044	2002	June	1 Jun 2002	Collins CT	M		Study Skin
LACM	114045	2002	June	10 Jun 2002	Collins CT	F		Study Skin
LACM	114043	2002	December	30 Dec 2002	Collins CT	F		Study Skin
SBMNH	9268	2004	November	Nov 2004	Bromfield A	M	adult	Study Skin
CUMV	10568					M		Study Skin
CUMV	10569					F		Study Skin
CUMV	10570					M		Study Skin
UCSB	3339				Laughrin LA			Foot only
UCSB	3340				Laughrin LA			Foot only
YPM	94292				Sibley F	M		Study Skin
MVZ	174334							Pickled
MVZ	174335							Pickled
MVZ	174336							Pickled

Historic and Prehistoric Status of Island Scrub-Jays on the Northern Channel Islands

Island Scrub-Jay (*Aphelocoma insularis*) egg sets collected from Santa Cruz Island (1897-1947).

Museum	Number	Year	Month	Date	Collector	No. Eggs	Condition
WFVZ	13802	1897	May	10 May 1897	Beck, RH	3	Begun
FSMG		1897	May	8 May 1897	Beck, RH	2	
		1897	May	9 May 1897	Beck, RH	3	
CAS	2112	1898	April	20 Apr 1898	Mailliard, J & JW	4	Begun
CAS	2113	1898	April	21 Apr 1898	Mailliard, J & JW	3	Begun
MCZ		1906	April	20-Apr-1906	Howard, OW	5	Fr
MCZ		1906	April	28-Apr-1906	Howard, OW	5	Fr
WFVZ	6894	1906	April	29-Apr-1906	Howard, OW	3	Third
WFVZ	69575	1906	June	7-Jun-1906	Appleton, JS	2	Fr
WFVZ	72206	1906				4	
SBMNH		1915	April	4-Apr-1915	Dawson, WL	4	
SBMNH		1915	April	5-Apr-1915	Dawson, WL	4	
SBMNH		1915	April	5-Apr-1915	Dawson, WL	4	
WFVZ	33621	1915	April	5-Apr-1915	Dawson, WL	4	Fr
WFVZ	64423	1915	April	5-Apr-1915	Dawson, WL	4	Half
MVZ	6306	1915	April	6-Apr-1915	Dawson, WL	5	75%
SBMNH	24709	1915	April	6-Apr-1915	Dawson, WL	3	N.R.
SBMNH	24711	1915	April	7-Apr-1915	Dawson, WL	4	50%
SBMNH		1915	April	7-Apr-1915	Dawson, WL	4	
SBMNH	24710	1915	April	7-Apr-1915	Dawson, WO	5	
SMNH	15475	1915	April	20-Apr-1915	Dawson, WL	5	
		1915	April	20-Apr-1915	Dawson, WL	5	
		1916	March	Mar -1916	Vrooman, AG	4	
		1916	March	19-Mar-1916	Trusedale, F	4	
SBMNH	24712	1916	March	19-Mar-1916	Vrooman, AG	4	Fr
SBCM	5988	1916	March	22-Mar-1916	Trusedale, F	5	?
WFVZ	127457	1916	March	22-Mar-1916	Trusedale, F	5	Adv
		1916	March	22-Mar-1916	Trusedale, F	4	
SBCM	5989	1916	March	22-Mar-1916	Vrooman, AG	4	Fr
WFVZ	15289	1916	March	22-Mar-1916	Vrooman, AG	4	Fr
BMNH	1958.6.228	1916	March	23-Mar-1916	Trusedale, F	3	
WFVZ	127456	1916	March	23-Mar-1916	Trusedale, F	4	Begun
WFVZ	144150	1916	March	24-Mar-1916	Trusedale, F	5	Fr
		1916	March	25-Mar-1916	Trusedale, F	4	
AMNH		1916	March	25-Mar-1916	Vrooman, AG	4	Begun
WFVZ	13801	1916	March	25-Mar-1916	Vrooman, AG	5	Fr
WFVZ	15290	1916	March	25-Mar-1916	Vrooman, AG	3	Fr
		1916	March	25-Mar-1916	Vrooman, AG	4	
SBMNH		1916	March	26-Mar-1916	Canterbury, R	4	Fr

Island Scrub-Jay (*Aphelocoma insularis*) egg sets collected from Santa Cruz Island (1897-1947).

Museum	Number	Year	Month	Date	Collector	No. Eggs	Condition
SBMNH	24713	1916	March	26-Mar-1916	Trusedale, F	4	Fr
SBMNH	24714	1916	March	26-Mar-1916	Trusedale, F	4	Std
WVZ	83566	1916	March	26-Mar-1916	Trusedale, F	4	Begun
		1916	March	27-Mar-1916	Canterbury, R	4	
MVZ	6305	1916	March	27-Mar-1916	Trusedale, F	4	Fr
SBMNH	24715	1916	March	27-Mar-1916	Trusedale, F	4	Fr
SBMNH	24716	1916	March	27-Mar-1916	Trusedale, F	4	Well Be- gun
WVZ	15309	1916	March	27-Mar-1916	Trusedale, F	3	Std
WVZ	60021	1916	March	27-Mar-1916	Trusedale, F	3	Std
WVZ	15284	1916	March	27-Mar-1916	Vrooman, AG	3	Fr
WVZ	15308	1916	March	27-Mar-1916	Vrooman, AG	3	Comm.
		1916	March	27-Mar-1916	Vrooman, AG	4	
SBCM	5990	1916	March	29-Mar-1916	Vrooman, AG	3	Fr
SBMNH	24718	1916	March	29-Mar-1916	Vrooman, AG	4	Fr
		1917	March	3-Mar-1917	Badger, MC	?	
Museum	Number	Year	Month	Date	Collector	No. Eggs	Condition
		1917	March	3-Mar-1917	Badger, MC	?	
SBMNH	24719	1917	March	28-Mar-1917	Canterbury, R	4	Fr
WVZ	15286	1917	March	30-Mar-1917	Canterbury, R	3	Fr
WVZ	82016	1917	April	2-Apr-1917	Canterbury, R	4	Fr
SBMNH	24720	1917	April	2-Apr-1917	Dawson, WO	4	Fr
		1917	April	3-Apr-1917	Canterbury, R	3	Fr
		1918	April	3-Apr-1918	Canterbury, R	4	Fr
SBCM	5183	1918	April	8-Apr-1918	Dawson, WO	4	Fr
SBMNH	24721	1918	April	12-Apr-1918	Canterbury, R	4	Fr
SBCM	4159	1918	April	14-Apr-1918	Badger, MC	3	
WVZ	86011	1918	April	14-Apr-1918	Badger, MC	3	Adv
SBMNH	24722	1918	April	15-Apr-1918	Dawson, WO	4	Fr
SBMNH		1918	April	15-Apr-1918	Dawson, WO	4	
WVZ	15307	1918	April	15-Apr-1918	Dawson, WO	4	Fr
WVZ	13800	1918	April	16-Apr-1918	Canterbury, R	4	Fr
		1918	April	16-Apr-1918	Canterbury, R	3	
		1918	April	19-Apr-1918	Canterbury, R	3	
SBCM	5991	1918	April	19-Apr-1918	Dawson, WO	3	Std
WVZ	15288	1918	April	22-Apr-1918	Canterbury, R	4	Fr
WVZ	15313	1918	April	22-Apr-1918	Canterbury, R	3	Fr
WVZ	15314	1918	April	22-Apr-1918	Canterbury, R	3	Fr
SBMNH	24723	1919	March	26-Mar-1919	Canterbury, R	4	Fr
AMNH		1919	March	28-Mar-1919	Canterbury, R	4	Fr

Historic and Prehistoric Status of Island Scrub-Jays on the Northern Channel Islands

Island Scrub-Jay (*Aphelocoma insularis*) egg sets collected from Santa Cruz Island (1897-1947).

Museum	Number	Year	Month	Date	Collector	No. Eggs	Condition
WFVZ	144151	1919	April	3-Apr-1919	Canterbury, R	4	Fr
		1919	April	3-Apr-1919	Canterbury, R	4	
WFVZ	15311	1919	April	17-Apr-1919	Canterbury, R	4	Fr
DMNH	R23/19	1919	April	22-Apr-1919	Canterbury, R	4	Fr
CAS	1283	1919	May	16-May-1919	Evermann, BW	4	Fr
WFVZ	15310	1922	April	1-Apr-1922	Canterbury, R	4	Begun
SBMNH	24727	1922	April	4-Apr-1922	Canterbury, R	4	Fr
SBCM	5752	1922	April	7-Apr-1922	Canterbury, R	4	Fr
SBMNH	24724	1922	April	7-Apr-1922	Canterbury, R	4	N.R.
WFVZ	15287	1922	April	7-Apr-1922	Canterbury, R	5	Begun
WFVZ	15312	1922	April	7-Apr-1922	Canterbury, R	4	Fr
WFVZ	15315	1922	April	7-Apr-1922	Canterbury, R	4	
SBMNH	24725	1922	April	8-Apr-1922	Canterbury, R	4	Fr
SBMNH	24726	1922	April	8-Apr-1922	Canterbury, R	4	Fr
WFVZ	15316	1922	April	8-Apr-1922	Canterbury, R	5	Fr
WFVZ		1922	April	8-Apr-1922	Canterbury, R	4	Fr
SBCM	17737	1922	April	10-Apr-1922	Canterbury, R	4	Fr
WFVZ	15285	1922	April	11-Apr-1922	Canterbury, R	4	Fr
SBMNH		1922	April	12-Apr-1922	Canterbury, R	4	
SBCM	5992	1922	April	13-Apr-1922	Canterbury, R	4	Fr
SBMNH	24727	1922	April	13-Apr-1922	Canterbury, R	4	Fr
SBMNH	24828	1922	April	14-Apr-1922	Canterbury, R	4	Fr
		1922	April	15-Apr-1922	Canterbury, R	4	Fr
WFVZ	61225	1927	March	29-Mar-1927	DeGroot, DS	5	
WFVZ	3463	1927	March	29-Mar-1927	Pemberton, JR	4	Third
WFVZ	33623	1927	March	30-Mar-1927	Carriger, HW	3	Trace
WFVZ	82015	1927	March	30-Mar-1927	DeGroot, DS	4	Fr
		1927	March	30-Mar-1927	Pemberton, JR	4	Begun
WFVZ	33622	1927	April	4-Apr-1927	Carriger, HW	3	Slight
DMNH	6913	1927	April	5-Apr-1927	DeGroot, DS	4	Fr
SMNH	15476	1927	April	5-Apr-1927	DeGroot, DS	4	
WFVZ	58566	1927	April	5-Apr-1927	DeGroot, DS	3	
WFVZ	61223	1927	April	5-Apr-1927	DeGroot, DS	4	
Museum	Number	Year	Month	Date	Collector	No. Eggs	Condition
WFVZ	61224	1927	April	5-Apr-1927	DeGroot, DS	4	
WFVZ	5299	1927	April	5-Apr-1927	Pemberton, JR	2	Begun
DMNH	6914	1931	March	27-Mar-1931	Stevens, LT	3	Fr
SBMNH	24729	1932	April	3-Apr-1932	Stevens, LT	4	N.R.
WFVZ	31746	1932	April	3-Apr-1932	Stevens, LT	5	

Island Scrub-Jay (*Aphelocoma insularis*) egg sets collected from Santa Cruz Island (1897-1947).

Museum	Number	Year	Month	Date	Collector	No. Eggs	Condition
WFVZ	58565	1932	April	4-Apr-1932	Stevens, LT, DeGroot, DS	4	
FSMG		1932	April	9-Apr-1932	Badger, MC	3	
WFVZ	69478	1932	May	3-May-1932	DeGroot, DS, Stevens, LT	4	Fr
WFVZ	82020	1935	March	31-Mar-1935	Badger, MC	4	Begun
WFVZ	82021	1935	March	31-Mar-1935	Badger, MC	4	Begun
WFVZ		1935	March	31-Mar-1935	Badger, MC	3	Adv
WFVZ		1935	March	31-Mar-1935	Badger, MC	5	Adv
		1935	March	31-Mar-1935	Stevens, LT	4	Begun
WFVZ	5297	1935	April	1-Apr-1935	Harrison, EN	4	Adv
WFVZ	82017	1937	April	7-Apr-1937	Badger, MC	3	Fr
ZMCU		1937	April	7-Apr-1937	Badger, MC	4	Adv
WFVZ	24719	1937	April	18-Apr-1937	Rowley, JS	4	Fr
WFVZ	82019	1937	April	21-Apr-1937	Badger, MC	3	Fr
WFVZ	82019	1937	April	21-Apr-1937	Badger, MC	4	Adv
WFVZ		1937	April	21-Apr-1937	Badger, MC	4	Fr
DMNH	6915	1947	March	22-Mar-1947	Stevens, LT	3	Fr
WFVZ	13803	1947	March	22-Mar-1947	Stevens, LT	3	Std

APPENDIX III

Published and Unpublished Information Written About the
Island Scrub-Jay (*Aphelocoma insularis*) from 1876 to 1951

Sources in this compilation of historical information written about island scrub-jay (*Aphelocoma insularis*) are arranged by publication date or, for manuscripts published long after they were written, by original date of writing. Titles for each year are arranged alphabetically by author and then chronologically by month if there are multiple papers/field notes by the same author in the same year. All information pertaining to island scrub-jays is then reproduced verbatim as it appeared in a given reference. Common and scientific names for plants and animals appear exactly as they appeared in the original publications. For unpublished field notes, the institution where the original notes can be found is also listed.

Henshaw, H. W. 1876. Appendix H8. Report on the Ornithology of the Portions of California Visited During the Field-Season of 1875 By H. W. Henshaw. Pp. 224-278. *In*: Wheeler, G. M. (ed.), Annual Report Upon the Geographical Surveys West of the One Hundredth Meridian, in California, Nevada, Utah, Colorado, Wyoming, New Mexico, Arizona, and Montana. Appendix JJ of the Annual Report of the Chief of Engineers for 1876. Government Printing Office, Washington.

p. 253. "*Cyanocitta floridana*, (Bartr.), var. *californica*, (Vigors). –California Ground Jay: When slightly startled, its curiosity compels it to linger, and in the unfrequented parts of California, and especially upon the island of Santa Cruz, the report of a gun was not sufficient to excite its fears." Also listed are three specimens collected by H. W. Henshaw from Santa Cruz Island in June 1875 as follows: HWH 19, female adult, 10 June 1875; HWH 20, male adult, 11 June 1875; and HWH 731, female adult, 2 June 1875.

Henshaw, H. W. 1886. Description of a New Jay from California. *Auk* 3(4):452-453.

"*Aphelocoma insularis*, sp. nov. General color above, including surface of wings and tail, dark azure blue, deepest on head. Back deep sepia brown. Feathers from just anterior to eye to the occiput tipped with white, forming a streaked line. Sides of head, extending well down on neck and breast, dark azure blue. A spot anterior and posterior to eye, including lores and ear-coverts, black. Feathers of throat and breast ashy white edged with blue. Posteriorly the underparts dull white. Crissum and under tail-coverts blue. Hab. Santa Cruz Island, California.

The island to which the above species is confined, so far as known at present, is the innermost of the Santa Barbara Group, and is distant from the California coast about twenty miles. While on a short visit to the island in June, 1875, I collected three specimens of the bird in question which, after considerable hesitation, I decided to call *californica*, though they differed considerably from the few specimens of that bird then at hand. Since then the number of specimens of *californica* in the National Museum has so materially increased that nearly every portion of its range on the west coast, from Cape St. Lucas to Oregon, is represented in the series. Having recently had occasion to examine the entire collection of Jays, Mr. Ridgway has

kindly called my attention to the fact that notwithstanding the accession of so much new material the island specimens still remain unique. I therefore hesitate no longer to describe them as representing a new species.

The insular habitat of the bird would seem to preclude the possibility of intergradation with the mainland form, if, indeed, the ample material at hand for comparison did not negative such an assumption.

The origin of the bird can hardly be doubtful. Individuals doubtless reached the island from the mainland, and being non-migratory their continued residence under new conditions has effected very considerable changes of size and coloration.

The essential differences of the island bird from *californica* are its large size, deeper colors, especially of the brown on back, and the blue under tail-coverts instead of white. With reference to its coloration, it is a curious fact that all the colors are much deeper than of specimens from the northern counties of California and of Oregon where, from the presence of deep forests and a heavy rainfall, the coloration should be darker than anywhere to the southward. Specimens of *californica* from the mainland, both in California and Oregon, appear to be remarkably uniform in coloration. In its blue under tail-coverts *insularis* is like *woodhousei*, but otherwise its resemblance to that form is no closer than to *californica*.”

Blake, W. W. Jr. 1887. Summer Birds of Santa Cruz Island, California. *Auk* 4: 328-330.

p. 329. “20. *Aphelocoma insularis*. Island Jay.-By far the commonest land-bird of the island, and familiar to the verge of impudence. General habits like those of its near relatives on the mainland. Several nests which must have belonged to this species were placed in trees and bushes between six and thirty feet from the ground. They exhibited no marked peculiarity of construction.”

