sometimes bunches of them. They were always bright and in good condition of flesh. They appeared to be idle which leads me to think that the late hatches do not lay the following spring. If this were to be seen only in summer I would believe that they had been robbed of their possessions, but it occurs when the hens should be nesting.

The counties of Albany, Converse, Natrona, and Carbon are the places where grouse are most abundant in Wyoming. A single hunter has been known to kill a hundred birds in a day without a dog. The best hunting is found over lands adjacent to springs, down green draws and the bottoms along streams, and the best time to find coveys is in the morning or evening when the birds are feeding. After feeding they hide either on the feeding ground or at some distance from it where the sage is large enough to screen them from enemies and the rays of the sun. Ofttimes a hen with her brood will venture to take refuge in the shade of a ranchman's cabin or barn. It is certain that grouse breed above seven thousand feet but just how much I am unable to say. Hail storms often kill large numbers when they strike the places of hiding. When their feathers are drenched with rain, the birds are often unable to rise, and at such times have been killed with a stick.

Birds from the West Coast of Lower California and Adjacent Islands

BY HENRY B. KAEDING

IT was the writer's privilege during the summer of 1897 to form one of a party that visited the islands off the west coast of Lower California. This expedition was made in a small schooner, leaving San Diego during the first week in March, and an endeavor was made to touch at all the islands between San Diego and Socorro Island, with the exception of Los Coronados. This was done, some of the more important islands being visited twice and even three times, and landings were also made on the mainland of the Lower California peninsula. Many interesting facts were brought to light concerning the breeding habits of little known shearwaters and petrels and several new species of birds were described from the material collected.

The ornithological material was for the collection of Mr. A. W. Anthony, who has written at length on the results of the expedition (see list of references appended), but as yet there has been no attempt to compile a complete list of the birds encountered on the trip. The following list is intended to furnish in as concise form as possible a complete hand-list of the birds taken or noted by the writer. Obviously it cannot be expected that a list of this kind will embody all the birds of the region visited, and for additional information on the avifauna of the region in question the writer has appended a list of the principal publications pertaining to the subject. With regard to this list of publications, it may be as well to state that no attempt has been made to compile a *complete* bibliography; this has been done by Mr. Brewster[a] and others, and the list of references appended is one of only the principal and leading publications on the subject; a bibliography of this region will be found in several of the works referred to.

Prior to the time of the visit of our party, the more southerly group of islands, Los Revillagigedos, comprising Socorro, San Benedicte and Clarion Islands, had

a. *Cf.* Brewster, Birds of the Cape Region of Lower California. Bull. Harv. Mus. Comp. Zool., XLI, 1902.

been visited once only by an ornithologist since 1867,[a] that once being by Mr. C. H. Townsend in 1889,[b] at which time a limited period only was spent on the islands and the meagre knowledge of the avifauna that was obtained, important as it was, served only to whet the interest of all western ornithologists. Since 1897 several expeditions have touched at these islands en route to and from the Galapagos group, and one expedition was sent to Los Revillagigedos by the California Academy of Sciences in 1903. This party spent several months in the region, principally upon Socorro Island, and the report of their work, when published, will undoubtedly add much to the history of the group.

