

parts. *P. auricularis* also has the bill entirely black and also stouter."

The species is dedicated to Mr. Newell, who has paid considerable attention to Hawaiian birds and has made extensive collections.

NESTING HABITS OF THE PACIFIC COAST SPECIES OF THE GENUS *RUFFINUS*.

BY A. W. ANTHONY.

Plate VIII.

THE BLACK-VENTED SHEARWATER (*Puffinus opisthomelas*), the most abundant of our Pacific Shearwaters, is extremely plentiful off the coast of central California during the summer months, and is found at all seasons of the year south of the Santa Barbara Islands. How far north its range extends I am unable to say, but I have seen what I was reasonably sure was this species off the Columbia River in November. Since its summer range is so far to the north it is a little strange that no breeding grounds have been discovered north of the Mexican Boundary.

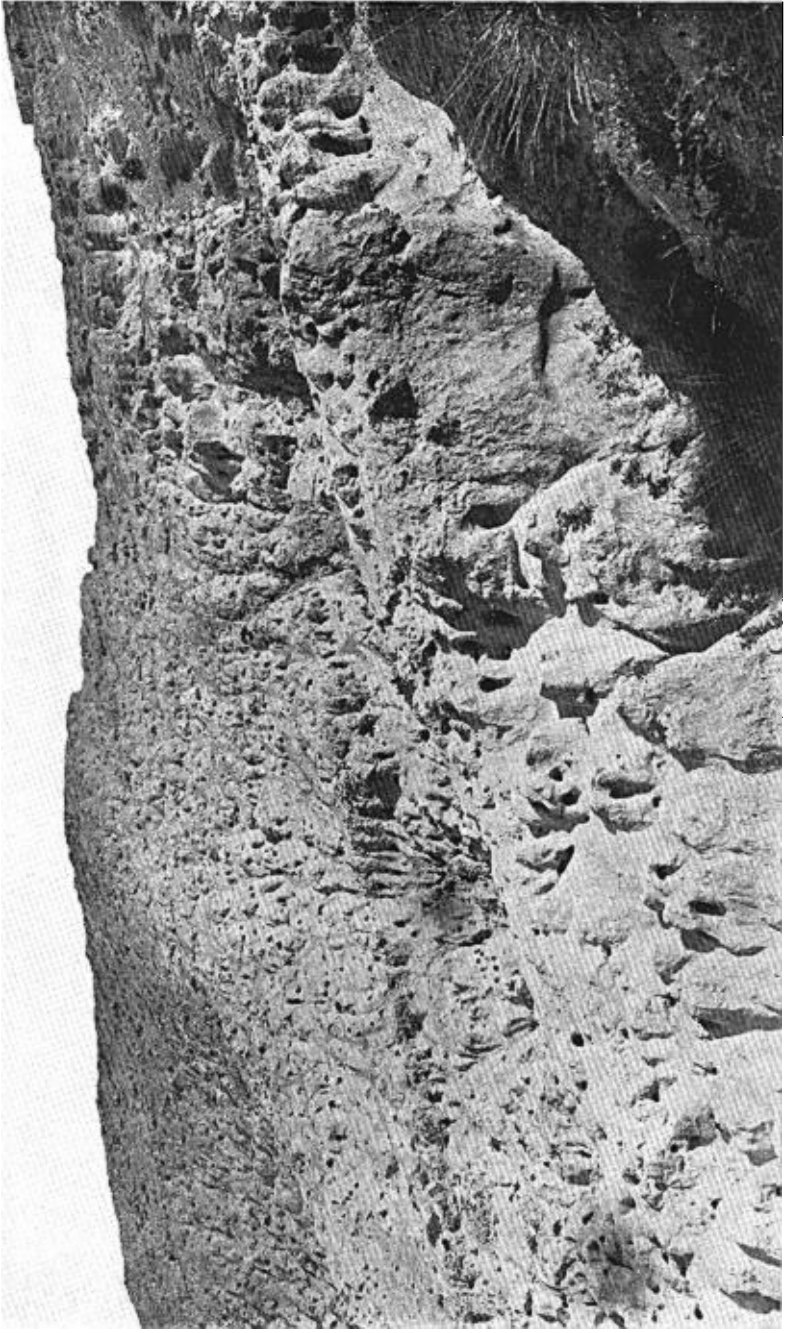
Several years since Major Bendire wrote me that there was in the National Museum two or three eggs said to have been taken on one of the Santa Barbara Islands. As I now remember, he expressed some doubt as to the location, but considered the identification correct. That it does not nest on any of the larger of the Santa Barbara group, I am certain, since the foxes that inhabit the islands would exterminate them, but it is possible that on some of the smaller islands where there are no enemies a few may be found nesting. South of the Santa Barbara Islands I am confident none are found until Guadaloupe is reached, about two hundred miles south of the National boundary.