Ridgway, R. 1887. A Manual of North American Birds. J. B. Lippincott Co., Philadelphia.

p. 355-356. *Aphelocoma insularis* Hensh. Santa Cruz Jay. “Back and scapulars dark sepia-brown, without blue tinge; breast, sides, and flanks brownish white, or very pale brownish gray; blue upperparts, etc., a very deep azure-almost Berlin-blue-shade; length about 11.50-12.25, wing 5.20-5.30 (5.27), tail 6.05-6.25 (6.15), culmen 1.15-1.30 (1.22), tarsus 1.70-1.80 (1.75). *Hab.* Santa Cruz Island, southern California.”

Chapman, F. M. 1888. List of additions to the North American Avifauna and of eliminations and changes in nomenclature proposed since the publication of the A. O. U. check-list. *Auk* 5(4):393-402.

p. 396. “32. *Aphelocoma insularis* Hensh. Henshaw, *Auk*, III, Oct. 1886, p. 452. *Hab.* “Santa Cruz Island, California.”

Streator, C. P. 1888. Notes on the Birds of the Santa Barbara Islands. *Ornithologists and Oologists* 13:52-53.

p. 53. "Passing up the canon, specimens of the Santa Cruz Jay (*Aphelocoma insularis*), and the Red-shafted Flicker (*Colaptes cafer*), made their appearance."

American Ornithologists' Union. 1889a. Supplement to the Code of Nomenclature and Check-list of North American Birds. American Ornithologists' Union, New York.

p. 11. "481.1. *Aphelocoma insularis* Hensh. Santa Cruz Jay. *Aphelocoma insularis* Hensh. *Auk*, III. Oct. 1886, 452. Hab. Santa Cruz Island, Southern California."

American Ornithologists' Union. 1889b. Check-list of North American Birds According to the Canons of Nomenclature of the American Ornithologists' Union. Abridged Edition. American Ornithologists' Union, New York.

p. 42. "481.1 *Aphelocoma insularis* Hensh. Santa Cruz Island Jay."

Belding, L. 1890. Land Birds of the Pacific District. Occasional Papers of the California Academy of Sciences II. San Francisco. 8 vol., pp. 1-274.

p. 111. "*Aphelocoma insularis* Hensh. Santa Cruz Island Jay."

Townsend, C. H. 1890. Scientific Results of Exploration by the U. S. Fish Commission Steamer Albatross. No. XIV. Birds from the Coasts of Western North America and Adjacent Islands, Collected in 1888-'89, with descriptions of New Species. *Proc. U. S. Natl. Mus.*, 8(799):131-142.

p. 141. "*Aphelocoma insularis* Hensh. Seven specimens, February 6."

Keller, C. A. 1891. Geographical Distribution of Land Birds in California. IV. The Island Fauna. *Zoe* 1 (11):337-343.

p. 339. "*Aphelocoma insularis*."

pp. 342-343. "In 1886 Mr. H. W. Henshaw described, in the *Auk*, a new species of jay from Santa Cruz Island (*Aphelocoma insularis*). In Mr. Henshaw's own words-"the essential differences of the island bird from *californica* are its larger size, deeper colors (especially of the brown on the back), and the blue under tail-coverts instead of white." In accounting for the origin of this insular form he says: "Individuals doubtless reached the island from the mainland, and being non-migratory their continued residence under new conditions has effected very considerable changes of size and coloration." This theory would seem to indicate that there was a time when the islands were destitute of an avifauna; but if the islands once formed a part of the mainland and were separated by a process of gradual subsidence, such

species of birds as found a congenial environment there would be left upon it. The jay being non-migratory and with imperfect powers of flight, would gradually, through isolation, become changed from the mainland forms. We have here a most interesting example of the time required to produce this species. Prof. Le Conte has shown that the subsidence which formed these islands occurred just previous to the age of ice, so it is obvious that this species has become differentiated during the present geological age. It is highly probable, to say the least, that at the beginning of the glacial epoch, Woodhouse's, the California and the island jay were all the same species. The affinity of the island form to Woodhouse's is shown by the blue under-tail coverts, by which both these two are distinguished from the California jay. In fact, all three forms seem to stand in almost perfectly parallel relations to one another, and to have been developed from the same stock. The most conservative estimates of the time which has elapsed since the age of ice, based upon the rate at which the Niagara Falls has worked backward, place it at from seven to ten thousand years, which figures may perhaps give some idea of the length of time which these species have required for assuming their present comparatively slight differences."

Lattin, F. H. 1892. The Standard Catalogue of North American Birds Eggs. Third Edition 1892-93. Frank H. Lattin, Albion, NY.

P. 32. "481.1 *Aphelocoma insularis* Santa Cruz Jay" No price assigned

Streator, C. P. 1892a. Birds. Santa Rosa Island California July 1 to 3 1892. Unpublished field Notes Smithsonian Institution Archives. Record Unit 7176, USFWS, 1860-1961, Field Reports, Box 42, folder 1.

"*Aphelocoma* - Mr. John More informs me that there are Jays on the island."

Streator, C. P. 1892b. Birds. Santa Cruz Island California July 9 to 20 1892. Unpublished field Notes Smithsonian Institution Archives. Record Unit 7176, USFWS, 1860-1961, Field Reports, Box 42, folder 1.

"*Aphelocoma insularis*. Common and very tame."

American Ornithologists' Union. 1895. Check-list of North American Birds. Second and Revised Edition. American Ornithologists' Union, New York.

p. 197. "481.1. *Aphelocoma insularis* Hensh. Santa Cruz Jay. *Aphelocoma insularis* Hensh. Auk, III. Oct. 1886, 452. Geog. Dist.-Santa Cruz Island, southern California."

Bendire, C. 1895. Life Histories of North American Birds From the Parrots to the Grackles with special reference to their breeding habits and eggs. U. S. Natl. Mus. Special Publ. No. 3. Government Printing Office, Washington.

pp. 379-380. "150. *Aphelocoma insularis* Henshaw. Santa Cruz Jay.... GEOGRAPHICAL RANGE: Santa Cruz Island, southern California.

The Santa Cruz Jay, which seems to be confined to the similarly named island, one of the innermost of the Santa Barbara group, about 23 miles distant from the California coast, was first discovered by Mr. H. W. Henshaw, in June, 1875, and described by him in "The Auk" (Vol. III, 1886, pp. 452, 453). It is a larger bird than the California Jay, and generally deeper colored. Very little is yet known about the life history of this species.

Mr. Eli Whitney Blake, Jr., who visited this island on two occasions in 1887, states: "It is by far the commonest land bird of the island, and familiar to the verge of impudence. General habits like those of its near relatives on the mainland. Several nests which must have belonged to this species were placed in trees or bushes, between 6 and 30 feet from the ground. They exhibited no marked peculiarity of construction.

The eggs of this species, as far as I am aware, remain still to be described. There is probably but little difference between them and those of the California Jay."

Webb, W. F. 1895. The Ornithologists and Oologists Manual. Being a complete catalogue of North American Birds, Skins and Eggs; also Ornithologists, Oologists and Taxidermists Supplies. Walter F. Webb, Albion, NY.

p. 36 "481.1 *Aphelocoma insularis* Santa Cruz Jay" No price given.

Lattin, F. H. 1896. The Standard Catalogue of North American Birds Eggs. Fourth Edition. Frank H. Lattin, ASlbion, NY.

p. 40. "481.1 *Aphelocoma insularis* Santa Cruz Jay" No price assigned

Taylor, H. R. 1896. Taylor's Standard American Egg Catalogue. A Guide for Oologists. H. R. Taylor, NY.

p. 17. "481.1 Santa Cruz Jay, *Aphelocoma insularis*." No price assigned.

Davie, O. 1898. Nests and Eggs of North American Birds. David McKay, Publ., Philadelphia.

p. 326. "481.1. Santa Cruz Jay. *Aphelocoma insularis* Hensh. Geog. Dist.- Santa Cruz Island, Southern California. This species is a larger bird than the California Jay, and generally deeper colored. There appears to be little known about its life history."

Beck, R. H. 1899a. Nesting of the Santa Cruz Jay. Bull. Cooper Ornith Club 1(1):6.

p. 6. "On the 30th day of April, 1897, I was landed on the west end of Santa Cruz Island and for five days busied myself in collecting and caring for the few species of birds found within a few miles of camp. I had been hoping

to find the Santa Cruz Jay nesting, but until the forenoon of the 8th of May not a bird had been seen. On that day, after a long walk up the bottom of a canon, the first Jay was seen perched on a dead willow stump a short distance ahead, and was at once laid away in my basket out of the hot sun. A 20 minutes' search among the bushes and small trees nearby revealed a nest in the thick top of a scrubby oak, on the steep side hill and on a level with my eyes. A careful approach showed the female on the nest where she remained until my hand was but 18 inches from her. She then flew to a tree forty yards off, from which she too was laid away with her mate.

The nest contained two eggs and was the counterpart of a California Jay's nest, being composed principally of oak twigs and lined with rootlets. The next day, after a long steep climb over rough hills, a second nest was found near the bottom of a rocky canon in a tangle of bushes. The birds were heard calling on the hill above the nest, which, after a short search, was located. It was similar in construction to the first and contained three eggs. A half mile farther down the canon another nest was found near the end of an oak limb, fifteen feet from the ground and contained two young birds. The location, material and size of this nest was very similar to that of the Blue-fronted Jay in Santa Clara County, Cal., so much so in fact, that I had to tear it slightly to make sure there was no mud in it. The birds were absent when I climbed out to it, and I thought it possible that the Blue-fronted might occur on the island.

A few hundred yards farther a nest was seen in a willow tree near the stream, twelve feet up. The bird remained on until I nearly touched her, when she flew across the stream and called her mate, who came and silently watched me a short distance away. The silence of the Island Jays was very noticeable, and except for their habit of perching in conspicuous places, might have prevented their discovery. Judging from the four nests examined, two or three eggs would seem to be an average set. The eggs are somewhat larger than the average eggs of *A. californica*. Those obtained measure: (Set 1/2); 1.21x.85, 1.18x.84/ (Set 1/3); 1.15-.90, 1.18x.90, 1.18x.92. (Set 2/3); 1.10x.86, 1.14x.88, 1.16x.86 inches. The markings are much lighter in color also, being light brown, grayish and lavender."

Beck, R. H. 1899b. Additional Notes on the Birds of Santa Cruz Island, Cal. Condor 1(5):85-86.

p. 86. "...further down this canon I found the Santa Cruz Jays nesting."

Mailliard, J. 1899. Spring Notes on the Birds of Santa Cruz Island, Cal., April, 1898. Condor 2:41-45.

p. 42. "Naturally enough a sight of the Santa Cruz Jay (*Aphelocoma insularis*) was eagerly desired, but it was some days before one was seen. There were

no Jays within a mile or two of this harbor but some were found where the first brush commenced on the steep hillsides toward the head of Scorpion Canon. In fact they were quite numerous among the brushy hills but were very difficult to approach, more from the nature of the ground than from their wariness, though they were here comparatively shy. Their harsh notes could be heard on all sides among the bushes, but seldom near enough to shoot. Two were taken at last in the canon, but all the rest fell to my lot were captured at La Playa. The notes of this Jay are much harsher than those of the California Jay (*Aphelocoma californica*), the screech being more like that of *Cyanocitta stelleri* and the bird much larger and of brighter and deeper plumage.”

p. 43. “In this locality [Central Valley] the Santa Cruz Jay was very abundant and bold. Many were shot with the auxiliary barrel, being too close to use a larger charge. In some particular trees these birds would at times be very numerous, flying singly, by twos or threes, and then again hours might pass without a Jay being seen. Every accessible bush and tree within two or three miles of La Playa was carefully searched for their nests, but, while many old ones were discovered, only five were found occupied. Two of these contained eggs, one set of three eggs and one set of four; two contained young, two fledglings in one nest and three in the other, while the fifth nest was placed near the end of a long slim branch of a large live-oak, with no means of reaching it. From the small proportion of new nests to old ones discovered, it would seem that either the birds were not breeding to any extent this year on account of the severe drought perhaps, or else nests when once built must last in that locality about 100 years before disintegrating.”

Frank Blake Webster Comp. 1899. Price List Bird Skins and Eggs. Frank Blake Webster Comp., Hyde Park, MA.

p. 10. “481.1 Santa Cruz Jay \$5.00 Skin price.”

Mailliard, J. 1900. Measurements of the Santa Cruz Jay. Condor 2:42.

p. 42. “I would like to call attention to some errors in ‘Ridgway’s Manual’ concerning the measurements of *Aphelocoma insularis*, which must have arisen from a scarcity of material at the time of taking them. Examination of thirty-six male and twenty-six female specimens collected by myself on Santa Cruz Island shows that there is quite a difference between male and female of this species. For instance, the wing measurements are, male, 5.00 to 5.72, average 5.32, and female 4.84 to 5.34, average 5.14, whereas ‘Ridgway’s Manual’ gives, irrespective of sex, 5.20-5.30 (5.27). The extremes of tail measurements show male 6.00-7.15, female 6.00-6.60, in stead of 6.05-6.25. The culmen in our series also shows great sex variation’ viz: male 1.14-1.47 (1.28), female 1.12-1.26 (1.22), while the ‘Manual’ shows for both sexes 1.15-1.30

(1.22). The greatest depth of bill in both sexes is .51 inches, while the least male is .47 and the least female .44, averaging .49 and .47 respectively. The greatest breadth of bill is also the same, viz: .53, but the least male .48, female .44, average .50 and .48. The extremes of tarsus are the same in both sexes as well, being 1.61-1.78, 'Ridgway's Manual' giving 1.70-1.80 (1.75) inches. These corrections, except as a matter of accuracy, are of no great importance unless an *Aphelocoma* should be found upon the neighboring island of Santa Rosa which might measure differently. I was unable to land upon Santa Rosa Island myself and have seen no record of any jay from there. As this island is only four miles from Santa Cruz Island, it is exceedingly probable that *A. insularis* exists there also."

Oberholser, H. C. 1900. Notes on some birds from Santa Barbara Islands, California. Proc. U. S. Natl. Mus., 22:229-234.

p. 230. "*Aphelocoma insularis* Henshaw. A fine series of twelve adults and five immature specimens serves very strongly to emphasize the distinctness of this species from both of its mainland relatives. Not only are its characters very pronounced, but among perfectly comparable examples there is relatively little individual difference either in size or color. Many of the adults are strongly tinged with brownish below, but this is undoubtedly an adventitious stain, as it is absent on feathers of the fresh plumage. All the adults are in process of molt and exhibit almost every stage of feather removal. The immature birds are all in "first" plumage, just beginning to change into perfect dress, and differ little from each other. The plumage of the young, which seems never to have been described, is as follows: Above chocolate brown, shading into dull dark blue on crown and upper tail-coverts, the transition on latter rather abrupt; wings and tail as in the adult; sides of head and neck blackish brown; chin, throat, and center of jugulum brownish white, the sides of jugulum and an almost complete collar on breast dull blackish brown; remainder of breast and abdomen smoke gray; crissum dark slate gray; thighs light brown."

Bailey, F. M. 1902. Handbook of Birds of the Western United States Including the Great Plains, Great Basin, Pacific Slope, and Lower Rio Grande Valley. Houghton, Mifflin and Comp., Boston.

p. 276. "481.1. *Aphelocoma insularis* Hensh. Santa Cruz Jay. Upper parts dark purplish blue except for brown back and scapulars; breast and sides brownish, under tail coverts blue. *Length*: 11.50-12.25, wing 5.20-5.30, tail 6.05-6.25, bill 1.15-1.30. *Distribution*.-Santa Cruz Island. southern California."

Grinnell, J. 1902. Check-list of California Birds. Pacific Coast Avifauna No. 3.

p. 46. "281 (481.1) *Aphelocoma insularis* Henshaw. Santa Cruz Island Jay. Status-Common resident on Santa Cruz Island."

Coues, E. 1903. Key to North American Birds. Dana Estes and Comp., Boston.

p. 4.98. "A. *insularis*. (Lat. of an island, insular) Santa Cruz Jay. Above, dark azure blue, including exposed surface of wing- and tail-feathers, this color deepest on crown, and extending on sides of head and well down on neck and breast; back dark sepia brown. A white superciliary line; a black loreal and auricular spot. Feathers of throat and breast ashy-white edged with blue; crissum blue; other upper parts dull white. Wing 5.35; tail 6.25; tarsus 1.80; bill 1.25. Santa Cruz Island, one of the Santa Barbara group, off the coast of California. The relationships of this species are rather with *woodhousei* than with *californica*, as it has the bluish under tail-coverts of the former; but its insulation keeps it apart from both, and it may be allowed to stand. Nesting as usual in the genus: eggs 2-3, averaging 1.18 X 0.88; markings rather light brown, lavender, and grayish. Henshaw, Auk, Oct. 1886, p. 452; A.O.U. List, No. 481.1. A. *floridana insularis* of the Key, 3rd and 4th eds. 1887 and 1890, p 878 and p. 901."

Reed, C. A. 1904. North American Bird Eggs. Doubleday, Page and Comp., New York.

p. 232. "481.1. Santa Cruz Jay. *Aphelocoma insularis*.
Range.-Santa Cruz Island, California.

This species is the largest and darkest colored bird of the genus *Aphelocoma*. It is said to be a very abundant species on the island from which it takes its name, and to have the habits and traits common to all the members of the Jay family. The nesting habits are the same as those of the others, but the eggs are slightly larger, averaging 1.15 x .85. The one figured is from a set of three in the collection of John Lewis Childs, taken by R. H. Beck on May 10, 1897."