Most of the islands along the coast-line of Lower California were at one time an integral part of the mainland. San Martin Island, however, is undoubtedly of volcanic origin and of comparatively recent eruption, the lava blocks being sharp and clean-cut on the edges. Guadalupe also is of volcanic origin but is older than San Martin, the lava on Guadalupe being well weather-worn. Cerros Island, while at one time part of the mainland, shows traces of volcanic disruption in the torsion of the strata, but no direct eruptive evidences were seen. Socorro and San Benedicte Islands, however, are strikingly volcanic, the former being in reality an active volcano, while San Benedicte is a vast heap of broken lava, pumice, tufa, ashes and obsidian. San Benedicte has but little vegetation, that little being mainly grasses, but on Socorro soil has formed and the island is a dense growth of cactus, grasses, vines, shrubs and even large trees; this, taken together with the extensive and peculiar avifauna, shows the great age of Socorro as compared with San Benedicte. Clarion Island, also, owes its origin to volcanic sources and to the subsequent action of the corals which have surrounded the island with reefs. The vegetation on Clarion is dense and consists principally of cactus; on some portions of the island a tree (*Dodonæa viscosa* L.) is abundant, and it is on the tops of these trees that the boobies (*Sula piscatrix websteri*) nest by thousands. These trees are undergrown by and interlaced with a network of thorny creepers (*Cæsalpinia bonducella* Roxb.), peculiarly tough and clinging, and these creepers aid the cactus in making locomotion impossible without the aid of a machete to cut a path. These thorn creepers are also a source of great danger to the boobies nesting over them, for if a booby misses alighting on the nest when returning heavy laden with fish, or if in rising the heavy bird falters and drops, the thorny ropes seize him in a grasp that never relaxes; to this we found many a skeleton bearing grim testimony.

The writer regrets exceedingly that lack of time and space prevent his giving to this list the detail it warrants. Much might be written on the curious habits of these little-known species, especially on the breeding habits, many nests and eggs having been found, and of species whose nesting habits were and are unknown to the majority of workers.

Colymbus nigricollis californicus (HEERM.). We saw one individual of this species on San Geronimo Island on March 17th; it is reported commonly, from the coast of Lower California in winter.

Cerorhincha monocerata (PALL.). Rhinoceros Auklet. A single specimen was taken near San Geronimo Island about March 9th, 1899.

Ptychoramphus aleuticus (PALL.). Cassin Auklet. This species is common on all the islands as far south as Ascuncion Island, becoming abundant on San Geronimo, San Benitos and Natividad Islands, less common on Todos Santos, San Martin, San Roque, Ascuncion and Cerros Islands; this is probably the most abund-

a. *Cf.* Grayson, Col. A. J., Exploring Expedition to the Island of Socorro. Proc. Bost. Soc. Nat. Hist., XIV, 1870-71, 287–289.

b. *Cf.* Townsend, C. H., Birds from the Coast of Western North America and Islands, etc. Proc. U. S. Nat. Mus. XIII, 1890, 131–142.

ant of the breeding sea-birds met with. The single egg is laid in a burrow in the sand, the burrow in certain localities being used in turn by these birds, then by shearwaters and lastly by petrels. Fresh eggs were found as early as March 10th.

Brachyramphus hypoleucus XANTUS. Xantus Murrelet. Fairly common on and about Todos Santos, San Martin, San Geronimo and San Benitos Islands, breeding most accessibly on San Benitos, where in addition to nesting in the crannies in the cliffs the nest is often placed under the foliage of the maguey (*Agave shawi*),on the sandy slopes facing the sea. The eggs, taken March 27th, were slightly incubated. No specimens exhibiting the characters of *Brachyramphus craveri* (SALVAD.) were noted, *craveri* being apparently confined to the Cape region and Gulf of California.[a]

Rissa tridactyla pollicaris RIDGW. Pacific Kittiwake. A few individuals noted at San Geronimo Island on March 15th.

Larus glaucescens NAUMANN. Glaucous-winged Gull. Well distributed along the northern islands but not common anywhere; noted on San Martin, Todos Santos and San Geronimo Islands March 10th to 15th, and on Guadalupe Island March 22nd.

Larus occidentalis AUD. Western Gull. Noted on Todos Santos, San Martin, San Geronimo, Guadalupe, San Benitos, Cerros, Natividad, San Roque and Ascuncion Islands; common and breeding during the latter part of March and April. This is the only species of the genus found breeding on the trip.

Larus californicus LAWR. California Gull. Noted only at Todos Santos Island, March 10th, where it was not common.

Larus heermani CASS. Heerman Gull. Common during March on Todos Santos, San Martin, San Geronimo and San Roque Islands, but giving no signs of breeding. This species is apparently common all along the west coast of Lower California during the entire summer, but we found no breeding birds.

