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## SOME TAGGING EXPERIMENTS WITH BLACK-FOOTED ALBATROSSES

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I reported in an earlier paper (Condor, 42, 1940: 229-238) some very limited results of first efforts at marking individual Black-footed Albatrosses (*Diomedea nigripes*) or "Goonies" off the coast of southern California. The long desired opportunity to renew this promising line of effort was afforded only this last summer on a week's cruise of the motor yacht "E. W. Scripps" of the Scripps Institution of Oceanography of the University of California. My sincere thanks are extended to Director H. U. Sverdrup of that institution for permission to take part in this cruise and likewise to Captain Earl Hammond and his genial crew for their hearty support of my varied activities while on board.

Six parallel lines were charted at approximately right angles to the general trend of the coastline from Santa Barbara, California, to northern Baja California, Mexico, and running across the continental shelf outward for about one hundred and fifty miles. The lines were thirty miles apart (fig. 1) and oceanographic stations were occupied at intervals of eighteen to twenty miles. Work was continuous day and night by the oceanographic watches (the ornithologist slept sometimes). Each station involved a stay of approximately two hours. During this time, if the stop was by day, chumming was done with galley waste or with prepared bait. The greatest gooney appeal was provided by bacon drippings which had congealed to semi-solid state.

To conserve this material and keep it more or less granulated, puffed rice was mixed with the warm fat before chilling. These grains were flung about with a big spoon. They floated conspicuously on the surface, and were small enough to keep the big birds busily occupied picking them up while I shifted to a paint swab and flung quick-drying oil paint over the plumage of the bolder individuals when they came near enough to the poop's overhang or to the skiff from which I sometimes worked. In this way twenty-five birds were rendered recognizable with white, green or red pigment. We were fortunate in having fairly calm weather in the off-shore zone frequented by the goonies. The almost frenzied interest developed by my improved bait helped to overcome the birds' customary dignified reserve, and the further fact that the ship was to be repainted at the end of the cruise conspired to further my efforts so that some interesting data were obtained.

The first goonies were encountered eight miles south of Santa Rosa Island (Station No. 13) where but three birds were attracted. They were not marked with pigment but were all birds of recognizable plumage characters.

None of them reported at Station 14, twenty miles south of San Miguel Island. Darkness prevailed from that point out to Station 17 where other methods of marking were tried without success. The method of spattering with paint was first practiced successfully at Station 28, eighty miles off San Nicolas Island in 2120 fathoms of water. Here sixteen birds came to my bait and seven individuals were marked with

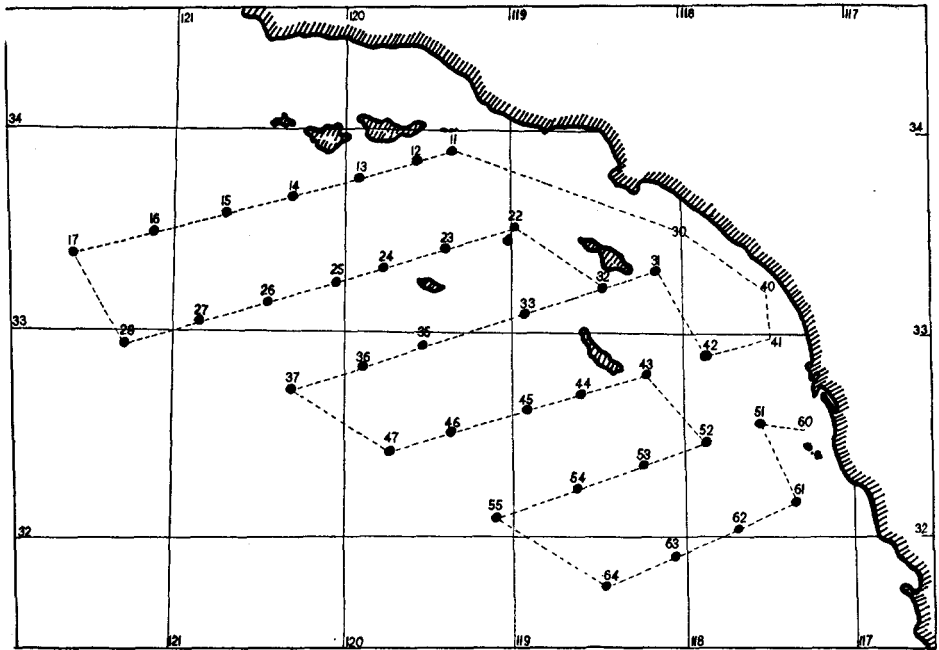


Fig. 1. Diagram of oceanographic stations occupied by the "E. W. Scripps" on the cruise on which Black-footed Albatrosses were marked. Coast line from Santa Barbara, California, to Ensenada, Lower California.

white enamel. From here we headed back landward again to Station 27. At this station only nine birds reported and three of the seven marked birds from twenty miles away (Station 28) were among them.

A gooney attacked a wounded petrel and laid open its scalp but did not go further. Petrels that were dropped lifeless were not noticed by the big goonies who could easily have swallowed them.