Ridgway, R. 1904. The Birds of North and Middle America: A Descriptive Catalogue of the higher groups, genera, species, and subspecies of birds known to occur in North America, from the Arctic lands to the Isthmus of Panama, the West Indies and other islands of the Caribbean Sea, and the Galapagos Archipelago. Part III. Government Printing Office, Washington, D. C.

pp. 331-332. "*Aphelocoma insularis* Henshaw. Santa Cruz Jay. Most like *A. californica obscura* in coloration but very much darker, and larger even than *A. c. californica*.

Adults (sexes alike).-Pileum, hindneck, sides of neck and sides of chest uniform dull ultramarine or French blue; auricular region, suborbital region, and greater part of malar region similar but rather duller or darker; lores and postocular region (upper margin of auricular region) blackish; a series of white streaks beginning immediately above the eye and continued backward, above the auricular region; back very dark brownish gray or

grayish sepia; scapulars and rump similar but (especially the latter) tinged with blue; wings, upper tail coverts, and tail dull ultramarine or French blue; chin, throat, and median portion of chest dull white, indistinctly streaked with grayish, the chest streaked with blue; under parts of body pale brownish gray or grayish brown (dull or soiled whitish in worn plumage); under tail-coverts light grayish blue, the thighs tinged with the same; bill, legs, and feet black; iris brown.

Young.-Pileum, hindneck, auricular and suborbital regions, and sides of chest dull slate color, slightly tinged with dusky blue; back, scapulars, rump, and smaller wing-coverts dark brownish mouse gray; upper tail-coverts dull grayish blue; chin, throat, and median portion of chest white, the last somewhat streaked with gray; under parts of body pale smoke gray, separated from the white of the chest by a narrow collar of bluish slaty, connecting the two slaty areas on sides of chest; under tail-coverts and thighs smoke gray; wings (except smaller coverts) and tail as in adults.

Adult male.-Length (skins), 284.5-313.5 (292); wing, 133.5-140.5 (135.5); tail, 138.5-153.5 (148.5); exposed culmen, 31.5-33.5 (33); depth of bill at nostrils, 11-11.7 (11.4); tarsus, 44.2-47.2 (46.5); middle toe, 21.8-26.5 (25.1). [based on five specimens]

Adult female.-Length (skins), 277-305 (292); wing, 127.5-136 (132.5); tail, 142-148.5 (145); exposed culmen, 31.5-31.7 (31.6); depth of bill at nostrils, 10.2-10.4 (10.3); tarsus, 43.5-44.5 (44.7); middle toe, 23-24.5 (23.5). [based on four specimens]

Santa Cruz Island, Santa Barbara group, southern California.

Taylor, H. R. 1904. Taylor's Standard American Egg Catalogue. Second Edition. An Ex-changer's Guide and Collectors Handbook. H. R. Taylor, Alameda, CA.

p. 54. "481.1 Santa Cruz Jay *Aphelocoma insularis*" Egg sets \$3.00.

Lattin, F. H., and E. H. Short. 1905. The Standard Catalogue of North American Birds' Eggs. The Oologist, Albion, NY.

p. 40. "481.1 *Aphelocoma insularis*. Santa Cruz Jay \$3.00"

Linton, C. B. 1908. Notes from Santa Cruz Island. Condor 10(3):124-129.

p.127. "*Aphelocoma insularis*. Santa Cruz Island Jay. Abundant except on northwestern portion of island. Those seen in the vicinity of Coches Prietos were nearly all females. In the higher pine region this order was reversed; only two or three females observed."

American Ornithologists' Union. 1910. Check-list of North American Birds. Third Edition. American Ornithologists' Union, New York.

p. 225. "*Aphelocoma insularis* Henshaw. Santa Cruz Jay. [481.1]

Aphelocoma insularis Henshaw, Auk, III, Oct., 1886, 452. (Santa Cruz Island, California). Range.-Santa Cruz Island, California.”

Howell, A. B., and A. van Rossem. 1911. Further Notes from Santa Cruz Island. Condor 13:208-210.

p. 209-210. “*Aphelocoma insularis*. Santa Cruz Jay. To us the most interesting bird on the island. Abundant in the pines. they were not as much in evidence as their cousins on the mainland, but when one did happen upon them they were as a rule unsuspecting. At this time of the year they are quiet unless one of a pair is killed or a nest disturbed, and if one does not know where and when to find them they might almost escape notice. However, it one goes along with much noise, so that the jays know he is about, and then sits down at a convenient spot and remains quiet, their curiosity will get the better of them. In nine cases out of ten it is useless to watch in front because the birds will not come that way, but after several minutes, upon a surreptitious glance to the rear, a jay will be discovered sitting motionless on a pine branch a few yards away. Practically all of their nests contained young at this date. Two nests examined were placed about twenty feet up in “palo fierros”, slim trees growing in small groves in the valleys, and were similar in construction to nests of the California Jay. One contained two small young and an addled egg, and the other had four young about a week old. A surprising number of old nests were found, placed usually in the palo fierros or tall bushes, but sometimes in the pines.”

Grinnell, J. 1912. A Systematic List of the Birds of California. Pacific Coast Avifauna No. 8.

p. 18. “381. *Aphelocoma insularis* Henshaw. Santa Cruz Island Jay.”

Willet, G. 1912. Birds of the Pacific Slope of Southern California. Cooper Ornith. Club Pac. Coast Avifauna No. 7.

p. 68. “226. (481.1) *Aphelocoma insularis* Henshaw. Santa Cruz Jay. This well marked insular form is confined to Santa Cruz Island, where it is a common resident. The specimens from which the species was originally described were taken by H. W. Henshaw in June 1875 (Auk, III, 1886, 452). The nesting season is in April and early May. In November and December, 1907, C. B. Linton and myself found this jay to be one of the most abundant land birds on Santa Cruz Island. They were singularly tame and unsuspecting for a blue jay and we had no trouble in securing all the specimens we desired. J. Mailliard found two nests containing eggs, and two nests containing young birds, the latter part of April, 1898 (Bull. Cooper Orn. Club, 1, 1899: 43). Three sets of eggs taken by R. H. Beck May 8, 1897 (Bull. Cooper Orn. Club, I, 1899,43). R. H. Beck took three sets of eggs May 8, 1897. Two sets were of

three eggs each and the other was of two (Bull. Cooper Orn. Club, I, 1899, 6). On April 28 and 29, 1906, O. W. Howard found seven nests of this species in scrub oak trees. Two of the nests contained, respectively, five slightly incubated eggs and three eggs, incubation commenced. The other five nests contained young birds. J. S. Appleton took two fresh eggs June 7, 1906, probably a second laying.”

Wright, H., and G. K. Snyder. 1913. Birds Observed in the Summer of 1912 Among the Santa Barbara Islands. Condor 15:86-92.

p. 91. “*Aphelocoma insularis*. Santa Cruz Island Jay. The species was very common in the wooded districts of Santa Cruz. Two full-grown immatures were taken (July 7).”

Dawson, W. L. 1915. Supposed New Records from Santa Cruz Island. Condor 17:203-204.

p. 203. “Through the courtesy of our distinguished fellow-member, Mr. Joseph Mailliard, and his friend, Mr. Arturo Caire, one of the present owners of Santa Cruz Island, I was permitted to spend nearly three weeks, viz., April 3rd to 22nd, with my son William, on this enchanted spot. We made camp at Prisoners Harbor and devoted ourselves chiefly to a study of the endemic Jay, *Aphelocoma insularis*, of which sixteen nests were found.”

Grinnell, J. 1915. A Distributional List of the Birds of California. Pac. Coast Avifauna No. 11.

p. 98. “*Aphelocoma insularis* Henshaw Santa Cruz Island Jay *Synonyms-Cyanocitta floridana* var. *californica*, part; Santa Cruz Jay. *Status*-Common resident on the wooded portions of Santa Cruz Island (see Willett, Pac. Coast Avif. no. 7, 1912, p. 68).”

Dawson, W. L. 1916. Santa Cruz Has Jays Found Only There. The Morning Press. Aug 30, 1916. page 2

“One of the most curious facts brought to light by the field work carried out this past season by the staff of the Museum of Comparative Oology is the effect of isolation upon the color of bird’s eggs. Isolation, that is, of the parent birds. Santa Cruz Island has a jay found upon the island only, and not even upon its neighbor, Santa Rosa. It is like the mainland type, our chestless blue jay, from which it undoubtedly spring, save that it is considerably larger and more deeply colored. An extensive series of the eggs of these birds collected this year shows almost absolute uniformity of coloring, whereas the eggs of the mainland bird, well distributed throughout California, are highly varied, and are rated among the handsomest in collections.

The differences in the eggs of the mainland bird are so marked that two distinct types or “phases” are recognized—a “red” and a “green.” While the

birds of the mainland stock themselves preserve a substantial uniformity of appearance, the great climactic variety of their setting, their environment, has reflected itself in the highly variable coloring of the egg. Diversity of stock, or a considerable development of the tendency to vary, is thus indicated. But the eggs of the Santa Cruz Island blue jay point as plainly to a uniformity of parental stock, to descent, in all probability, from a single pair of birds [birds]. The Santa Cruz Island colony of the crestless blue jay stock is closely inbred, while the mainland stock is highly crossbred. The evidence of the two series of eggs now reposing in the M. C. O. collection is so clear that he who runs may read.”

Howell, A. B. 1917. Birds of the Islands off the Coast of Southern California. Cooper Ornith. Club. Pacific Coast Avifauna No. 12.

pp. 68-69. “Peculiar to Santa Cruz Island, where it is an abundant resident. This species was first described by H. W. Henshaw (2) from three birds collected by him in June 1875. In coloration it most nearly approaches *A. c. obscura*, but is very much darker and much larger. It differs from *californica* in greater size, deeper colors, especially the brown of the back, and in having blue instead of white under tail coverts. As with the mainland birds, the males are larger than the females, but not to a degree that can be noticed without comparison of specimens.

During July and August E. W. Blake (4) found the Santa Cruz Jay to be impudently familiar, but when A. van Rossem and I (2) were on the island during the breeding season, we found the opposite to be the case. Although the birds were very common, we might easily have overlooked them entirely. Never a sound did one make unless its mate was shot, and it was useless to try for them by walking through their haunts. However, if we would select a likely spot and sit quiet for a few moments, one would usually approach from the rear and silently examine the intruders from a distance of several yards.

It is truly surprising to note the number of old jays’ nests upon the island. These must either last for a greater number of years than is the case elsewhere, or else the birds are in the habit of building extra or dummy nests. The favorite sites seem to be in the tops of the local “palo fierro” (ironwood) trees, though many were noted in low oaks or large bushes, mostly on the sides of the canyons. Construction is the same as that employed by the mainland form. The latter part of April, 1911, all the females shot had already laid, and I believe that a large majority then had small young. Two nests that I examined on the 28th (22) were some twenty feet up in ironwoods, and held, respectively, two small young and an addled egg, and three young, half grown. R. H. Beck (30) found four nests with eggs May 8, 1898, and I believe that the time for fresh eggs varies considerably in different seasons. Eight of the above eggs average 1.16X.88 inches. Extremes are 1.10 to 1.21, in length, and .84 to .92 in diameter.

In the late fall C. B. Linton (20) found that the birds near the shore were nearly all females, while in the high pines males predominated. They are not equally common over the entire island, but seem to prefer the neighborhood of the pines and heavy brush. Smugglers Cove is a good place to look for them.”

Swarth, H. S. 1918. The Pacific Coast Jays of the Genus *Aphelocoma*. Univ. Calif. Publ., in Zool., 17(13):405-422.

pp. 418-419. “*Aphelocoma insularis* Henshaw *Type locality*.-Santa Cruz Island, California. *Range*. Santa Cruz Island, California. *Specimens examined*.-From Santa Cruz Island, 14. *Distinguishing characters*.-Distinguished from any subspecies of *A. californica* by greater size, darker coloration, and definitely blue under tail coverts. From *A. woodhousei*, which it resembles in its blue under tail coverts, *insularis* is distinguished by greater size, darker coloration, and (like *A. californica*) in more strongly contrasted markings. No. 5458 (coll. of J. Grinnell), male, Santa Cruz Island, September 3, 1903. Blue areas, deep dull violaceous blue; dorsum, clove brown.

Remarks.- The Santa Cruz jay is in many respects one of the most remarkable species that has been produced upon the Santa Barbara Islands. Each of the animal forms evolved upon these islands has developed in ways deserving the most careful study, for neither in the trend taken by the characters serving to distinguish them from their mainland relatives, nor in the distribution of species upon the islands, is it possible to detect uniformity in the results attained. In the particular species in question certain anomalies stand out even more conspicuously than in any of the other island birds.

The Santa Cruz jay is one of the most sharply differentiated of any of the island species, and it is hard to appreciate the possibility of the development of the form under the given conditions. Santa Cruz is the only one of the Santa Barbara Islands upon which jays of any sort are found, though other species of birds far more sedentary in their manner of life, are widely distributed over the group, and conditions upon some, at least, of the other islands would permit the existence of jays. Santa Cruz is not so widely distant from the mainland but what it would seem possible for jays to travel back and forth. While the California jay of the adjacent mainland strictly speaking is not a migratory species, still in the fall small flocks may occasionally be seen wandering far from their breeding grounds, in territory where they certainly never nest, and it would seem not unlikely, under the circumstances, for individuals from the mainland to reach the islands occasionally, and vice versa.

Then, as regards the extreme differentiation achieved by the Santa Cruz jay, it is of interest to make comparisons with other variable forms occurring upon the same island.

The spotted towhee (*Pipilo maculatus*) as it occurs upon Santa Cruz is indistinguishable from the mainland subspecies, *megalonyx*, though upon others of the islands there is the subspecies *clementae*, with strongly developed characters. The Bewick's wren (*Thryomanes bewicki*) upon Santa Cruz Island is recognized separately, as the subspecies *nesophilus*, but it is with difficulty distinguished from the race *charienturus* upon the adjoining mainland, while again upon other of the islands there are races with much more strongly marked features. The bush-tit (*Psaltriparus minimus*), Hutton vireo (*Vireo huttoni*), and perhaps one or two other species, occur upon Santa Cruz alone of the Santa Barbara Islands-as does the jay-yet none of these have developed into recognized insular races.

On the whole it is evident that Santa Cruz Island has not served as a differentiating center to the same extent as other islands of the group; yet at the same time it has produced in the Santa Cruz jay the most strongly characterized of any of the island races.

The most striking feature of the Santa Cruz jay, as compared with the mainland species is its enormous size, so in this case a marked restriction of range, with consequent probability of inbreeding of closely related individuals has not been productive of the dwarfed stature which such conditions are supposed to engender.”

Anonymous. 1919. The season of 1916. J. Mus. Comp. Oology 1(1-2):20-25.

p. 20-21. “...we dispatched him [A. G. Vrooman] to Santa Cruz Island on the 16th of March, together with a volunteer working on shares, Fred Truesdale, of Shandon.

The ensuing twelve days were profitable ones for the M. C. O., and we wish to take the occasion to thank the general manager of the Santa Cruz Island Company, Mr. Arthur J. Caire, for his courtesies on this and subsequent occasions. Mr. and Mrs. Caire, visited the Museum on the 17th of March, 1917, and their esteemed promise of cooperation, together with the privileges of “the island,” we count one of the valued assets of the institution.

The boys struck it just right this year, so far as Santa Cruz Island Jays were concerned. They secured thirty-three sets of this interesting bird, *Aphelocoma insularis*, more that were ever taken before, all told, and the series thus established we count so important in its phylogenetic bearings that it will form the subject of a special report.”

Dawson, W. O. 1919 [1990]. Diary Kept While on Santa Cruz Island for Vera Pilat, 1919. Pp. 141-177. In: Daily, M. (ed.), *A Step Back in Time. Unpublished Channel Islands Diaries*. Santa Cruz Island Foundation Occasional Paper No. 4. [These notes were originally written in 1919.]

p. 142. March 19, 1919: "We got the island jays pretty well sized up today. The results were six nests for Bob [Robert Canterbury] and three for me, none of which had anything in them. It is a little early yet, but the nests seemed about ready for occupation."

p. 153. March 26, 1919: "About three o'clock we went up the canon to look for jay nests awhile. Bob found one nest with three eggs, whereas I found two. We did not take any of them because they may lay more later. Bob was getting almost unbearably glum and insulting at this point when he found a nest with four eggs which he promptly collected....His jay is the first collected set [of eggs] except his eagle."

p. 155. March 28, 1919: "Bob took a couple of sets of four of jay eggs this morning. We revisited all the nests that we found earlier expecting in most cases good sets. They fell back on us horribly this year, probably because we have worked them too hard before....My nests are coming on all right; the first one had two eggs, and another, had one. I would rather have them that way than with three because three are sets this year and dad doesn't want them....Well I found one with four quite accidentally and, of course, I was overjoyed. I took them and when I reached the ground I found one broken in the box I brought them down in."

p. 168. April 18, 1919: "...we went up a side canon and went way along the ridge toward the southeast. Bob found five good [jay] nests and took three sets of eggs....I find rafts of old nests-a great many more than Bob; I find three or four old nests and a minute or so later he finds the good one."