Sterna maxima BODD. Royal Tern. Noted at Cerros Island April 1st; at San Juanico Bay June 12th; near San Martin Island in July; apparently fairly common along the coast.

Sterna elegans GAMB. Elegant Tern. A small flock of these truly elegant birds was seen off San Domingo Point on June 14th, and several were taken. They are not uncommon in the mainland lagoons near Magdalena Bay.

Sterna fuliginosa GMEL. Sooty Tern. On a large rock lying a few miles to the northward of Socorro Island this species was found on May 12th breeding in a vast colony, with downy young at this date.

Anous stolidus ridgwayi ANTHONY. Ridgway Noddy. These birds occupied the same rock near Socorro Island as the sooty terns, and were if anything more numerous than the latter, having fresh eggs on May 12th.

Diomedea nigripes AUD. Black-footed Albatross. Common all summer from San Diego south to Cape San Lazaro, both far out at sea and along the coast line; can be caught with a hook and line at almost any time. One was seen near Clarion Island in May.

Diomedea immutabilis ROTHSCHILD. Laysan Albatross. One specimen was taken between Guadalupe and San Martin Islands on March 19th.

Puffinus creatopus COUES. Pink-footed Shearwater. Common off San Domingo Point on June 14th.

Puffinus opisthomelas COUES. Black-vented Shearwater. Common about San Martin Island March 12th; on Guadalupe Island March 22nd, breeding; on San Benito Island March 27th, breeding; on Natividad Island, April 10th, breeding in a

a, *Cf.* Brewster, Birds of the Cape Region of Lower California. Bull. Harv. Mus. Comp. Zool., XLI, 1902.

vast colony, with fresh eggs at this date; common off San Domingo and Abreojos Points June 14–17th. This is the most abundant shearwater up and down this coast during the early summer.

Puffinus auricularis C. H. TOWNSEND. Townsend Shearwater. This little-known species was found common at sea between Cape St. Lucas and San Benedicte Island during April, May and June, and was found breeding in a large colony on San Benedicte Island on April 30th, with large young at this date; on Clarion Island, May 20th, it was also breeding abundantly, with large young; was common about Socorro Island May 24th; abundant at Cape St. Lucas June 3rd.

Puffinus griseus (GMEL.). Dark-bodied Shearwater. Common off San Domingo Point June 14th and off Natividad Island June 30th.

Puffinus cuneatus SALVIN. Wedge-tailed Shearwater. This shearwater breeds by thousands on San Benedicte Island, entering the burrows apparently about April 1st. We found them busily occupied on April 30th but without eggs; a second visit to the island on the 18th of May showed in a few places green twigs dragged to the entrance of the burrow, but no eggs, and it was not until the 31st of May, when we visited the island a third time, that we found the first egg of this species. The species is seldom seen about Socorro or Clarion Islands, but was seen as far north as Cape St. Lucas on June 5th.

Puffinus bulleri SALVIN. New Zealand Shearwater. A gray shearwater seen near Cape St. Lucas on June 5th which was not taken was conditionally referred to this species.

Halocyptena microsoma COUES. Least Petrel. This little petrel breeds on San Benitos Islands, rather plentifully in certain spots among the rocks, the eggs being partially incubated on July 14th; was common off San Domingo Point on June 14th; is apparently not seen about the breeding grounds before June 1st.

Oceanodroma kaedingi ANTHONY. Kaeding Petrel. This species is to be found from Guadalupe south to Socorro during June and July, but was not seen along the shore line in company with the others of the genus; apparently not seen in these waters before the middle of May. The breeding grounds of this species are as yet unknown, but it is probable that the birds occupy the burrows of the Guadalupe petrels on Guadalupe Island after the breeding season of the former is closed.