Several years since, I found the Black-vented Shearwater (*Puffinus gavia*) rather common on Guadaloupe, where their burrows were dug under huge blocks of lava in several parts of the island, but in no place was there any large colony. Their nests

were all inaccessible owing to the nature of the sites selected, either in natural holes in the lava or under large boulders, and no eggs were secured. A night was spent on the top of the island in a heavy cypress growth, about 4000 feet above the sea. Here the Shearwaters were heard all night, their choking, gasping notes coming from all sides as they flew through this grove.

On the San Benito Islands, lying between Guadaloupe and Cerros Islands, I have also found a few *P. opisthomelas* nesting. So far as I have been able to discover, there are no burrows on these islands, all the nests being in small caves, which are nearly filled with deposits of guano left by untold generations of *Puffinus*. The caves are all small and the nests inaccessible but I think that each cave was inhabited by several pairs of birds, judging by the outcry and warning hisses that greeted my approach to the entrance.

About thirty-five miles south of San Benito Islands lies Natividad Island, a lower and more sandy island than those previously mentioned — a condition which seems to suit the requirements of the Black-vented Shearwaters to a nicety, for here are found thousands of them, nesting the full length of the island, some three miles in extent. With the exception of a few rocky slopes and ridges the entire island may be said to be one almost continuous colony. This island I first visited in August, 1896. The size of the burrows at once attracted my attention, and a closer examination revealed the unmistakable tracks of a *Puffinus*. Though the footprints were abundant and fresh, proving that the burrows were still visited at night, all of those examined were unoccupied. I again called at Natividad April 10, 1897, and found the breeding season at its height, each burrow containing either a pair of Shearwaters or one Shearwater and a fresh egg. In no case, I think, did I find an egg in a burrow with two birds. The burrows were usually about ten feet in length, seldom if ever straight, but with one or two sudden turns to the right or left, the nest sometimes being but two feet from the entrance though at the end of a ten foot burrow. Few of the nests were over eighteen inches below the surface, the burrows being for the most part nearly horizontal, and the loose nature of the soil made walking



NESTING COLONY OF WEDGE-TAILED PETRELS (*Puffinus cinctus*), ON SAN BENEDICTO ISLAND, LOWER CALIFORNIA.

anything but a pleasure, as one constantly broke through into tunnels, the exact location of which it was impossible to determine.

The tracks in the fresh soil about the entrance to the burrows showed the imprint of the tarsus for its full length, showing that the birds rest their weight on the tarsus as much as on the toes.

There was little attempt at nest-building, the eggs for the most part being laid in a depression in the sand at the end of the burrow. In a few cases a number of small twigs and sticks had been placed in the hollow forming a very crude nest. Before the egg is deposited the burrow is occupied by both birds, and I have found them on the nest at least a month before any eggs were laid. Just how early they take to the burrows I am unable to say, not having visited the nesting colony earlier than the first week in March, when all the burrows were occupied.

I have never heard any love notes from this species when in the burrows. Their outcry at night, however, when they emerge from their nests and fly about over the island, is something unique in my experience. The note is a series of choking cries coupled with a hissing, like escaping steam, the same that I have at times heard them utter when disturbed in their burrows. On July 1, I found the burrows on Natividad occupied entirely by young birds that were nearly or quite as large as the adults, but still clothed in down through which were growing a few feathers. They were sooty black above and lighter below. When brought to the light they gave vent to their feelings in the characteristic notes of the adults.

About Cape St. Lucas Townsend's Shearwater (*Puffinus auricularis*) is rather common, and though perfectly distinct specifically it is quite closely related to *P. opisthomelas* and has a similar breeding season. On San Benedicto Island I found a few nesting the last week in May. At this date most of the young were but a few days old, covered with sooty down above, and paler-grayish below. With the smaller young I often found one of the parents, but they were as frequently alone. The burrows were all confined to the higher parts of the island—about 500 feet above the sea, where they were dug among the bunches of thick, tangled grass, and were well scattered, a dozen or so being a large colony. The burrows were not so deep or long as were those of *P. opis-*

thomelas on Natividad, averaging about five feet in length. On Clarion Island this species was again found in a similar location, all of the burrows being confined to a thick growth of grass, on the high parts of the island.