At dawn the next morning the boat was off Begg's Rock but no albatrosses appeared. At Station 23 we were off the east end of San Nicolas Island and a single albatross came to a pail of garbage. Here he was fraternizing at table with Western Gulls and Black Petrels. This gooney was unmarked but the watch on duty said that it followed to Station 22, four miles off Santa Barbara Island, which we reached about noon. This was probably true, for no other goonies appeared so far in on the continental shelf. We left this gooney here, however, as we headed southeast parallel with the mainland shore fifty miles away. He had plenty of reason to follow if he had so desired.

During the night we worked the eastern end of the third transect, going outward, and dawn found us at Station 35, which is eighteen miles southwest of San Nicolas Island. The overcast sky was scarcely lightened at 4:15, but when I threw a grapefruit rind overboard, a gooney loomed up out of the darkness to look it over. There is nothing phosphorescent about a grapefruit so the birds must see pretty well in the dark. Four goonies were about the ship while we proceeded southwestward to Station 36, which we occupied at 8:00 a.m. Within ten minutes I was able to assemble ten goonies by chumming with cold bacon drippings, and within an hour there were eighteen birds and I had successfully marked eight with white enamel. Bacon grease seems to throw

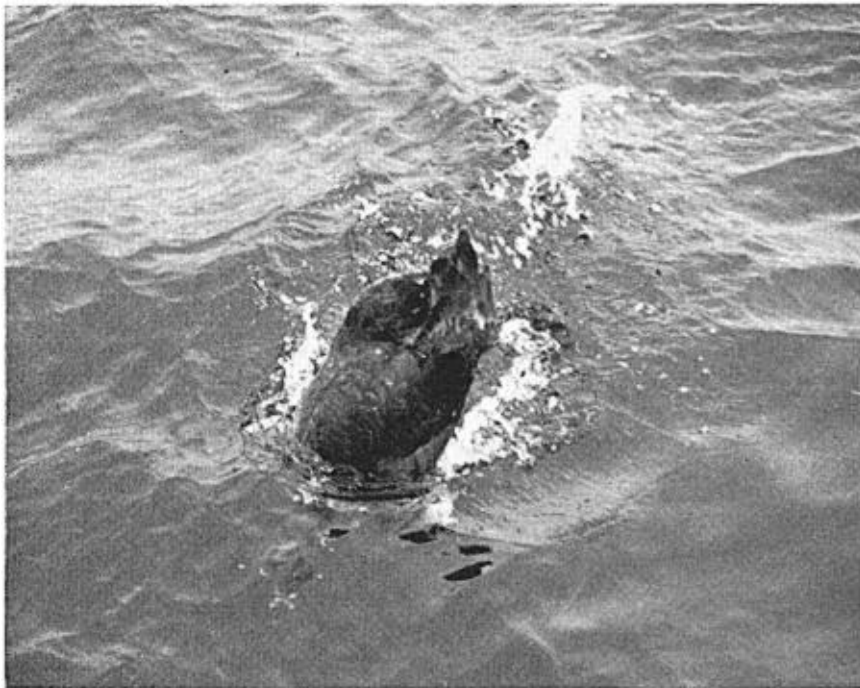


Fig. 2. Black-footed Albatross engaged in subsurface feeding by the tip-up method, with wings closed.

the birds almost into a frenzy. Some of them rushed right up under the overhang of the poop.

There was much bill washing and head ducking after my attempts to splatter paint had spread a slight film of the paint-flux on the water. Birds were able to distinguish instantly between this oil film and the bacon fat film on the surface, seemingly by the odor, before the beak had touched it.

We were now thirty-five miles southwest of San Nicolas Island, headed out to sea with two more stations to go by daylight. We arrived at Station 37 at 11:30 a.m. The first gooney that landed was a marked bird from eighteen miles away. In the first half hour thirteen birds assembled and three were marked birds from the previous station (No. 36). After lunch a further chumming brought the number of birds to twenty-two, and a total of five were marked birds. Here it is notable that these last two birds were over an hour coming in and three marked birds never turned up. Only one had been present when we hove to at the station. There appears to be some "grapevine telegraph" that brings birds in from considerable distances so that they arrive as much as an hour after the first chum is thrown out. These late birds are often the marked birds from twenty miles away.