Oceanodroma macrodactyla (BRYANT). Guadalupe Petrel. This species, peculiar to the immediate vicinity of Guadalupe Island, breeds sparingly on the island, eggs taken on the 25th of March being slightly incubated; the birds may be seen at sea near the island. The breeding habits of this petrel differ materially from the other petrels found breeding in these waters in that they lay their eggs at least 100 days earlier than the others, and also instead of selecting low, sandy or rocky situations for their burrows, are only to be found nesting in burrows at the extreme top of Guadalupe Island, at an altitude of over 4000 feet above sea level, and in pine and cypress groves at that.

Oceanodroma melania (BONAP.) Black Petrel. Breeds abundantly on San Benitos Islands, eggs taken July 14th being partially incubated; was common off San Domingo Point on June 14th and near Guadalupe Island on July 25th; appears during May in these waters with the other petrels breeding on the Benitos.

Oceanodroma socorroensis C. H. TOWNSEND. Socorro Petrel. This species also breeds abundantly on the San Benito Islands, having eggs partially incubated on the 14th of July. It is to be seen from this point south to Socorro (and beyond?) at this time of year, appearing coincident with the other petrels breeding on the Benitos. It is interesting to note that during the trip south to Socorro Island, prior to May 1st, no petrels were seen except *Oceanodroma macrodactyla* at Guada-

lupe; but after May 1st the least, black, Socorro, and Kaeding petrels appeared, becoming more numerous during June and apparently passing north to the breeding grounds from the regions south of Socorro Island. Mr. Townsend secured but one specimen of *Oceanodroma socorroensis* at Socorro Island and saw very few March 9th,[a] so that it is probable that the bulk of the birds were still to the southward at that date. It is interesting to note in this connection that so far as we were able to ascertain, there are no sea birds nesting on Socorro Island at all, with the exception of the terns nesting on the outlying rocks. Mr. Townsend found burrows that he judged would be occupied later by petrels,[a] but I am constrained to believe that these were the burrows of the land crabs, which swarm over the island. These crabs are so voracious and bold that it would hardly be possible for even a shearwater to withstand their attacks, and this is probably the reason why, although thousands of shearwaters nest on San Benedicte thirty miles away, none nest on Socorro, there being very few crabs on San Benedicte.

Phaethon æthereus LINN. Red-billed Tropic Bird. Breeds sparingly on San Benedicte Island May and June; seen near Socorro, Clarion and Roca Partida Islands, at sea; seen off Magdalena Bay on June 6th.

Phaethon rubricaudus BODD. Red-tailed Tropic Bird. Known in these waters from the single specimen taken by our party near Guadalupe Island on July 23rd.

Sula cyanops SUND. Blue-faced Booby. Common on San Benedicte and Clarion Islands, breeding; fresh eggs were taken as early as April 30th and as late as June 1st. This booby, as well as *Sula brewsteri* and *Sula piscatrix websteri*, is often seen fishing at Socorro Island, but as far as we could see none of the boobies nest on Socorro.

Sula brewsteri GOSS. Brewster Booby. Brewster booby breeds sparingly on San Benedicte Island, the eggs taken during May being partially incubated. Should *Sula brewsteri nesiotes* HELLER & SNODGRASS prove tenable, these San Benedicte Island birds may be referable to the latter race.

Sula piscatrix websteri ROTHSCHILD. Webster Booby. Webster booby is by far the most numerous of the three boobies nesting on the islands of this group. It nests abundantly on San Benedicte and on Clarion Islands, the nests on the former island being placed on grass hummocks, etc., while on Clarion the majority of the nests are placed on the tops of the low tree (*Dodonæa viscosa* L.) which grows in rather close thickets or groves on certain portions of the island. The eggs are laid during May.

Phalacrocorax dilophus albociliatus RIDGW. Farallone Cormorant. Noted on Todos Santos, San Martin and San Geronimo Islands March 10th to 15th; reported as breeding commonly along this coast from San Diego to the Cape.