The Clarion colonies were more extensive, each suitable patch of grass being well populated. Few birds were seen at sea during the daytime and at night, those that visited the nests must have been much more silent than is the Black-vented Shearwater, in the vicinity of its colonies, for I do not remember hearing any notes that I could attribute to *P. auricularis* though one or two of those that were dragged from their nests gave vent to their displeasure in notes similar to those of *P. opisthomelas*.

About Cape St. Lucas, and between that point and the Revillagigedo Islands, the Wedge-tailed Shearwater (*Puffinus cuneatus*) is found in abundance in May and June. It probably may occur at other seasons, but as I have not visited the region of the Cape during other seasons I can give no assurance of its doing so. This species is of exceptional interest, as it belongs to a group of Shearwaters new to the North American fauna, and of which little is known. I was so fortunate as to discover a large colony nesting on San Benedicto Island, from which was obtained a fine series of skins with all of the intergrades between the white-bellied phase of 'cuneatus' and the dusky form described by L. Stejneger from the Sandwich Islands as *knudseni*.

On first landing on San Benedicto, the first of May, I heard a low murmuring noise which seemed to come from the opposite side of the island. Thinking it might come from a rookery of seals, I started out to investigate, but soon found that I was getting no nearer the source of the noise, which possessed a ventriloquial power difficult to locate. I soon, however, found myself surrounded by large burrows which fairly honeycombed the entire south end of the island, which was so completely undermined that one constantly broke through into burrows, frequently sinking to the hips in ground that had every appearance of being solid.

The accompanying photograph (Plate VIII) gives one but a faint conception of the number of burrows, and of course shows but a very small part of the colony.

From many of the holes came moans and sobs in soft low

tones, inexpressively sad and wierd, — the love notes of *Puffinus cuneatus*.

A number of the burrows were opened, and from each were taken two birds, which fought and bit most savagely on being dragged to the light. By far the greater number were in dark plumage, but many showed lighter underparts, and in some cases a perfectly typical '*cuneatus*,' with pure white underparts, was found in the same burrow with a dark '*knudseni*.'

At this date the burrows were about four to five feet in length, most of them running in a nearly horizontal direction along the sides of the steep narrow ravines that everywhere cut this end of the island.

The soil is chiefly of fine pumice, in some places soft and easily excavated, but in others so hard as to require the use of a pick in opening the burrows. In most of the excavations was a rude attempt at nest building, consisting of a few sprigs of green grass and other vegetation which grew about the colony, and on this meagre platform were both birds, but no eggs. Nor did the condition of the birds indicate that the actual nesting season was at hand. About sunset the birds from the island began to seek the water, meeting a similar tide moving in from the sea. They mostly centered about the south end of the island, which soon presented the appearance of a vast beehive. Thousands upon thousands of Shearwaters were circling about with easy flight, much more airy and graceful than that of any Shearwater with which I am familiar; especially was the difference accentuated when an occasional *auricularis* with typical Shearwater flight, skimmed through the throng. The greater part of those birds which came from the higher parts of the island descended at an angle of about 45°, with wings set until near the water, when they sailed off over the waves until lost to view, while others descending in a spiral course joined their fellows in circling about the water at the foot of the cliffs. There was little, if any, outcry, though the sobbing notes were often heard from the birds on shore. One bird — doubtless an albino — had a pure white head and dusky body, strongly suggestive of a Heermann's Gull. It circled several times about our skiff, which was an object of great interest to the busy throng.

Thinking I would find eggs, I returned to San Benedicto from Socorro Island two weeks later, but was disappointed. Many of the burrows were empty, and all had been extended two feet or more in length, and the nest of green plants moved back to the end. As before, when birds were found there were usually two.

The two following weeks were spent at Clarion, between two and three hundred miles west of San Benedicto. At Clarion, *P. cuneatus* was rare, and only seen at sea. Neither here nor at Socorro were there any signs of nesting colonies. San Benedicto was reached again May 31, and though dozens of burrows were opened, scarcely any birds were found. The tunnels had now a length of from eight to ten feet, having been extended another two feet or more, and as before the nesting material moved to the end. The few birds found were generally in the shorter burrows, which were perhaps incomplete. Only one egg was found with the parent, a white-bellied bird.

Toward evening a greater percentage of birds began to appear from seaward, but at no time before dark did the numbers congregated about the island equal those seen a month earlier.

From the data obtained I would place the nesting season of *P. cuneatus* at least three months later than that of either *opisthmelas* or *auricularis*, which both deposit their eggs at about the same time, in early March.