Dawson, W. L. 1920. The Case of the Santa Cruz Island Jay, *Aphelocoma insularis* Hensh. An Example in Comparative Oology. J. Mus. Comp. Oology 1(3 & 4):26-29.

pp. 27-28. "There exists upon the Island of Santa Cruz, some twenty-five miles distant from the mainland at Santa Barbara, a Jay, *Aphelocoma insularis*, which is almost an exact replica of the mainland bird, *A. californica*, in color and pattern of plumage, but which has undergone certain important modifications of proportion, especially of beak and feet. while the wing and tail measurements of the island bird average only from ten to twenty per cent longer than those of the mainland type, the bill will sometimes bulk nearly twice as large, and the feet and tarsi will probably show a fifty per cent increase in bulk. The Santa Cruz Island Jay enjoys a fairly uniform distribution within its narrow range, an area twenty-five miles long by eight wide at the widest point: and because it is a vigorous, dominant form upon the island, is probably maintained at the saturation point of some 2000 or 3000 pairs.

As in the case of any other insular species, questions arise as to the presence of this jay on Santa Cruz Island. How did it get there? How long has

it been there? What was the size of the original colony? Has there been an infusion of new blood from time to time derived from the mainland? or has there ever been such infusion? These are very natural and very interesting questions, but their answer is quite beyond the power of the anatomist. The "skin-man" is silent. He has no criteria beyond that of somatic change in one direction, i. e., increase in size, to guide him. He is destitute of the knowledge of any other factor by which he may check up or correlate his guesses.

Naturally, the taxonomist turns to the geologist. He is able to help out sometimes, but his answers are apt to be a little vague. For how long a period has Santa Cruz Island been separated from the mainland of California? "A hundred thousand years," says Mr. John R. Pemberton, who has done a great deal of topographic work for the U. S. Geological Survey in this section. That is a generous allowance, more than ample to account for this increase of the bird's bulk. But are there any other possibilities besides this of original occupancy by which this semi-distant island might have been stocked? Yes, three at least: and in naming them we shall rule out of present consideration the "obvious," but also impossible, hypothesis of flight. The wings of a jay, whether *insularis* or *californica*, are too short and weak to permit of its attempting a sheer flight of twenty-five miles. The jays of Santa Cruz, if not actually autochthonous, are colonists, and their immigration must have been assisted either by storm, or by drifting wreckage used as a refuge, or by human agency. Either one of these, or else the migration occurred at a time when the channel which separates the island from the mainland was much narrower than at present.

A consideration of the soundings of the Santa Barbara Channel might be instructive here, but it would lead us to far afield for our present discussion. The point is that the anatomist unaided is absolutely helpless in trying to answer these questions. He cannot tell whether the Santa Cruz Island Jays were a split-off branch of the mainland stem, resident for a hundred thousand years, or whether they were carried over a few thousand years ago by the Indians. He cannot tell whether they are the motley residue of a familiar traffic between island and shore, which finally ceased only when the channel became too wide to cross conveniently awing, or whether, indeed, the place was peopled by a chance pair blown over in a storm.

At this point the oologist comes in. He does not pretend to know all about it, but he is able to make a modest contribution to knowledge. At least he feels competent to circumscribe the area of this inquiry. A series of some fifty sets of eggs of the Santa Cruz Island Jay passed in review by the Museum of Comparative Oology shows them to be the most absolutely uniform of any spotted eggs known. The series is practically without deviation as to ground color; and while there is inevitably some difference in the distribution of the spots, there is no substantial deviation in the color of the pigment.

If this series had to be compared with a mainland series, showing also a substantial uniformity, we should be as far at sea as the anatomist; but when we place this series alongside one accumulated on the mainland shore, only twenty-five miles away, we find the most startling contrast. The eggs of *Aphelocoma insularis* are among the most homogeneous known; the eggs of *A. californica* exhibit the highest degree of habitual variation of any passerine species in North America. There can be only one meaning to this. *A. insularis* does not represent a general derivation or stock from the mainland, nor could it have achieved such a uniformity if it had been variously derived. The Santa Cruz Island Jays represent a single Mendelian type accidentally derived from one of the multitudinous strains existent on the mainland. We have in their eggs an example of purest inbreeding, an exact selection; and the birds are in all probability the offspring of a single original pair. There have been no intrusions or replenishments from the mainland, for the egg-type at least would have "gone to pieces" under the impact of such a strain.

We have denied that there exists upon the mainland, in the case of the California Jay, any recognizable evidence of correlation between variation of eggs and somatic changes in the parents. But that is not to say that such evidence may not exist. For we have already conceded that such evidence of correlation, or at least of concomitant variation, might become instantly manifest under selective breeding. The somatic uniformity of the mainland jay may still represent potential variations now held in stern check by inbreeding. The case of the Santa Cruz Island Jay may represent an accidental release of a tendency toward increase in size, latent but held in leash, in the case of its particular ancestors. This being true, or at least possible, we are not free to ascribe all the evidence of change in *A. insularis* to the slow workings of environmental reaction alone. If we are correct in our surmise that *insularis* is the product of a single pair of birds accidentally or artificially isolated from mainland stock, the distinctions which we observe might have arisen immediately, or within a few hundred years at the most. While we do not know even yet what all the geno-dynamic values of the Santa Cruz Island Jay are, we have greatly restricted the field of discussion, and we regard this inquiry as a fair example of the methods and promises of comparative oology."

Van Rossem, A. J. 1920. Santa Cruz Island Notes March 10 to April 6, 1920. Unpublished Field Notes. Univ. of California Los Angeles, CA.

"Common everywhere, but more especially so in heavily brush-grown areas. However, even the highest pine held a fair number, and every dry cactus-grown ravine sheltered (depending on size) one or more pairs. This is one of the commonest birds on the island, and while rather quiet and retiring (for a jay) at nesting time are easily found and shot. It is extremely curious and several pairs would often slip quietly through the brush following me for

half a mile or more. As an instance of this: on one occasion I climbed to a Dusky Warbler's nest in process of construction and on coming down shot a Jay sneaking about close at hand. A short wait brought six more – some of which were shot in the act of investigating the Dusky's nest to which they had undoubtedly watched me climb. At the time of my departure from the island, every grove of oaks and clumps of denser brush held its Jay's nest from "just starting" to the completed nest. No eggs were found but a female taken March 26 would have laid in a day or two at most."

Bailey, F. M. 1921. Handbook of Birds of the Western United States Including the Great Plains, Great Basin, Pacific Slope, and the Lower Rio Grande Valley. Houghton Mifflin Comp., The Riverside Press Cambridge, Boston, MA.

p. 276. "*Aphelocoma insularis* Hensh. Santa Cruz Jay. Upper parts dark purplish blue except for dark brown back and scapulars; breast and sides brownish, under tail coverts blue. Length: 11.50-12.25; wing 5.20-5.30, tail 6.05-6.25, bill 1.15-1.30. Distribution.-Santa Cruz Island, southern California."

The American Oologists'. 1922. The American Oologists' Exchange Price List of North American Birds' Eggs – 1922. R. Magoon Barnes, Lacon, IL.

p. 67. "*Aphelocoma insularis* Santa Cruz Jay \$2.30"

Dawson, W. L. 1922. The Season of 1919. The Santa Cruz Island Trip. J. Mus. Comp. Oology 2(3-4):45-54.

p. 45. "The war was over. Thank God for that! It was meet, then, to go bird-egging. Two of the youngsters, William Oberlin Dawson and Robert Canterbury, were assigned to Santa Cruz Island, the little principality of the Caire Estate, twelve miles by twenty-five in dimensions, and which lies twenty-five miles distant (over a sometimes choppy sea) from Santa Barbara. Their instructions were to concentrate on Ravens, Dusky Warblers, Island Wrens, Island Shrikes, and Santa Cruz Island Jays. Regarding the last-named species they were enjoined not to take "threes." thereby hangs a tale of meager returns, for threes were the ordained fashion for Santa Cruz Jaydom for the season of 1919. In a residence of over five weeks, 39 days, to be exact, these young men, both of them familiar with island ways, took only five sets of the Santa Cruz Island Jay, all fours; and they estimated that approximately forty sets of three were "passed up."

Miller, L. 1922. Santa Cruz Id. – 1922. (Aug 18-22, 1922). Unpublished Field Notes, University of California, Los Angeles, CA.

"Santa Cruz Jays are all about us and not at all shy. They are almost as big as Magpies." (19 Aug 1922)

Van Rossem, A. J. 1922. Santa Cruz Island, Calif. Aug. 18-21, 1922. Unpublished Field Notes. Univ. of California, Los Angeles, CA.

“Santa Cruz Jays are just finishing the molt. They are as abundant as ever.”
(Aug 19, 1922.)

Dawson, W. L. 1923. The Birds of California. A complete, Scientific and Popular Account of the 580 Species and Subspecies of Birds Found in the State. Vol. 1. Booklovers' Edition. South Moulton Company, Los Angeles, CA.

pp. 58-63. “Santa Cruz Jay A. O. U. No. 481.1. *Aphelocoma insularis* Henshaw.

Synonyms.-Island Jay. Santa Cruz Island Jay.

Description.-Similar to *A. californica* (of which it is undoubtedly a localized race), but averaging larger, and with bill much larger (about 45 per cent bulkier, although relatively narrower); coloration richer and deeper; the blue element brighter (i. e. with less of neutral gray) and deeper (between Rood's blue and Prussian blue); back and scapulars dusky drab; under tail-coverts pale blue (light cadet-blue); thighs tinged with blue. Plumage changes as in California Jay. Length 336 (13.25) or over; wing 135 (5.70); tail 148 (5.83); bill 33 (1.30); depth at nostril 11.4 (.49); tarsus 46.5 (1.83).

Nesting.- *Nest*: a bulky mass of interlaced twigs of live oak tree, into which is set neatly and deeply a cup of coiled rootlets with some admixture of grasses and, rarely, horsehair; placed at moderate heights in live oak or lesser tree. *Eggs*: 3 or 4, rarely 5, according to character of the season; in appearance remarkably uniform; ground color light bluish green (microcline green fading to pale Niagara green), lightly spotted with olive (lincoln green to deep grape-green). Av. size of 140 specimens in the Museum of Comparative Oology: 29 x 21.3 (1.14 x .84); index 73.7. Range 25.4-31.7 (1.00-1.25) by 19.6-22.6 (.77-.89). Extreme examples 30.5 x 19.6 (1.20 x .77), index 64.1; 25.6 x 21.8 (1.01 x .86); index 85.1. *Season*: March 10-April 10; one brood.

Range.-Santa Cruz Island.

“BLUE JAYS” of whatever type have a faculty of making themselves very much at home wherever found, whether in the firry depths of a Siskiyou forest, or in the fervent chaparral of Temecula; but of all recorded spots where the jaybird doth dwell Santa Cruz Island is undoubtedly the choicest. Here is the Blue Jay paradise. And the Jay of Santa Cruz is almost an angel? Well, no; but he is somewhat less an imp. Early isolation from his mainland fellows, by what happy chance we know not, in an equable climate, with abundant and varied food, and measurably secure from human persecution, the Santa Cruz Island Jay has become a more beautiful, a more robust, and a much more demure bird than its co-type *A. californica*. This gem of the islands belongs to him by unquestioned title, and he has no need to defend his claim by frantic protest or scurrilous abuse.

This demure quality shows itself to best advantage when his nest is threatened, for it is then, if ever, that a bird's soul is tried. Yet I have spent an hour beside a nestful of jay babies with never a word of protest from the closely attendant parents, beyond a mellow, and almost inaudible *choop choop*. This, and the sound of pecking on tree limbs, for even this gentle bird employs this familiar corvine device for relieving surcharged feelings. But this jay is capable of vigorous expression, and the variety and suggestive affinity of its notes are worth consideration. There is, first, the Aphelocome scolding cry of common use, but this is fuller, rounder, and much less harsh. Then there is a *djay djay* note which distinctly recalls that of *Cyanocitta stelleri*. Lastly, this note is so modified and accelerated as to strikingly simulate the *rickety rack rack rack* or *shack shack shack shack shack* of the Magpies. I know the Magpie's voice better than the baying of a hound, but I have leaped to my feet and reached for the glasses at this *jack jack* call before realizing that there are no Magpies on Santa Cruz Island. And lastly, again (a preacher's "lastly" may be repeated indefinitely, so why not an ornithologist's?), some *sotto voce* musing lead me to believe that the bird is capable of real song. Exquisite warblings have I heard at a rod's remove, so delicate that a Wren's outburst would have drowned them utterly, but so musical that I had hoped the bird was only tuning his strings in preparation for a rhapsody.

All these comparisons lead one to ask where this most fortunate of Blue Jays got his gifts. He has seen neither magpies nor crested jays for ages. Are not these startling variants of song really primal? Is not this the authentic heir of the original cyano-corvine traits, narrowed and singled elsewhere by reason of excessive competition? *Quien sabe?* But he is a very gifted bird; and I warrant he makes a merry hullabaloo after the ban of silence, which affects all Blue Jays in the nesting season, is lifted.

The Santa Cruz Jay nests early. The last week in March is the height of the season, counting always by fresh eggs. We have found them as early as March 10th. For nesting sites the California live oaks are leading favorites, but the birds nest indifferently throughout the scrub (It is hardly considered proper to speak of "chaparral" on this island, because the sheep keep the lesser undergrowths cleaned out) to the tops of the ranges. Manzanita, Christmas berry, holly-leaf cherry, ironwood, mountain mahogany, scrub and Wislizenus oaks, and Monterey pines, all serve as hosts, therefore, with little preference save for shade. Nests, although bulky, sometimes being as large as a crow's, are placed at moderate heights, usually from eight to twelve feet; and are habitually, so well made that they may be lifted clean of their setting without injury. The jays evidently have assigned beats, or ranges, of mutual adjustment, and they are very loyal to a chosen locality at nesting time. Thus, the nests of succeeding years are grouped in a single tree, or scattered narrowly in a small section of the scrub.

It is in the uniform coloring of the egg that the Santa Cruz Island Jay most surely reveals its isolation, and its consequent inbreeding. The ground color of fresh eggs is a beautiful light bluish-green (microcline green), and this is lightly spotted with olive (Lincoln green to deep grape green). The green element fades quickly, however, so that eggs advanced in incubation are of a pale Niagara green ground color. Among a dozen sets there are no color variants worth mentioning; nor have I seen a single example of the “red” type, which is so pleasing a feature of the mainland form. In size the eggs of the Santa Cruz form average slightly larger than those of *A. californica*.

Second sets are prepared with amazing alacrity if the first are destroyed. In two cases we noted complete sets of five thirteen days after the first had been taken. This quick recovery was the more remarkable in one instance, because the first set had been near hatching, and the reproductive organs of the birds were, therefore, in a state of quiescence.

One speaks without apology of “collecting” jays’ eggs, for the jay is a master oologist himself. Doubtless he owes much of his sleek corpulence to a diet of Dusky Warblers’ eggs; and as for those pleasing, but not humanly seductive ovals known as Mourning Doves’ eggs, they are a thing almost unknown in jay territory. The poultry keeper, too, at the “big ranch” has had to wage unceasing warfare on the Blue Jays – or rather, the “Corbales,” for he speaks Italian—in order that *El Superintendente* may have hens’ eggs for breakfast.”

Ross, R. C. 1926. A Spring Trip to Santa Cruz Island. *Condor* 28(5):240-241.

p. 241. “Island Jay (*Aphelocoma insularis*). A pair observed building a nest. An acorn was found wedged in the rocks at the very crest of a high ridge, far above the oaks of the canyon bottoms. It must have been placed there by this bird; the distance above the oaks impressed me.”

Sheldon, H. H. 1928 [1990]. Santa Cruz Island Mammal and Bird Report December 17-30, 1927; January 16-30, 1928; February 8-March 7, 1928. Pp 189-205. *In*: Daily, M. (ed.), A Step Back in Time Unpublished Channel Island Diaries. Santa Cruz Island foundation Occasional Paper No. 4. [Unpublished field notes originally written in 1928.]

p. 199. *Aphelocoma insularis*: “Found to be abundant everywhere and to the contrary of other reports, most easy to approach; in fact, my experience is that of all the jays, this one is the most unwary and dumb in regard to collecting them. I gained a close acquaintance with them during February while engaged in trapping foxes. The traps were often sprung and the bait shredded by their continuous picking and often the trap covering would be neatly cast aside. Of course a lot of them were not so smart and fell victims to the little number one’s to be later devoured by a fox, - the feet and a few feathers telling the story. The think that struck me most about this jay is

the notes, some of which are very much like the deep tones of *frontalis*. Its habits too are not dissimilar, frequenting mostly the deep wooded canyons and pine forests. The bass notes, the nests in Palo Ferro trees and the eggs so similar to *frontalis*, are a few things about the Santa Cruz Island Jay that appear worthy of future comparative study. As it was noted by Linton in Howell's Manual, that the males predominated in the pines. I took three specimens in December in the pine belt northeast of Christy Ranch and two were females."

Cookman, A. 1930. Birds Noted on a Visit to Santa Cruz Island, California. *Wilson Bull.* 42:64-66.

p. 65. "Santa Cruz Island Jay (*Aphelocoma insularis*)."