Phalacrocorax penicillatus (BRANDT). Brandt Cormorant. Todos Santos, San Martin, San Geronimo and Cerros Islands, March 10th to 31st; breeding range and abundance apparently about the same as that of the Farallone cormorant.

Phalacrocorax pelagicus resplendens (AUD.). Baird Cormorant. Noted only on San Geronimo Island, where a few individuals were seen on March 15th.

Pelecanus erythrorhynchos GMEL. American White Pelican. A small flock of these birds was seen on San Geronimo Island on March 15th.

Pelecanus californicus RIDG. California Brown Pelican. Abundant on San Martin Island March 12th, where it is known to breed.

Fregata aquila LINN. Man-o'-war Bird. The frigate bird breeds commonly on San Benedicte and Clarion Island, full grown young and fresh eggs (second

a. *Cf.* Townsend, Birds from the Coasts of Western North America, etc. Proc. U. S. Nat. Mus., XIII, 1890, 134-5.

sets?) being found during May; seen occasionally off Lower California coast north to San Diego; is known to breed in salt lagoons on the mainland, and also to breed abundantly on Santa Margarhita Island at Magdalena Bay.

Merganser serrator LINN. Red-breasted Merganser. Not uncommon along this coast in winter and early spring; we noted several at the northern islands on the trip south.

Aythya affinis (EYT.). Lesser Scaup Duck. A few seen at San Martin Island on March 12th.

Oidemia perspicillata (LINN). Surf Scoter. A few seen about San Martin Island on March 12th.

Branta nigricans (LAWR.). Black Brant. Several large flocks of these birds were seen about San Martin and San Geronimo Islands on March 12-15. They were very wild and shy, keeping to the outer fringe of kelp.

Ardea herodias LINN. Great Blue Heron. One or two noted; San Martin Island March 12; Clarion Island May 20th; Socorro Island May 10th.

Nyctanassa violacea (LINN.). Yellow-crowned Night Heron. Socorro Island, May 15th; San Benito Island March 25th; not common.

Crymophilus fulicarius (LINN.). Red Phalarope. Seen at sea occasionally during March; on June 3rd, near Cape St. Lucas, a large flock of these birds was seen passing rapidly north.

Actodromas minutilla VIEILL. Least Sandpiper. Rather common in small flocks at San Geronimo Island March 15th, Turtle Bay April 14th and Abreojos Point April 19th.

Pelidna alpina sakhalina (VIEILL). Red-backed Sandpiper. Several small flocks seen at Abreojos Point April 19th.

Ereunetes occidentalis LAWR. Western Sandpiper. Commonly seen along this coast up to about May 15th.

Calidris arenaria (LINN.). Sanderling. Common in small flocks at San Geronimo Island March 15th and at Abreojos Point April 19th.

Limosa fedoa (LINN.). Marbled Godwit. Fairly common at Turtle Bay April 14th; a few seen at San Geronimo Island March 15th.

Symphemia semipalmata inornata BREWST. Western Willet. Common at Turtle Bay March 14th and at Abreojos Point April 19th.

Heteractitus incanus (GMEL.). WANDERING TATLER. Seen along the beaches at Todos Santos Island March 10th, at San Geronimo Island March 15th, at San Martin Island March 12th, at San Benitos Islands March 27th, at San Roque Island April 16th, at Ascuncion Island April 18th, at San Benedicte Island April 30th, at Socorro Island May 10th, and at Clarion Island May 20th.

Actitis macularia (LINN.). Spotted Sandpiper. Not common; seen at San Geronimo Island March 15th and at Socorro Island May 14th.

Numenius longirostris WILS. Long-billed Curlew. Quite common in flocks at Turtle Bay April 14th.

Numenius hudsonicus LATH. Hudsonian Curlew. San Geronimo Island March 15th; common at Turtle Bay April 14th.

Charadrius squatarola (LINN.). Black-bellied Plover. San Geronimo Island March 15th; quite common at Turtle Bay, April 14th, moving in large flocks.