American Ornithologists' Union. 1931. Check-list of North American Birds. American Ornithologists' Union, Lancaster, PA.

p. 224. "*Aphelocoma insularis* Henshaw. Santa Cruz Jay. [481.1.] *Aphelocoma insularis* Henshaw, *Auk*, III, No. 4, Oct., 1886, 452. (Santa Cruz Island, California) Range.-Santa Cruz Island, California."

Willett, G. 1933. Birds of the Pacific Slope of Southern California. *Cooper Ornith. Club Pac. Coast Avifauna* No. 21.

p. 116. "Confined to Santa Cruz Island, where common resident. Specimens from which the species was originally described taken by H. W. Henshaw in June 1875 (*Auk*, 3, 1886: 452). Nesting season principally in April and early May. Set of three eggs collected by M. C. Badger (MS) April 14, 1918. Two nests with eggs and two with young birds found by J. Mailliard the latter part of April, 1898 (*Bull. Cooper Orn. Club*, 1, 1899: 43). Three sets of eggs taken by R. H. Beck May 8, 1897 (*Bull. Cooper Orn. Club*, 1, 1899: 6). Two nests containing slightly incubated eggs and five nests with young birds found by O. W. Howard April 28 and 29, 1906 (*Willett, Pac. Coast Avif.*, No. 7, 1912: 68). Two fresh eggs taken by J. S. Appleton June 7, 1906 (*loc. cit.*), probably a second laying."

Hellmayer, C. E. 1934. Catalogue of Birds of the Americas and the Adjacent Islands in Field Museum of Natural History Including all Species and Subspecies Known to Occur in North America, Mexico, Central America, South America, the West Indies, and Islands of the Caribbean Sea, the Galapagos Archipelago, and other Islands which may be Included on Account of their Faunal Affinities. Part VII. Corvidae-Paridae-Sittidae-Certhiidae-Chamaeidae-Cinclidae-Troglodytidae-Prunellidae-Mimidae-Turdidae-Zeledoniidae-Sylviidae. Field Museum of Natural History Publication No. 330. Zoological Series Vol 8.

p. 53. “*Aphelocoma coerulescens insularis* HENSHAW.¹ SANTA CRUZ JAY. *Aphelocoma insularis* Henshaw, Auk, 3, p. 452, 1886-Santa Cruz Island, California (type in U. S. National Museum); Ridgway, Bull. U. S. Nat. Mus., 50, Part 3, p. 331, 1904-Santa Cruz Island (monog., full bibliog.); Willett, Pac. Coast Avifauna, 7, p. 68, 1912-Santa Cruz Island (nesting habits); Grinnell, l.c., 11, p. 98, 1915-Santa Cruz Island; Howell, l.c., 12, p. 68, 1917-Santa Cruz Island; Swarth, Univ. Calif. Pub. Zool., 17, p. 418-Santa Cruz Island (monog.). *Range*.-Santa Cruz Island, Santa Barbara group, off southern California. 4: Santa Cruz Island. ¹ I cannot see in the Santa Cruz Jay anything but a well-marked insular race.

Rett, E. Z. 1936. Santa Cruz Island. (March 17-28, 1936. Unpublished Field Notes. Santa Barbara Museum of Natural History, Santa Barbara, CA.

17 Mar 1936: “Took a short hike of about a mile inland and collected a Santa Cruz Jay, *Aphelocoma insularis*. Saw 4 or 5 and shot at several.”

19 Mar 1936: “I was anxious to get some Island Horned Larks but saw none, took 3 jays. They are common everywhere and easy to get.”

Ward’s Natural Science Establishment. 1936. Catalogue of North American Bird Skins and Mounted Specimens. Ward’s Natural Science Establishment, Rochester, NY.

p. 26. “*Aphelocoma insularis* (Santa Cruz Jay) Skin \$3.50, Mount \$6.00.”

Grinnell, J., and A. H. Miller. 1944. The Distribution of the Birds of California. Cooper Ornithological Club Pacific Coast Avifauna No. 27.

p. 291. “*Status*-Resident. Common; some observers say “abundant.” *Geographic Range*-Exclusively, Santa Cruz Island, of Santa Barbara group. Life-zone, Upper Sonoran. Chief references furnishing life history information: Blake, Auk 4, 1887:329; Beck, Bull. Cooper Ornith. Club, 1, 1899:6; Mailiard, Bull. Cooper Ornith. Club, 1, 1899:42; Linton, Condor, 10, 1908:127; Howell and van Rossem, Condor, 13, 1911:209; Howell, Pac. Coast Avif. No. 12, 1917:68; Dawson, Jour. Mus. Comp. Zool., 1, 1920:26, figs., col. pl.; Dawson, Birds Calif., 1, 1924:58; Ross, Condor, 28, 1926:214; Willett, Pac. Coast Avif. No. 21, 1933:116.

Habitat-Woodland and brushland, of the open and interrupted type characteristic of the greater portion of Santa Cruz Island. Nesting, perching, roosting and foraging places are afforded by “heavy brush” or “large bushes” (so reported by some persons), ironwood, live oak, pines of two sorts, holly-leaf cherry, Christmas berry, Manzanita; adjacent open ground provides for the terrestrial level of foraging. Evidently, the habitat requirements of this jay are quite like those of the closely related mainland species.”

Pitelka, F. A. 1945. Pterylography, molt, and age determination of American jays of the genus *Aphelocoma*. *Condor* 47:229-260.

See this article to obtain the complete text pertaining to ISSJs.

Bent, A. C. 1946. Life Histories of North American Jays, Crows, and Titmice. *Bull. U. S. Natl. Mus.*, No. 191.

pp. 114-118. "*Aphelocoma coerulescens insularis* Henshaw Santa Cruz Jay

Habits. "Santa Cruz Island, one of the Santa Barbara group, off the coast of southern California, has developed this large, handsome, dark-colored jay, which once stood on our list as a full species, though it is evidently very closely related to the mainland forms of the California jay. It is confined entirely, so far as we know, to the island for which it is named. It is larger than the largest race and darker than the darkest race of *californica*, and it has definitely blue under tail coverts, which the neighboring mainland jays of the California species do not have. Mr. Swarth (1918) says: "From *A. woodhousei*, which it resembles in its blue under tail coverts, *insularis* is distinguished by greater size, darker coloration, and (like *A. californica*) in more strongly contrasted markings....The Santa Cruz Jay is one of the most sharply differentiated of any of the island species, and it is hard to appreciate the possibility of the development of the form under the given conditions....The most striking feature of the Santa Cruz jay, as compared with the mainland species is its enormous size, so in this case a marked restriction of range, with the consequent probability of inbreeding of closely related individuals has not been productive of the dwarfed stature which such conditions are supposed to engender."

Santa Cruz Island is the only one of the group on which any jays are to be found. It is one of the larger islands, over 20 miles long and up to 5 miles in width at its widest parts; it lies about 21 miles due south across the channel from Santa Barbara to the mainland. It is a rugged, steep, mountainous island, with some of its peaks said to rise from 1,800 to 2,700 feet above sea level. The coast line is irregular and largely precipitous, with few suitable landing places except on the beaches at the mouths of the streams. A. B. Howell (1917) says: "The eastern part is very irregular, barren and almost destitute of water. The western part, however, is, in certain localities, especially near Prisoners Harbor, plentifully besprinkled with forests of Santa Cruz pine, which, in the higher parts, gives a distinctly boreal impression. At the lower edge of the pines are oaks and considerable grass land. The larger canyons are well wooded with a variety of deciduous trees, some of them quite large, and there is good water in many of them."

It was in this latter locality that I landed on June 5, 1914, and spent parts of two days exploring the vicinity of our camp. Here the deep valleys, watered by rocky streams, were well wooded with ancient live oaks, willows, and other deciduous trees and shrubs. There were scattering oaks, or small

groves of them on the less exposed portions of the steep hillsides; and the opener hills were covered with wild oats, scattering bushes, and some cactus. But it was in the wooded valleys that we found the main object of our search, the grand Santa Cruz jay. Most of the other birds, towhees, vireos, flycatchers, wrens, warblers, and hummers, were concentrated with the jays in these valleys or canyons. The jays were common enough here, but were rather shy and were oftener heard, but Mr. Howell (1917) says that these jays "are not equally common over the entire island, but seem to prefer the neighborhood of the pines and heavy brush."

Nesting.-Mr. Howell (1917) writes: "It is truly surprising to note the number of old jays' nests upon the island. These must either last for a greater number of years than is the case elsewhere, or else the birds are in the habit of building extra or dummy nests. The favorite sites seem to be in the tops of the local 'palo fierro' (ironwood) trees, though many were noted in low oaks or large bushes, mostly on the sides of the canyons. Construction is the same as that employed by the mainland form. The latter part of April, 1911, all the females shot had already laid, and I believe that a large majority of them had small young. Two nests that I examined on the 28th were some twenty feet up in ironwoods, and held, respectively, two small young and an addled egg, and three young, half grown."

W. L. Dawson (1923) says: "The Santa Cruz Jay nests early. The last week in March is the height of the season, coming always by fresh eggs. We have found them as early as March 10th. For nesting sites the California live oaks are leading favorites, but the birds nest indifferently throughout the scrub....to the tops of the ranges. Manzanita, Christmas berry, holly-leaf cherry, ironwood, mountain mahogany, scrub and Wislizenus oaks, the Monterey pines, all serve as hosts, therefore, with little preference save for shade. Nests, although bulky, sometimes being as large as a crow's are placed at moderate heights, usually from eight to twelve feet; and are, habitually, so well made that they may be lifted clean of their setting without injury. The jays evidently have assigned beats, or ranges, of mutual adjustments, and they are very loyal to a chosen locality at nesting time. Thus, the nests of succeeding years are grouped in a single tree, or scattered narrowly in a small section of the scrub."

He says that the nest is "a bulky mass of interlaced twigs of live oak tree, into which is set neatly and deeply a cup of coiled rootlets with some admixture of grasses and, rarely, horsehair."

Eggs. Three or four eggs, rarely five, constitute the full set for this jay. They vary in shape from rounded-ovate nearly to elliptical-ovate but are mostly ovate, with only a slight gloss. They do not show the wide variation in colors exhibited in the eggs of the California jay. Mr. Dawson (1923) remarks on this subject: "It is in the uniform coloring of the egg that the Santa Cruz Island Jay most surely reveals its isolation, and its consequent inbreeding."

The ground color of fresh eggs is a beautiful light bluish-green (microcline green), and this is lightly spotted with olive (Lincoln green to deep grape green). The green element fades quickly, however, so that eggs advanced in incubation are a pale Niagara green color. Among a dozen sets there are no color variants worth mentioning; nor have I seen a single example of the 'red' type, which is so pleasing a feature of the mainland form."

Dawson's colored plate shows some variation in the size and shape of the markings, in pale olives and light browns; some are finely sprinkled with faint dots, others more clearly marked with small spots, and one has pale olive-brown blotches of fair size. He gives the average measurements of 140 eggs in the Museum of Comparative Zoology at 29.0 by 21.3 millimeters; they range in length from 25.4 to 31.7, and in breadth from 19.6 to 22.6 millimeters. The measurements that I have collected of 50 eggs average 29.2 by 21.6 millimeters; the eggs showing the four extremes measure 32.0 by 21.5, 29.0 by 23.0, 26.2 by 20.6, and 28.5 by 20.5 millimeters.

Plumages.-The plumage and molts of the Santa Cruz Jay probably follow the same sequence as in the California jay, to which it is so closely related. The juvenal plumage seems to be only slightly different; Ridgway (1904) describes it as follows: "Pileum, hindneck, auricular and suborbital regions, and sides of chest dull slate color, slightly tinged with dusky blue; back, scapulars, rump, and smaller wing-coverts dark brownish mouse gray; under parts of body pale smoke gray, separated from the white of the chest by a narrow collar of bluish slaty, connecting the two slaty areas on sides of chest; under tail-coverts and thighs smoke gray; wings (except smaller coverts) and tail as in adults."

Food.-Practically nothing has been published on the food of this jay, which probably includes the same wide range as that of other jays. Dawson (1923) implies that it is a robber of small birds' nests and that it even invades the poultry yard. As much of its habitat is thinly settled, or entirely uninhabited by human beings, its feeding habits are not of great economic importance.

Behavior.-Its habits suggest those of the mainland forms of the genus. During the breeding season it is quiet and secretive, but at other times it is bolder and more inquisitive, coming readily in response to the squeaking call and watching the intruder at short range in silence. Pursuing it through brushy calleys leads to only passing glimpses of it, but its curiosity often leads it to reward the patient waiter. J. Stuart Rowley writes to me: "It was my good fortune to be able to spend the day of April 18, 1937, on the western side of Santa Cruz Island. Here, in the scrub oak on the hillsides and in the ravines, is the home of this large, dark-blue-colored jay. Since this was my first experience with these jays, I had expected them to behave much like the mainland species. However, they were extremely shy and quiet and would duck down into the bushes as I walked along, remaining hidden from

view until I was well beyond them. I was able to collect a nice series of birds by concealing myself in the brush and making a squealing distress sound with my lips on the back of my hand. This procedure brought the birds up promptly, without any voiced protest, but with wide-eyed curiosity.

I found one nest that day, it being placed about 8 feet up in a scrub oak. When located, no sign of either bird was seen or heard; and until I climbed the tree and just reached into the nest, no jays would seem to be in the vicinity. However, when I started taking the four eggs from the nest, both birds burst forth with the most vociferous scolding, I have ever had administered. This retiring behavior by a species of jay was a new experience for me. After the nest was reached, their restraint exploded.”

Voice.-The various notes of the Santa Cruz jay are much like those of its relatives but rather harsher and suggestive of the notes of Steller’s jay. Dawson (1923) mentions a note that is strikingly like “the *rickety rack rack rack* or *shack shack shack shack shack* of Magpies.” and exquisite warblings have I heard at a rod’s remove, so delicate that a Wren’s outburst would have drowned them utterly, but so musical that I had hoped the bird was only tuning his strings in preparation for a rhapsody.”

Pitelka, F. A. 1948. Santa Cruz Island, Calif. Aug-Sept 1948. Species accounts. Pp. 25-38. Unpublished Field Notes, Museum of Vertebrate Zoology, University of California, Berkeley, CA.

Aug 29, 1948 (Prisoner’s Harbor, 50 ft.): “Lone bird calling from oak in a side draw west of 2nd eucalyptus grove. Note given was the interrogation note, uttered intermittently. Some birds on other side of main canyon answered. The jay I was watching then dropped to the ground and began searching for food, pecking leaves and debris and throwing them to the side. This continued for a few minutes, the jay jumping up to one of the prostrate branches, resting a moment, and then resuming his foraging. It found an acorn, and then moved up into the tree by short leaps, and left, flying into a neighboring oak and then across the canyon, through the Eucalyptus grove to the other side, where, as mentioned earlier there were other jays.

Later. – A pair noted in an oak-wooded area at the mouth of a small side canyon (live oaks more or less continuous along southeast side of main canyon, also replaced by some scrubby, less leafy form higher in the side canyons and on exposed slopes), to which area there activities were more or less localized. They foraged quietly in the oak canopy, then flew off a short distance up slope.

A lone individual (proved to be an adult male, #816) observed at another canyon-mouth woodland site. This individual remained quiet throughout the 10 minute period or so that I watched him. He too stayed in the area where first found in spite of the fact that my walking through it disturbed him at least twice. A loose flock of jays was present and calling intermit-

tently no more than 75 yards beyond this individual, but he did not respond to them at any time. No other individual was present, and so far as I could tell, this male was alone. When I shot it, no calls were heard; the flock earlier mentioned had moved on. The male taken was about $\frac{3}{4}$ through the molt, the outermost tail feathers are not quite $\frac{1}{2}$ grown and the old outermost primary is still present.

Group of five 1st-year birds found quietly feeding in small grove of *Prunus* trees on canyon flat. They were picking the fruits of this cherry (*P. ilicifolia*), about an inch in diameter, and either carrying them off across the canyon or eating the meat off of the stone in the same tree. One of these five was taken. Later the same group was watched, and on this occasion an adult was present in one of the trees also. It was not actively feeding, although occasionally a cherry was taken and partially stripped of its meat; rather the bird was loafing; more or less casually moving about in the tree, now resting, now breaking a twig, now pounding a branch with its beak, etc. Once while resting, it began to sing softly, the bill opened slightly. In pattern and quality, this did not differ from that of the mainland birds. However, the song was given in a more animated fashion, in that several times the jay raised its head in time with some slight inflection in the song. Most interesting was soft, hoarse, cough-like note, given twice each of three times and accompanied by a forward dip of the body. During all other parts of the song performance, the jay retained more or less normal perching posture. This dipping behavior and accompanying cough-like notes has not been observed by me in the mainland races.”