Charadrius dominicus MUELL. American Golden Plover. One specimen taken on Clarion Island May 21st.

Ægialitis nivosa CASS. Snowy Plover. Common at Abreojos Point April 19th.

Ochthodromus wilsonius (ORD.). Wilson Plover. Quite a number of this species seen at Abreojos Point June 17th.

Aphriza virgata (GMEL.). Surf Bird. San Geronimo Island March 15th; Turtle Bay April 14th; quite common at Abreojos Point April 19th, moving in small flocks.

Arenaria interpres (LINN.). Turnstone. Quite common in flocks on San Geronimo Island March 15th; seen also at Clarion Island May 21st. It is probable that the records given here of this species are in reality those of *Arenaria morinella* (LINN.)., as the skins are not at hand and it is doubtful if *Arenaria interpres* is found on the Pacific Coast.[a]

Arenaria melanocephala (VIG.). Black Turnstone. Quite common in flocks on San Geronimo Island March 15th and on San Martin Island March 12th.

Hæmatopus bachmani AUD. Black Oystercatcher. Common on San Martin, San Geronimo, San Benitos, Natividad, San Roque and Ascuncion Islands, and at Turtle Bay and Abreojos Point; breeds abundantly on San Roque, Ascuncion and Natividad Islands, eggs having been taken in all stages of incubation about June 25th.

Hæmatopus frazari BREWST. Frazar Oystercatcher. Common on San Martin, San Geronimo, San Benitos, Natividad, San Roque and Ascuncion Islands, breeding plentifully on San Roque, Ascuncion and Natividad Islands, eggs taken about the 25th of June being in various stages of incubation. It is interesting to note that in the localities where *H. bachmani* and *H. frazari* both breed, several individuals were noted that were apparently intermediate in coloration between the two species, one in particuiar being noted that was entirely black except the white lining of the wings, visible only during flight; it is more than probable that a series could be obtained showing complete and gradual intergadation.

Zenaidura clarionensis C. H. TOWNSEND. Clarion Island Dove. Abundant on Clarion Island; one egg found about May 22nd.

Zeniadura graysoni (LAWR.). Socorro Island Dove. Socorro Island, not common; evidently breeding May 2nd.

Melopelia leucoptera (LINN.). White-winged Dove. Quite common about San Jose del Cabo April 20th, evidently breeding.

Columbigallina passerina pallascens (BAIRD). Mexican Ground Dove. Quite common about San Jose del Cabo April 20th, evidently breeding.

Columbigallina passerina socorroensis (RIDDW.). Socorro Ground Dove. Socorro Island, not common; evidently breeding May 2nd.

Cathartes aura (LINN.). Turkey Vulture. San Martin Island, March 12th, common and apparently ready to nest; Cerros Island, April 1st, a few.

Buteo borealis lucasanus RIDGW. St. Lucas Redtail. San Jose del Cabo, April 20th, not common; this subspecies has been found referrable to *Buteo borealis calurus* (CASS.).[a]

Buteo borealis calurus (CASS.). Western Redtail. Todos Santos Island March 10th; Guadalupe Island March 22nd; San Jose del Cabo April 20th; Socorro Island, May 2nd; not common anywhere as far as noted.

Buteo borealis socorroensis RIDGW. Socorro Redtail. Socorro Island, not common and very wild; this subspecies has been also referred to *Buteo borealis calurus.* (CASS.).[a]

Haliæetus leucocephalus (LINN.). Bald Eagle. Todos Santos Island, March 10th, one pair breeding; nest inaccessible.

Falco peregrinus anatum (BONAP.). Common on San Geronimo, San Benito, Cerros and Natividad Islands, breeding; eggs taken March 13th that were fresh. The duck hawk is found breeding commonly on all islands where the Cassin auklets breed, the auklets being the principal food of the falcons.

(*To be concluded.*)

a *Cf.* Brewster, Birds of the Cape Region of Lower California. Bull. Harv. Mus. Comp. Zool., XLI, 1902.