Aug 31: “9 a. m. Pair of adults observed about 1.75 mi SW of camp in main canyon. Feeding quietly in upper branches of oak, moving about leisurely, sitting quietly for periods of a minute or so, preening themselves occasionally, then picking insects off the side of a main vertical branch, or climbing up into the twiggy and picking an acorn which was then pounded. The two birds moved about within a few feet of each other, one occasionally following the other out of curiosity when the latter found some food item and repeating the search. In their movements through the branches, they do not seem to be heavier or slower than the mainland birds. 9:10 a. m. A third jay flew downslope, perched momentarily in a dead tree overlooking the canyon live oaks, then joined the pair under observation. A short chase occurred immediately. I could not see the birds for a few moments; then a second chase of some distance took place up canyon, the chasing bird calling *kra kra kra kra* loudly. One of the pair, presumably the female, did not leave and continued to feed. I heard three series of *kra-kra* notes after the second chase, given nearby from direction in which chasing jays flew, but could not see them. About two minutes after the last series of notes, the jay returned and resumed feeding. 9:20 a. m. Feeding now on the ground in among grass and *Symphoricarpos* where the oaks are low, but open beneath and where

there is a good litter. 9:25 a. m. Moved onto the other side of ridge. When I rounded end of the ridge, there were three jays, one of them a bird of the year in an early stage of p-j molt. All three drank from a pool in the stream bed, though not all at once. The young bird was at times no more than two or three yards from the other jays, but no chase ensued. The latter presently moved along the slope of the canyon, leaving the young bird alone. 10 a. m. – Another pair of adults located farther upstream. Male called alarmedly as I approached, female stayed behind, and as the male called, she gave the frog note and bobbed several times simultaneously. Later. – A jay called a frog note with several notes best recorded as *ik-ik-ik*.”

Sept. 1 (1 mi. SW Prisoner’s Harbor): “Large group of jays, including 3 or 4 adults and perhaps a half dozen first-year birds, was observed moving along a slope, back and forth, over an area apparently regularly inhabited by an established pair. Several chases were noted, also two actual clashes, one of them resulting in screaming of one of the jays. Entire group very active and noisy. The entire sequence resembled in all essentials several such sequences noted in the Berkeley Hill jays (see Canyon Road notes).

The frog note seems to be given by the female when the male calls *kra-kra-kra* excitedly. This was observed in the sequence described above; and also later in the morning when a pair was found high on the NW facing slope, the male flew downslope calling and the female frog-noted at once, ending the note with the three inflected notes, *ik-ik-ik*.”

Sept. 3 (2mi SW Prisoner’s Harbor): “Jays along narrow canyon checked for third time this morning. None have been collected from the area as yet. Pairs (adults recognizable by incompletely grown tail feathers in most individuals; sexes recognizable by size differential) are about 300 feet apart, as closely spaced as anywhere I have seen them here, or on the mainland for that matter. Of course, the habitat in this canyon area is exceptional from the standpoint of scrub-jay preferences, and one can probably regard the population there as at maximal density. Young of the year associate loosely with adults, presumably their parents, though in only one case does there appear to be a normal sized family group. One young bird still feathered superficially with juvenal plumage was found at the same spot where it was seen on Aug. 31.

The chief activity of the jays was foraging, both on the ground and in the oak foliage (My impression is that in these as in the mainland birds, most foraging is done on the ground.). *Insularis*, like *ovileptica*, hops about the ground, throwing leaves and twigs to the side. On finding an acorn, it is taken to a branch, and pounded and eaten or carried, as was seen once today, to a grassy spot on the opposite slope of the canyon and buried. The acorn-burying action was precisely as in *ovileptica* – initial exploration of

ground, insertion of acorn, pounding of it and covering of it with leaves and twigs from surface litter nearby.

The jays were silent for the most part. Only once did a male call in alarm as I approached, and in this instance, as in a number noted since my observations were begun here, the female answered immediately with the frog note, varying it from others heard by giving a *ki* note at the beginning. The only other calling was in conjunction with intermittent chases by adults (presumably males of isolated pairs) when a roving, active loose group would move into the territory of an established pair.”

Sept 7 (Stanton Ranch Headquarters): “First year bird taken by Earl, the gardener, not prepared as skin. A male, testis 3 mm. Weight, 112.5 gr. chin area feathered, as also sternal area, and line down neck; sides of head and neck, old feathers: old feathers also among undertail coverts and on femoral areas, but in both places some new feathers were about 1/3-1.2 grown; remainder of body with only scattered old feathers evident, but feather growth active everywhere.”

Sept. 4. (5.5 mi W Stanton Ranch Headquarters): “Jays common in pine forest. Collected eight, including two in post-juvenal molt (see specimens under date of Sept. 4). Others in post-juvenal molt were seen. A number of (three) adults were obtained at more or less one spot in a brief hunting period in the evening along with the two in p-j molt and one already for the most part through the molt. Also, in the morning, while the jays were quietly feeding and so somewhat more difficult to locate, they were regularly distributed. One adult was seen inspecting opened cones on the branches of a partially dead pine. Others were observed in shrubbery and also on the ground. One was seen taking *Vaccinium ovatum*. Berries of several kinds, pine nuts, and acorns (not yet ripe) are available here in plentiful quantity.”

Sept 6 (5.5 mi W Stanton Ranch Headquarters): “Two pairs of jays found in small canyons, one pair in each, along NE facing slope in the direction of Pelican Inlet. Female of one and both members (only male saved) of other pair were collected. In third canyon, both adults and some roving young of the year were seen. Jays were generally distributed in this area.”

Sept 7: “A first-year bird, which proved to be a female, was collected at the Stanton Ranch Hsqtrs. It had been calling *kra-kra-kra* in the manner typical of unlocated, lone first-year birds. One of these series of *kra* notes was ended with a frog note., *ki-dr-r-r-r*. At this time the jay was sitting upon a dead tree, casually pecking at branches, or when not calling, just perched quietly.”

Sept. 9: “A lone jay found at a spot about 2 mi. SW camp in the main canyon is the female of a pair noted earlier at the same spot on several occasions.

The male was taken on the 7th. Throughout a period of about 45 minutes this morning when I was either watching her or was nearby, she did not call. Once two jays, one of them a bird of the year, the other probably also moved through the area and called but the female did not respond to them anywhere. (Sex here is judged solely on the basis of relative size; the difference in *insularis* being at once evident when a pair of adults were seen together). The individual just discussed is apparently remaining on a home territory in spite of the loss of its mate (as noted in *ovileptica*). That it does not call as these lone birds sometimes do may be part due to the fact that this individual, as all taken thus far, is in a late stage of molt, or the lone, territorially established birds that call may be males. This latter needs to be investigated.”

Sept. 6.: “Went with Pearson to the area of the radar station about 4 miles east of the ranch headquarters, on the main ridge. Most of the area is rolling grass hills with patches of cactus, or steep, rubble-covered slopes sparsely vegetated. In a few areas there is oak scrub-woodland. In one such patch of woodland, I found a pair of adults, both in an early stage of molt (female advanced over male) and a single fledgling, with tail feathers still sheathed basally. These were discovered when I heard a series of whine notes given by young jays when they are being fed. After the juvenile and female were taken, the male called *ka-ee-ah*, strongly inflected, a note of extreme alarm.”

Sept. 9.: “Two adult females taken on the 7th from willow grove near camp were thought to be a pair when taken, but sexing showed otherwise. Subsequently the same date (7th) I saw an adult in the grove which may have been the male. Today there is a pair in the grove. A third bird came to one of the willows, to a point between the two supposedly paired birds. The “female” was casually moving about in one of the willows, the “male” was resting on a branch, preening himself. The third bird was hammering at some object it was carrying, otherwise making no noise, when the “male” apparently saw it for the first time, and dashed at it, chasing it out of the willow grove. The third jay flew into an elm, where I collected it. It was an adult male, and was there again hammering at what proved to be a pine nut. when the male chased, he did not call. The female gave a frog note as the chase occurred – *dr-r-r-ka-yi-yi-yi-yi-yi*, not loud.”

Aug 30 (1.5 mi W Standon Ranch Hdqtrs.): “Three jays observed in a group; one remained quiet, the second called repeatedly in mild alarm, apparently because of my presence, and the third uttered the frog note, bobbing 3 or 4 times while giving the note, as the second was calling. I collected all three: all were adults, the first a female completely through the molt, the calling bird was a male in late molt, the bird which responded to him was a female about 2/3 through the molt. A 4th bird passed me just as I was approaching

this group and judged by the direction from which it came must have been included in it just as I came along.”

2 mi. SW of Prisoner’s Harbor: “Two jays in molt, one of them in an early stage, apparently represent a late breeding pair, as indicated by molt and also presence of a young bird in juvenile plumage within a few feet of the female (smaller of the pair.”

Aug 31. (0.5 mi S Prisoner’s Harbor): “Shot an orange-crown which flew a short distance into an oak before dropping noisily on the litter under the oak. The shot attracted a male jay, which uttered a single loud *fra-a* as it plunged into the oak. Just at that moment the warbler fell, the jay cocked his head looking down at it, then dropped down, picked it up, and flew away. I went after the jay, and fortunately it switched back instead of continuing on up the slope. The jay flew into a Eucalyptus thicket, where I soon located and shot it. The warbler was a few inches from the jay, its wings and tail feathers all pulled out as well as some of the body (especially back) feathers. Neck broken in two, otherwise the warbler was intact. Apparently the jay would have fed on it.”

Aug 29: “The “krack” note of the insular race is different from that of the mainland forms, but difficult to describe, as the difference is only slight. Pitch seems to be the same, but the note is louder, more of a “kwack” than “krack”, somewhat reminiscent of a magpie call. The note is now given mainly amongst scattered or loosely flocking individuals that are probably mostly if not all 1st year birds. One so calling and seen was clearly a bird of the year not yet through the post-juvenile molt.

Most surprising of the notes heard today was the “frog” note typically given by *Cyanocitta* in the Berkeley area and elsewhere. This note or its counterpart in *A. c. oocleptica* is what I have called the gurgle note. In quality it is similar to the note heard from *insularis*, but rather than being a single, hoarse, course grating note somewhat drawn out, it is broken into several parts with a prominent inflection toward the end. The soft “kruck” note heard. It seems to be more or less identical with that of *oocleptica*.”

Sept 9: *kraa-a* – given singly, apparently a sort of location note.”

Pitelka, F. A. 1950. Additions to the avifaunal record of Santa Cruz Island, California. Condor 52:43-45.

p. 45. “Single instances of several species in last stages of breeding activity were observed: Scrub Jay (*Aphelocoma coerulescens insularis*), September 6, adults feeding at least one well-grown fledgling (all three individuals collected);”

Miller, A. H. 1950. Channel Islands, March 5-14, 1950. Species Accounts. Unpublished Field Notes, Museum of Vertebrate Zoology, University of California, Berkeley, CA.

Aphelocoma c. insularis

(Mar 5, 1950 Prisoner's Harbor): "In the course of two hours spent in oak woods and open chaparral west of the harbor detected only two, possibly members of the same pair, although they were 100 yards apart. The first was detected sitting low in thick oak foliage and was shot up severely – not saved. It was a male with testes estimated at 6 mm. length. Once in this area I heard a loud jay call definitely like that of a Steller though not identical; it was the *Ka ka ka ka ka ka ka* note. Apparently it was given by the species. I have never heard it from a scrub jay before. Soon saw a bird fly across the low oak tops with a large twig in its bill. It stopped in a dense oak at the crest of a ridge below an open grassy slope. Here I approached and shot it when it was about 5 feet from the nest in which I presume it had placed the twig. The nest was about 20 feet above ground on a 2 inch limb, approximately vertical. The nest was about 4 feet from the tips of the tree on the southwest side and it was well concealed from view except from below. The nest had nothing but a platform base of 75+ twigs through which I could see readily."

March 5 (1 mi W Stanton Ranch, 250 ft elev.): "3+ birds were seen respectively at the edge of brush on the south-facing slope and in a ravine lined with oak scrub that passed through the fields. Here a nest was found 20 ft up in a tall scrub-like oak in the ravine bottom at the edge of the oak woods. It could not be reached and it was just under the crown foliage on a lateral limb. Some lining material could be seen through the edge. I could not be sure that it was a new nest, though it seemed in too good shape for a last-years nest. Jays skulked about and at 50 yds. distance often revealed themselves and were easily approached. Here they were often seen flying into the air for insects. Today the *swish swish swish swish* etc. note was heard many times. On every occasion I was impressed with its rapidity and timed it at 4 notes per second, maybe 5, lasting for 2 or 3 seconds. I estimate a mainland scrub jay at 3 per second. Also heard the ratchet like note, once ended, close by me, with a liquid gurgle, with visible throat movements accompanying."

March 11 (Willows Anchorage): "About 5 were seen in the Baccharis brush in the river bottom and in the adjoining slopes in scattered lemonade berry bushes. Again the *swish swish swish* note was observed to be rapid. The single note with rising inflection has a little different quality from that of mainland birds."

Miller, A. H. 1951. A Comparison of the Avifaunas of Santa Cruz and Santa Rosa Islands, California. Condor 53:117-123.

p. 119. “It is of course well known that the distinctive island form of Scrub Jay (*Aphelocoma coerulescens insularis*) is confined to Santa Cruz Island. Other groups, like ours, have looked carefully for jays on Santa Rosa and the Vail family fully corroborated the fact that they are absent. Yet within sight of Santa Cruz on the east slopes of Santa Rosa there are oak and brush-filled canyons that are ideal for this species.

Possibly related to the absence of jays is the fact that Loggerhead Shrikes seem much more numerous on Santa Rosa Island than on Santa Cruz.”

Pitelka, F. A. 1951. Speciation and ecological distribution of American jays of the genus *Aphelocoma*. Univ. of California Publ. Zool. 50:195-464.

See this article to obtain the complete text pertaining to ISSJs.

APPENDIX IV

Estimates of the Number of Feral Herbivores on the
Northern Channel Island between 1840 and the Present

YEAR	SHEEP	CATTLE	HORSES	PIGS	COMMENTS	SOURCES
SAN MIGUEL ISLAND						
pre-1850					Samuel C. Bruce introduced the first herbivores to San Miguel Island.	Roberts (1989)
1850					In 1850 George Nidever "bought out the interest of a man by the name of Bruce" [S. C. Bruce] who had been grazing sheep on San Miguel Island.	Doran (1980), Ellison (1937)
1851	45	17	7	2	George Nidever introduced herbivores to the island.	Roberts (1989)
1857	400-500				"At present [1857] there are some four or five hundred head of sheep upon it."	Greenwell (1858:394)
1862	6,000	200	32	100	Number of stock estimated to be present on San Miguel Island during the peak of Nidever's grazing operations.	Ellison (1937)
1864	1,000	20	2	"some"	An estimate of the number of Nidever's grazing stock that survived on San Miguel Island following the drought of 1863-1864. He lost nearly 83% of his sheep (5,000 sheep), 90 percent of his cattle (180 cattle), and 94 percent of his horses (30 horses).	Ellison (1937)
1865	X				"Some sheep have been placed on San Miguel."	Whitney (1865:185)
mid-1860s and mid-1870s					Sheep and donkeys were removed from the island in the mid-1860s and mid-1870s due to intense droughts in 1863-1864 and 1870. Nidever lost 5,000 sheep during these droughts and he abandoned his grazing operations on the island in 1870.	Knowlton et al. (2007:534)
1868	~2,000				"...but several thousand sheep manage to subsist upon the limited pasturage growing on the island."	Cronise (1868:90)
1869					The Nidevers sold their rights for grazing animals on San Miguel Island on May 8, 1869 to Hiram W. Mills.	Doran (1980), Santa Barbara County Records Office, Deed Book H, pp.137-138.
1871	X				S. Forney thought that San Miguel Island "could sustain 4,000 sheep."	Letter from S. Forney to Supt. Benjamin Pierce, November 30, 1871, Assistants 1866-1875, E-F, Record Group 23, National Archives
1872					San Miguel grazing lease held by the Pacific Wool Growing Company. The Mills brothers ran the grazing operation on the island during this time (1870-1887).	Santa Barbara County Records Office, Deed Book J, pp. 630-631 and 642-643; O'Neill ed. (1939)

Historic and Prehistoric Record for Island Scrub-Jays on the Northern Channel Islands

YEAR	SHEEP	CATTLE	HORSES	PIGS	COMMENTS	SOURCES
1883	2,000				"... San Miguel, on which are 2,000 sheep."	<i>San Francisco Morning Call</i> , November 19, 1883
1886	X	X	X		"It ... is stocked with the finest horses, cattle and sheep."	Streator (1887)
1888	4,000	30	X	X	W. G. Waters bought the grazing rights to San Miguel Island in January 1888 and managed a productive sheep ranch during spring 1888. He also had turkeys, chickens, a dog and 2 cats.	Santa Barbara County Recorders Office, Deeds, Book 26, pp. 203-204; Minnie Waters Diary, January 1, 1888;
1888	2,000				Estimate of the number of sheep on San Miguel Island.	Thayer (1888:600-601)
1890	3,000	~150	10	X	W. G. Waters took possession of San Miguel Island. The sale statement for this transaction lists an inventory of all the equipment, personal property and livestock on the island as of December 20, 1890. In this inventory was a listing of the number of herbivores present on the island along with poultry and goats.	Johnson (1972), Roberts (1989)
1897	3,000		18		Number of livestock listed on the island on the March 1897 deed in the County Recorder's Office.	<i>Santa Barbara Morning Press</i> , March 9, 1897; Rouse (1989)
1897					W. G. Waters and J. F. Conway filed papers of incorporation for the San Miguel Island Company at the Santa Barbara Recorder's office in February 1897.	Doran (1890)
1909	5,000				Number of sheep that W. G. Waters "reportedly ran" on San Miguel Island in 1909.	Roberts (1989)
1917	2,500	"some"			R. L. Brooks and J. R. Moore paid Waters \$30,000 in January 9, 1917 for improvements made on the island and for his livestock including 1,700 Spanish Merino Sheep that were present on San Miguel Island.	Roberts (1989), Livingston (2006)
1917	2,356	5	"mules"		Number of livestock on San Miguel Island listed in Brook's and Moore's business statement at the end of their first year of managing the grazing operation on San Miguel Island	Business statements on file at Santa Cruz Island Foundation, cited in Livingston (2006)
1918	2,391				Number of sheep sheared on San Miguel Island in 1918.	Roberts (1989)

YEAR	SHEEP	CATTLE	HORSES	PIGS	COMMENTS	SOURCES
early 1920s	2,000-3,000				Hancock Banning, Jr.'s estimate of the number of sheep that San Miguel Island could support.	"The Banning Family in Southern California," [interview with] Hancock Banning, Jr., February 19, 1970, Oral History Program, UCLA, Tape II, Side 1, transcript pp. 54, 60-66; cited in Livingston (2006)
1921	>4000				Following Brooks' first ten years on San Miguel Island sheep had increased to more than 4,000 head.	Business statements for 1917-1923; cited in Livingston (2006)
1924	500				Following a drought in 1923-1924 Brooks removed all but 500 sheep from San Miguel Island and transplanted them to San Nicolas Island.	Livingston (2006)
1929	~1,500				Number of sheep present on the island under H. Lester's management of the San Miguel Island grazing operations	
1935					Brooks signs a lease with the Navy for his grazing operation on San Miguel Island at \$600 a year.	Livingston (2006)
1938	1,000-1,200				Due to overgrazing on the island the Navy in 1938 limited the San Miguel Island grazing allotment to 1,200 sheep, but later reduced the allotment to 1,000 sheep.	Roberts (1989), Livingston (2006)
1938	1,200				Navy's limit of the number of sheep that can be grazed on San Miguel Island in 1938. This limit was later reduced to 1,000.	Livingston (2006)
1939	1,100				Estimate of the number of sheep on San Miguel Island.	Sumner and Bond (1939)
1948	500		4		Navy revokes Brooks' grazing lease on San Miguel Island in 1948. He removed all but 500 sheep and 4 horses from the island.	Hochberg et al. (1979), Roberts (1989)
1950	"some"				In June 1950 Brooks removed many more sheep from San Miguel Island following the loss of his island lease. Some sheep remained that could not be rounded up.	Hochberg et al. (1979), Roberts (1989), Santa Barbara News Press, July 9, 1950
1966	148		15 burrows		The Navy shot 148 sheep and thus ended 127 years of sheep grazing on San Miguel Island.	Letter dated March 26, 1967 from Channel Islands National Monument to Western Regional Director
1968			X		A small herd of burrows remained on San Miguel Island.	Hochberg et al. (1979)

YEAR	SHEEP	CATTLE	HORSES	PIGS	COMMENTS	SOURCES
1970	4				Number of sheep seen alive on San Miguel Island.	Letter from Julian P. Donahue to Mr. Donald M. Robertson, Superintendent of Channel Islands National Monument.
1975			25		Number of burrows present on San Miguel Island.	DeLong (1975)
1976			23		Number of burrows shot by the National Park Service to rid the island of this last remaining feral herbivore.	Douglas (1977)
SANTA ROSA ISLAND						
1842		X			According to S. Bowers cattle were first introduced to the island in 1842 and hogs were introduced 10 years later.	Bowers field notes for April 8, 1876 in Benson (1997)
1844	53	270	9		Number of livestock shipped to Santa Rosa Island in September 1844 by A. B. Thompson. Most of these cattle belonged to Don Carlos.	Jones et al. vs. U. S. Case 117, pp 49, 50, 67 cited in Holland (1962); Vail and Daily (1989)
1844	75				Alden reports that 75 sheep were placed on the island in 1844.	Alden (1852)
1852	10,000				According to Thompson & West (1883) a total of 3,000 sheep were taken off the island in 1852 by Dixie W. Thompson.	Alden (1852), Bache (1852), O'Neill (1939), Thompson and West (1883:107)
1853				X	Pigs were introduced to Santa Rosa Island.	Bowers (1877)
1857	3,000	7,000		~3,000	"At the present time there are some 7,000 head of cattle upon it - 3,000 sheep and probably as many wild hogs."	Greenwell (1858)
1857	2,300	8,000	235	"lots"	W. G. Graves' assessment for the court of the livestock that were present on Santa Rosa Island in the summer of 1857.	Gast (1976:90)
1858	6,000-7,000	8,000	250-300		Estimate of the livestock present on Santa Rosa Island in mid-June 1858. A total of 8,000 cattle and 2,300 sheep shipped off the island to the mainland.	Jacob Metzger's inventory of livestock on Santa Rosa Island in June 1858.
1858	5,000	7,000	259	200	Writ of execution from the district court of Santa Barbara placed a levy on the Santa Rosa Island livestock in September 1858.	District Court of Santa Barbara, September 21, 1858
1859	8,500	3,700	319		In January 1859 a total of 6,500 cattle, 300 horses, and 2,300 sheep were transported off Santa Rosa Island by A. P. More.	Livingston (2006)

YEAR	SHEEP	CATTLE	HORSES	PIGS	COMMENTS	SOURCES
1859	1,400	2,000	19		A total of 6,500 cattle, 2,300 sheep, and 300 horses were transported off the island on the Goliath in June 1859 which left 1,400 sheep, 2,000 cattle and 19 horses on the island by the end of 1859.	Livingston (2006)
1860	2,000	1,000	100		The tax assessment roles for 1860 show that T. W. More stocked 1,000 cattle, 2,000 sheep and 100 horses on Santa Rosa Island.	Cleland (1964), Holland (1962:58)
1868	10,000	X			"...several Mexican families, who raise a considerable number of cattle, besides herding ten thousand sheep."	Cronise (1868)
early 1870s					A. P. and H. H. More shipped 1,000s of sheep to the island in the early 1870s.	
1872	10,000				S. Forney's estimate of the number of sheep that could be sustained on Santa Roas Island in 1872. An article in the Index the following year claimed that four times that many sheep were being sheared in 1872 on the island.	S. Forney letter to Prof. Benjamin Peirce, Superintendent, U.S.C.S., October 31, 1872, RG 23, Superintendent's File 1866-1910, Box 355, NA(CP) cited in Livingston (2006)
1872	40,000				"They are shearing 40,000 sheep at a rate of 1,400 a day..."	Index, March and April, 1873
1874	60,000 + lambs				In 1874 Browne recorded 60,000 sheep on Santa Rosa Island and suggested that the island could support 100,000.	Browne (1874), Mason (1883), O'Neill (1939), Thompson and West (1883), Vail and Daily (1989)
1876	50,000	40		400	Number of livestock remaining on Santa Rosa Island following the 1876 matanza that slaughtered 25,000 sheep. "The island now supports about 50,000 sheep, but has supported an equivalent of 100,000....Cattle were introduced to the island in 1842, hogs in 1853. Some 40 cattle and 400 hogs are now wild"	Bowers (1877:66, 443); Bowers (unpubl. field notes April 8, 1876)
1877	15,000-20,000			X	"Twenty-five thousand sheep are to be killed, which will leave from 15,000 to 20,000 on the island...The offal is fed to hogs."	Santa Barbara Daily Press, May 29, 1877; Mason (1883)
1880s	80,000				At its peak in the 1880s, 80,000 sheep were on Santa Rosa Island and 200 trained goats were used to help herd the sheep in lieu of sheep dogs.	Towne and Wentworth (1945), Wentworth (1948)
1880	40,000	250	150		"The place contains at present some 40,000 head of sheep, 250 head of Durham cattle and 150 head of horses and mules, besides a number of deer and elk that roam at will..."	Santa Barbara Daily Press, March 10, 1880.

YEAR	SHEEP	CATTLE	HORSES	PIGS	COMMENTS	SOURCES
1880					"Mr. F. W. Frost was the owner of a couple of pet deer, which last fall [1880] he gave to Mr. More, who took them to one of the islands." [Santa Rosa Island]	<i>Santa Barbara Weekly Press</i> , February 19, 1881
1885				"plentiful"	"Wild hogs are plentiful on Santa Rosa Island."	<i>Santa Barbara Daily Independent</i> , January 21, 1885
1888	80,000				Estimate of the number of sheep present on Santa Rosa Island.	Thayer (1888), Wentworth (1948)
1889	125,000				Estimate of the maximum number of sheep that could be carried on Santa Rosa Island.	Storke and Tompkins (1958)
1891	60,000				"It is now in possession of A. P. More, and is pastured for about sixty thousand sheep..."	Kinsell (1891:630)
1894	60,000 + lambs				Total number of "grown sheep plus lambs" estimated to be present on Santa Rosa Island by 1894.	Holland (1962:58)
1897	X	X			J. Lawlor purchased 400 cattle, 200 goats, and 600 sheep from Santa Rosa Island.	<i>Santa Barbara Morning Press</i> , August 5, 1897
1900	~8,000	200	170	25	The island contained "about 8,000 head of sheep and lambs, 200 head of cattle, and 170 head of horses, 25 head of hogs, and one hundred head of goats..."	Santa Barbara County Recorders Office, Deeds Book 75, pp. 34-43; A. P. More probate report, April 27, 1900
1901	~10,000		180	20	This is an estimate of the livestock present on Santa Rosa Island at the distribution of A. P. More's estate on May 1, 1901. Also present were 150 goats.	Holland (1962:59); Santa Barbara County Recorders Office, Deeds Book 77, pp. 345-358
1902	~10,000	300-400	125-150		Edward L. Vail's estimate of the livestock present on Santa Rosa Island when Vail and Vickers took ownership of Santa Rosa Island from the More's. "There are from 125 to 150 horses, mares, mules, etc., about 10,000 sheep and 300 or 400 cattle."	Edward L. Vail letter dated September 25, 1901, reprinted in <i>Island of the Cowboys</i> , pp. 103-105.
1902-1904					Sheep were being shipped off the island to the mainland on a regular basis and were being replaced by cattle from the mainland.	<i>Santa Barbara Morning Press</i> , April 13 and 17, May 8 and 15, 1902, January 24, April 14, June 2 and 25 and July 16, 1904.
1903	"a few thousand"				Alex Mills wrote to Walter L. Vail that in 1903 the sheep population on Santa Rosa Island had dropped to "a few thousand."	Letters from Alex Mills to Walter L. Vail, March 9 and 17, 1903

YEAR	SHEEP	CATTLE	HORSES	PIGS	COMMENTS	SOURCES
1903		7,000-8,000			Vail and Vickers were "gradually retiring from the sheep business and after stocking the rich ranges across the channel with beef cattle..." Number of cattle shipped to Santa Rosa Island in 1903.	<i>Santa Barbara Morning Press</i> , April 13, 1902
1904					In January 1904, a total of 150 head of cattle were shipped on the schooner Santa Rosa to Santa Rosa Island.	<i>Santa Barbara Morning Press</i> , January 1904.
1904	~700				By October 1904 there were only ~700 sheep remaining on Santa Rosa Island.	<i>Santa Barbara Morning Press</i> , October 2, 1904
1905					Three elk from Oregon were introduced onto Santa Rosa Island with a bull elk released on the island a few years later.	N. R. Vail (in litt.) cited in Livingston (2006).
1908		2,700			The final load of about 20 of 2,700 Arizona cattle arrived on Santa Rosa Island in November 1908.	<i>Santa Barbara Morning Press</i> , November 19, 1908
1911		3,000			Vail & Vickers shipped 3,000 Arizona yearlings to Santa Rosa Island in 1911.	<i>Santa Barbara Morning Press</i> , October 4, 1911
1911					Frank Pepper, the superintendent of the island, secured three elk from the Sierras and released them onto Santa Rosa Island. The elk on this island now number nine.	<i>Santa Barbara Morning Press</i> , November 5, 1911; cited in Livingston (2006)
1913					N. R. Vail reported that he imported two elk cows (Tule Elk) and a bull (Rocky Mountain Elk) to Santa Rosa Island in 1913. Within eight years [1921] the herd had increased to 14-15 and by 1929 had decreased to 10 or less animals.	N. R. Vail correspondence to Chief of Biological Survey, August 17, 1929 and other correspondence circa 1929-1930, File 1785, SBMNH Channel Islands Archive; cited in Livingston (2006)
1929					N. R. Vail transported 38 deer from Kaibab National Forest to Santa Rosa Island in the fall of 1929. Seven died in transport and several others were injured. According to Vail the fawns did well on the island but the others died off. In late 1929 Vail released additional deer from southern Utah onto the island.	[N.R. Vail] to Forest Supervisor Walter G. Mann, Kaibab National Forest, August 27, 1930, and other correspondence in File 1785, SBMNH Channel Islands Archives; cited in Livingston (2006)
1930					In January 1930, 12 elk were shipped from Yellowstone Park to Santa Rosa Island. Eleven deer from Utah and five Fallow Deer were released onto Santa Rosa Island. In August 1930 the Vails received nine fawns from Kaibab National Forest.	N. R. Vail correspondence to Chief of Biological Survey, August 17, 1929 and other correspondence circa 1929-1930, File 1785, SBMNH Channel Islands Archive; cited in Livingston (2006)

YEAR	SHEEP	CATTLE	HORSES	PIGS	COMMENTS	SOURCES
late 1930s	300-400				"...there were 300 or 400 head of sheep of remnant that were gathered in the late '30s... and those sheep had scabies...we finally got rid of the last of them sometime in the '50s."	Oral history with Al Vail, October 22, 1986 by Marla Daily, transcript pp. 14-15, SCIF; cited in Livingston (2006)
early 1940s					Lt. Commander Stanley A. Wheeler wrote of being "fortunate enough to see a rare white deer" [Fallow Deer] on Santa Rosa Island.	Lt. Commander Stanley A. Wheeler, "California's Little Known Channel Islands," in U. S. Naval Institute Proceedings [March 1944], p. 260.; cited in Livingston (2006)
1948		~5,000			One of the worst droughts on record occurred during the winter of 1947-1948. In response to the drought, "Cowboys moved 2,500 head, about half the herd, off the island early in 1948, but still no rain came. In March Ed Vail decided to move the rest, at a rate of about 400 animals a day, to the mainland...Ranch managers decided to leave 10 to 20 head of steers on the island; about 5,000 had been evacuated"	Ed Ainsworth, "Santa Rosa Island Gives Up Its Starving Herds" in Los Angeles Times, March 8, 1948; oral history interview with Al Vail, March 25, 1993 by Carolyn Petry, transcript p. 12, SCIF
1950s	eradicated				According to Al Vail the last sheep were shot on Santa Rosa Island during the 1950s.	Oral history with Al Vail, October 22, 1986 by Marla Daily, transcript pp. 14-15, SCIF; cited in Livingston (2006)
1930s-1980s		6,000-7,000			According to Livingston (2006) the "usual stocking level would reach about 6,000 to 7,000 head at the "spring peak." The largest number of cattle on the island at one time, consisting largely of calves, was about 9,000."	Livingston (2006:191)
1982-1987		4,204			Lynn Brittan, an employee of the Soil Conservation Service, reported that "an average of 4,204 head of cattle on the island over the last six-year period."	Lynn Brittan, District Conservationist, Soil Conservation Service, letter to Ed Haberlin, NPS, April 15, 1987, in file L30, Vail & Vickers Special Use Permit, CHIS
1993				eradicated	Feral pigs were eradicated from Santa Rosa Island by the National Park Service and elk numbered about 900 head.	Lombardo and Faulkner (2002), Livingston (2006)
1994		~4,000	120		As of 1994 the "island's rangelands supported the Vail's cattle, approximately 120 horses, 900 elk and 1,000 deer, the latter two having been imported to the island early in the century."	Livingston (2006:260)

YEAR	SHEEP	CATTLE	HORSES	PIGS	COMMENTS	SOURCES
mid-1990s		3,000-5,000	125-150		There were also 700-800 deer and 600-1,000 elk.	Knowlton et al. (2007), U. S. Dept. of the Interior (in litt.)
1998		eradicated	X		All cattle and most of the horses were removed from Santa Rosa Island by November 1998 but free-ranging populations of elk, deer and a few horses remained. The five year special use permit issued in 1998 allowed for 452 deer and 740 elk on the island.	J. Wagner et al. (in litt.), Special Use Permit #PWR-8120-2600-98-, dated October 1, 1998, CHIS; cited in Livingston (2006).
2011					The year that elk and deer are scheduled for a planned phaseout.	Special Use Permit #PWR-8120-2600-98-, dated October 1, 1998, CHIS; cited in Livingston (2006)
SANTA CRUZ ISLAND						
1830		X	X		One hundred Mexican convicts dropped off on Santa Cruz Island were provided with "...seed for sowing and some animals such as cattle and a few horses."	Ord (1956:15)
1851	X	X	X		"[James B. Shaw] have paid the taxes on [Santa Cruz Island] since 1851, and have placed cattle and horses and sheep on it; ..."	Andres Castillero vs. The United States, Testimony of James B. Shaw, 1857
1852		"a few"			"There are a few cattle here, but like all the other islands, there are no inhabitants."	Alden (1852:14-15)
1852	200				Barron , Forbes & Co. and Jecker, Torre & Co. took possession of Santa Cruz Island and immediately stocked it with sheep.	Mason (1883), Kinsell (1891 :628)
1853	X	X	X		James B. Shaw introduced feral herbivores to Santa Cruz Island. In 1853, Santa Cruz Island was the chief supplier of mutton to the Los Angeles market.	U. S. District Court Proceedings (1857) cited in Brumbaugh (1980), Newmark and Newmark (1930)
1852-1853				X	In December 1852 James Box began living in a shanty on Santa Cruz Island and was raising pigs as early as 1853.	340 SD, Deposition of James Barron Shaw, January 7, 1857, pp. 48-51; California District Court 2nd Judicial District, Thomas Wallace More vs. M. J. Box, n.d., transcript at SCIF; cited in Livingston (2006)

YEAR	SHEEP	CATTLE	HORSES	PIGS	COMMENTS	SOURCES
1853				X	Captain Martin M. Kimberly was sent to Santa Cruz Island in 1853 by T. W. More to take possession of the pig herd. Due to their wild state he was unable to remove any of the pigs from the island.	340 SD, Deposition of James Barron Shaw, January 7, 1857, pp. 48-51; California District Court 2nd Judicial District, Thomas Wallace More vs. M. J. Box, n.d., transcript at SCIF; cited in Livingston (2006)
1854	X	X	X		J. B. Shaw imported cattle, horses and sheep to the island and bought 200 ewes from Alpheus Thompson of Santa Rosa Island.	340 SD, Deposition of James Barron Shaw, January 7, 1857, pp. 48-51; California District Court 2nd Judicial District, Thomas Wallace More vs. M. J. Box, n.d., transcript at SCIF; cited in Livingston (2006)
1854	1,000				"Mr. J. B. Shaw, has lately, with commendable enterprise, purchased and placed upon the island of Santa Cruz, ...about one thousand Merino sheep."	<i>Santa Barbara Gazette</i> , August 9, 1855
1857	7,000-8,000				"At present [1857] there are some 7,000 to 8,000 head of sheep upon it..."	Greenwell (1858:394)
1857				"large herd"	Judgment made in More's favor over ownership of a large herd of pigs on Santa Cruz Island.	Thomas Wallace More vs M. J. Box, November 9, 1857, Santa Cruz Island Foundation
1860	15,000					U. S. Bureau of Census, Census of Agriculture 1860: cited in Brumbaugh 1980
1860	12,375	191	108		In 1860 the County Assessor's records reported 12,375 sheep, 116 rodeo cattle, 3 bulls, 72 cow calves, 2 oxen, 42 mares, 11 lame horses, 53 colts and 2 stallions on Santa Cruz Island.	County of Santa Barbara Assessment Roll for year 1860; cited in Gherini (1997)
1864	24,371				County Assessor's estimate of the number of sheep roaming Santa Cruz Island in 1864.	County of Santa Barbara Assessment Roll for year 1864; cited in Gherini (1997)
1865	X				Justinean Caire became manager of the island in 1865 and managed a profitable sheep operation until 1897.	Towne and Wentworth (1945)
1868	~30,000				"The Messrs. Barron, of San Francisco, who own this island, graze about thirty thousand sheep upon it."	Cronise (1868:89)

YEAR	SHEEP	CATTLE	HORSES	PIGS	COMMENTS	SOURCES
1869	23,819				County Assessor's record of the number of sheep on Santa Cruz Island in 1869.	County of Santa Barbara Assessment Roll for the year 1869; cited in Gherini (1997)
1869	30,000-40,000				"For many years past it has been occupied as a sheep run, and now contains some thirty or forty thousand sheep."	<i>Santa Barbara Post</i> , February 17, 1869
1869	30,000				"It is used at present for nothing else but a sheep range, of which there are some 30,000 or more."	<i>Santa Barbara Press</i> , July 24, 1869
1869	54,000	"Large numbers"	"Large numbers"		Yda Addis Storke wrote that at the end of Dr. Shaw's tenure on Santa Cruz Island in 1869 there were 54,000 sheep and a large number of cattle and horses. The sheep census on SCI seems to be consistently exaggerated and these estimates seem to bear this out.	Storke (1891)
1870	45,000-50,000				Sheep increased rapidly during the 1860s and the population on Santa Cruz Island was estimated at over 50,000 head by 1870.	U. S. Census, Census of Agriculture (1870) cited in Junak et al. (1995) and Brumbaugh (1980)
1872	(20,000)				Number of sheep shipped to the mainland from Santa Cruz Island in April 1872.	Krythe (1958) cited in Junak et al. (1995); <i>Santa Barbara Times</i> , April, 1872
1873	23,000				"Board of Equalization in the matter of the petition of H. Ohlmeyer for a reduction of the assessment of the Island of Santa Cruz, Ordered,Reduce number of sheep to 16,000 and lambs to 7,000."	<i>Santa Barbara Daily Morning Times</i> , July 24, 1873
1870-1885	20,000-30,000				Number of sheep rounded up and shorn annually.	Blake (1887), Symmes and Associates (1922)
1874	40,000-45,000	180	126+		In 1874 the livestock on Santa Cruz Island was estimated to include 40,000-45,000 Spanish Merino sheep, 125 saddle and draft horses and mules, some breeding mares with colts, a fine stallion of the Morgan blood, 30 head of Devon cattle including bull and milk cows, and 150 head of wild cattle.	<i>New York Times</i> , January 24, 1874, Manuscript Collection HM 19355, Scrapbook "Blank Book for Guadalupe Island," Huntington Library; cited in Livingston (2006)
1874	50,000				A government mapmaker [S. Forney] estimated that in 1874 Santa Cruz Island was capable of feeding 50,000 sheep.	Thompson and West (1883) cited in Livingston (2006)
1875	60,000				There were an estimated 60,000 sheep on the island in 1875 with 15,000 killed in June for hide and tallow.	Rothrock (1876), <i>Santa Barbara Index</i> , March 22, 1877; Thompson and West (1883); Kinsell (1891)

YEAR	SHEEP	CATTLE	HORSES	PIGS	COMMENTS	SOURCES
1875	(12,000)				Number of sheep processed in the 1875 matanza on Santa Cruz Island.	Thompson and West (1883)
1876		X		"great numbers"	Loew (1876) suggested these [pigs] were the "progeny of those introduced by Sebastian Viscaino (1606). Wild cattle are also said to occur."	Loew (1876:216)
1877	(25,000)				"twenty five thousand sheep [were] slaughtered on Santa Cruz Island...[because of] scarcity of food induced by want of rain."	Thompson and West (1883), <i>Santa Barbara Index</i> , March 22, 1877.
1870s-1880s	~70,000				"...as many as 70,000 animals or more may have roamed the island at one time in the not to distant past."	Anon (1979)
1880	40,000				"The Company have something like forty thousand sheep on the island."	<i>Santa Barbara Daily Press</i> , October 25, 1880
1881	45,000-59,500				"There are 45,000 head of stock sheep on the island, in addition to the lot purchased [14,500]..."	<i>Santa Barbara Daily Press</i> , March 8, 1881; <i>Santa Barbara Weekly Press</i> , March 12, 1881
1882	(12,000)				Number of sheep sold in June 1882.	Unidentified news clipping dated June 2, 1882, Santa Cruz Island Foundation; cited in Livingston (2006)
1883	40,000				Estimate of the number of sheep that the pasturage on Santa Cruz Island could support by 1883.	Thompson and West (1883)
1883	25,000				"This island contains about 64,000 acres, and on it are 25,000 sheep..."	<i>San Francisco Morning Call</i> , November 19, 1883
1888	25,000				Estimate of the number of sheep on Santa Cruz Island.	Thayer (1888:600-601)
1890	~100,000				Over 50,000 sheep were corralled and shorn during the roundup of 1890. With only about half of the total sheep population on the island being shorn, the sheep population on Santa Cruz Island in 1890 would have been close to 100,000 sheep.	Symmes and Associates (1922), Towne and Wentworth (1945)
1891	~60,000-70,000				"Thousands of sheep were feeding on the uplands,... I have since learned that there were seventy thousand sheep on the island at that time. Now there are about sixty thousand."	Kinsell (1891)
1894	15,000				In 1894 the number of sheep on Santa Cruz Island was estimated from assessment roles at 15,000 head.	Wentworth (1948:205)

YEAR	SHEEP	CATTLE	HORSES	PIGS	COMMENTS	SOURCES
1897	45,000- 50,000				Estimate of the number of sheep on Santa Cruz Island.	Wentworth (1948)
1898					"Shipments of 18,000 sheep and 1,000 cattle from Santa Cruz Island to points in Arizona..."	<i>Los Angeles Times</i> , Redondo, April 28, 1898
1899	50,000				"On Santa Cruz feed has been very good all summer, considering the dry season, and about fifty thousand sheep were carried through..."	<i>Los Angeles Times</i> , February 5, 1899
1899	35,000				"He [C. E. Sherman] says that there are 35,000 sheep on this island [Santa Cruz Island], as well as the thousands on the other Channel Islands..."	<i>Los Angeles Times</i> , Santa Barbara, July 29, 1899
1903		(302)			Number of cattle transported to Santa Cruz Island aboard the Pasadena in 1903.	Santa Cruz Island Company Ledger, pp. 56-57, Santa Cruz Island Foundation; cited in Livingston (2006)
1907	(20,706)				Number of fleeces from sheep shearing in 1907.	Santa Cruz Island Company Ledger, pp. 285-294; 300-301, Santa Cruz Island Foundation; cited in Livingston (2006)
1908	~40,000	"a few"			Estimate of the number of sheep and cattle on the island in 1908.	Linton (1908)
1908	(18,065)				Number of fleeces from sheep shearing in 1908.	Santa Cruz Island Company Ledger, pp. 285-294; 300-301, Santa Cruz Island Foundation; cited in Livingston (2006)
1910		1,212			Number of cattle on Santa Cruz Island as of the end of 1910. An additional 53 head had died on the island during the year.	Santa Cruz Island Company Ledger, pp. 66, 79, 80, 82-83, 89, 277, Santa Cruz Island Foundation; cited in Livingston (2006)
1911		1,403			Number of cattle on Santa Cruz Island as of the end of 1911. An additional 67 head had died on the island during the year.	Santa Cruz Island Company Ledger, pp. 66, 79, 80, 82-83, 89, 277, Santa Cruz Island Foundation; cited in Livingston (2006)
1911	(24,714)				Number of fleeces from sheep shearing in 1911.	Santa Cruz Island Company Ledger, pp. 285-294; 300-301, Santa Cruz Island Foundation; cited in Livingston (2006)

Historic and Prehistoric Record for Island Scrub-Jays on the Northern Channel Islands

YEAR	SHEEP	CATTLE	HORSES	PIGS	COMMENTS	SOURCES
1912		1,366			Number of cattle estimated to be on Santa Cruz Island in 1913.	Santa Cruz Island Company Ledger, pp. 66, 79, 80, 82-83, 89, 277, Santa Cruz Island Foundation; cited in Livingston (2006)
1913	(5,181)				Number of fleeces from sheep shearing in 1913.	Santa Cruz Island Company Ledger, pp. 285-294; 300-301, Santa Cruz Island Foundation; cited in Livingston (2006)
1916	20,000				"It is said that the Caire estate, on Santa Cruz Island, has 20,000 head."	<i>Santa Barbara Daily News</i> , January 10, 1916
1916	(8,289)				Number of fleeces from sheep shearing in 1916.	Santa Cruz Island Company Ledger, pp. 285-294; 300-301, Santa Cruz Island Foundation; cited in Livingston (2006)
1918	(13,666)				Number of sheep sheared in 1918. A total of 175 sacks of wool.	Santa Cruz Island Company Ledger, pp. 285-294; 300-301, Santa Cruz Island Foundation; cited in Livingston (2006)
1921	(11,231)	787	97		Estimate of the number of sheep corralled in 1921 (11,231) with 9,356 of these being shorn. It was estimated that no more than half of the sheep population could be corralled during roundups which would have put the island-wide population of sheep in 1921 at over 22,000. The island was capable of supporting "800 head of stock cows and some 2,000 head of all ages."	Symmes and Associates (1922)
1923	(18,685)				Number of sheep sheared in 1923.	Santa Cruz Island Company Ledger, pp. 285-294; 300-301, Santa Cruz Island Foundation; cited in Livingston (2006)
1937	12,000				"By 1937, the bands of sheep were cut down to 12,000, and are now [1939] being built up again with introduction of superior stock."	O'Neill ed. (1939)
1937	(10,000)				Edwin Stanton purchased the island and introduced 10,000 domestic sheep.	Van Vuren (1981)
1937-1988		2,000-3,000			Estimate of the number of cattle present at any one time on Santa Cruz Island during the Stanton years.	See editors comment in Caire (1989:107) cited in Gherini (1997)

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1939					Edwin Standon began a systematic roundup of sheep which were shipped to the mainland. During a short period of years 35,000 head were removed with an additional 20,000 head killed in successive years.	Warren (ca. 1954)
1955-1962	(27,950)				Number of sheep trapped and shipped to the mainland during these years	Santa Cruz Island Company records
1960s & 1970s	(~180,000)				Number of sheep shot on Santa Cruz Island during these two decades.	Santa Cruz Island Company records
1980	11,000-43,000				The minimum and maximum number of sheep believed to be present on Santa Cruz Island.	Van Vuren (1981)
1981-1989	37,171				Number of sheep killed on Santa Cruz Island by The Nature Conservancy between December 1981 and June 1989. Sheep were eliminated from the western 2/3 of the island by the end of 1989.	Schuyler (1993)
1988-1989		1,800			Number of cattle removed from Santa Cruz Island by June 1988. All cattle were removed from the island by the end of 1989.	Schuyler (1988), Wagner et al. (2004)
1997-2000	9,200				Number of sheep removed from the east end of Santa Cruz Island by the National Park Service.	U. S. Dept. of Interior (2001)
2005-2007				5,036	Number of pigs eradicated from Santa Cruz Island between March 2005 and January 2007. The island is now pig free.	Macdonald and Walker (2008), Morrison (2007)
ANACAPA ISLAND						
1869	X				"...sheepmen were on Anacapa." On July 29, 1869 William Dover sold all of his interest in Anacapa Island to Louis Burgett and W. H. Mills for \$1500.	Doran (1980:125)
1872	X				W. H. Mills and H. W. Mills sold Anacapa Island interest to Pacific Wool Growing Company for \$1,000.	Doran (1980:125)
1875	500				The number of sheep that were reported to be kept on Anacapa Island.	<i>Santa Barbara Daily Press</i> , October 2, 1875
1877	X				"At the extreme west end of Anacapa there is a small corral and sheep camp...."	<i>Santa Barbara Daily Press</i> , January 17, 1877
1877	X				"The sheep on the smaller of the Anacapa islands have died during the dry season of last year, they are now being stocked from the larger islands."	<i>Santa Barbara Daily Press</i> , June 22, 1878

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1883	X				"... the sheep and goats thereon...the sheep all perished on the two smaller Anacapa Islands in a certain season of drought."	Mason (1883:258)
1890	X				Captain Elliot was running sheep on Anacapa Island.	Doran (1980:125)
1902					First grazing lease granted to Louis le Mesnager on April 1, 1902 for a period of 5 years.	Doran (1980:125)
1904	100-200				Several hundred head of sheep were watched over by "Charlie" for Mesanger.	<i>Los Angeles Times</i> , Ventura County, October 7, 1904
1904	350-400					Oxnard Courier, October 14, 1904; Dallas Morning News, November 28, 1904
1911	200				Anacapa Island is listed as being capable of "carrying several hundred head of sheep during the season."	<i>Santa Barbara Morning Press</i> , March 8, 1911
1911 & 1912	X				Mr. Ray Webster ran Anacapa Island grazing leases for nine years.	Doran (1980)
1912	1,000				"Anacapa Island has again been leased by H. Bay Webster of Venture...Mr. Webster has 1000 sheep upon one section of the island at the present time..."	<i>Santa Barbara Morning Press</i> , March 30, 1912
1902-1912	X				Only period when sheep were grazed on east anacapa Island.	Hochberg et al. (1979)
1917	400				"Captain Ira K. Eaton has just been awarded by the Federal Government the lease of Anacapa Island for a term of five years beginning April 1...he will also utilize the small sheep range on the island, expecting to have a flock of about 500 of the profitable wool bearers. There are at present about 400 sheep on the range belonging to Captain Webster, and these may be bought by the new lessee, or they may not."	<i>Santa Barbara Morning Press</i> , March 20, 1917
1917	500				"Captain H. B. Webster, who for ten years has been lord at Anacapa, will today get the last units of a herd of some 500 sheep loaded on a parge and... will depart for the mainland."	<i>Los Angeles Times</i> , July 2, 1917

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1902-1937	X				Sheep ranching occurred on Middle and West Anacapa Islands between 1902 and 1937 with a few sheep persisting into the 1960s.	Hochberg et al. (1979), Weinman (1978)
1930s	X				"Until the late 1930s sheep were grazed on all three island segments...At the present time there are a few sheep on East Anacapa and remnants of a barbed wire fence can be seen on Middle Anacapa."	McKusick (1959) cited in Doran (1980:125)
1937					Sheep ranching came to a close on Anacapa Island.	Hochberg et al. (1979)