From this point we turned southeast to Station 47, the outer point of our next transect, thirty miles away. We arrived at 5:00 p.m. and chumming was begun. Sixteen birds soon came about and one was a white-marked bird. After nearly an hour two more marked birds arrived. These individuals had been marked at Station 36. Our ship had traveled fifty miles and made an acute angle turn which brought us back within thirty-two miles of the point where birds were marked. Had the birds traveled fifty

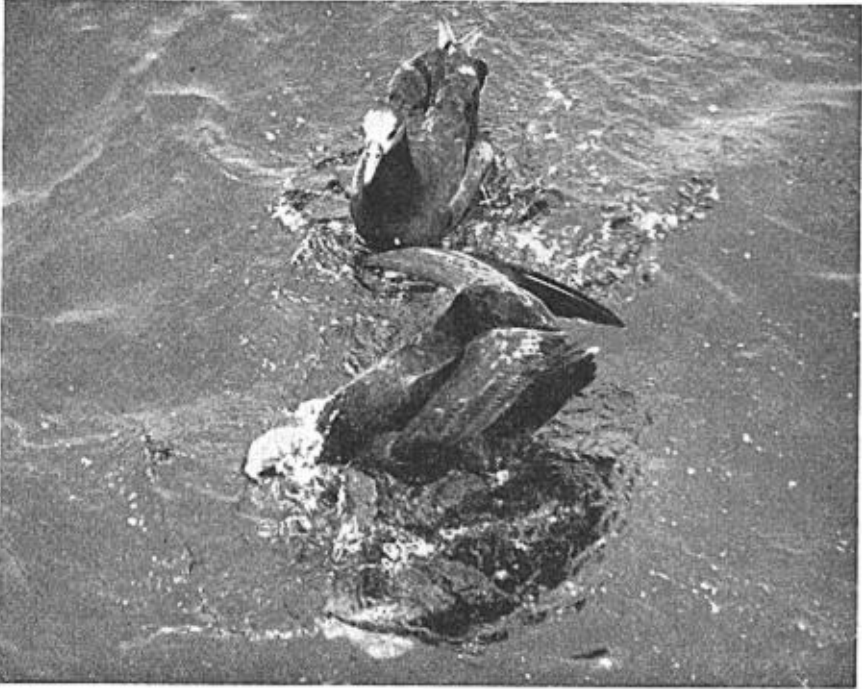


Fig. 3. Beginning of a dive, with wings raised.

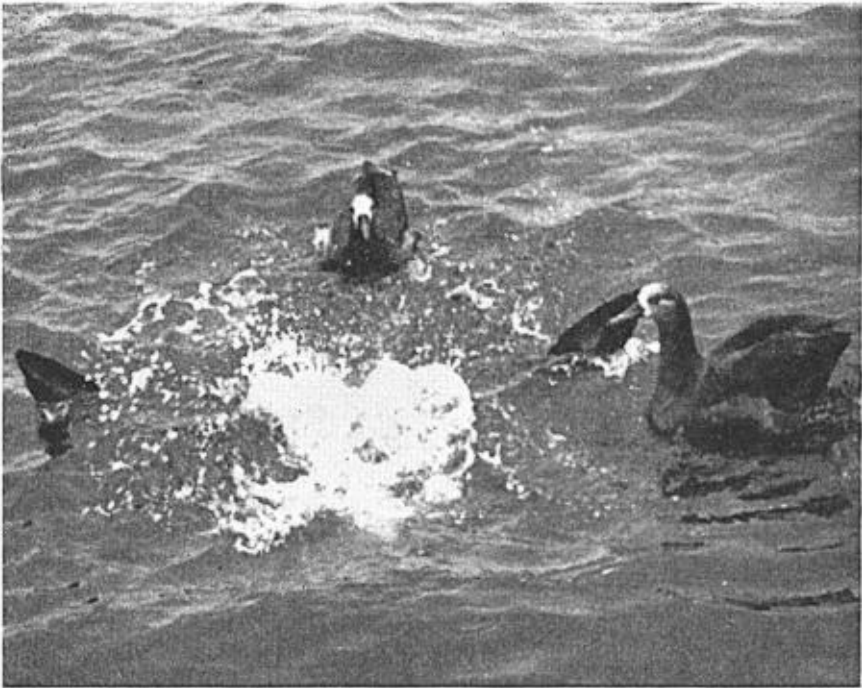


Fig. 4. Albatross wholly submerged in dive, except for wing tips.

miles or only thirty-two? A total of twenty-five birds assembled at this station. We now turned back landward on a line parallel with the last and thirty miles distant, but nightfall put a stop to my watch for marked birds.

Next morning at Station 44 we were fourteen miles southwest of China Point, San Clemente Island. Six goonies were brought to chum and three were successfully marked with green paint. They were fortunately recognizable as individuals and numbered in my notes as 1, 2 and 3.

Our next station (43) was occupied at 10:00 a.m. and my first chumming brought three birds, none of which was marked. By 11:00, however, there were five birds and one of them was a bird (No. 1) marked with green paint twenty miles away. It had taken him an hour to discover us and travel that distance. This station was but five miles off the southeast point of San Clemente Island and was fairly close in for goonies. Still, one out of three marked birds had reported for food (1 hour late).

Again we made a southward tack for our next transect line at Station 52 where we started chumming with little result as to goonies for the first half hour. Then here came No. 1 from Stations 44 and 43. Half an hour late though he was, he came bowling right up to the rail and looked up at me with an attitude of readiness for a hand-out. Six birds were finally coaxed about but no other was recognized as a repeat.

About 6:00 p.m. we stopped at Station 53 and No. 1 was right on hand this time for his fourth meal at my expense. We had traveled seventy miles but had doubled back on our fifth transect line so that we were only thirty miles from the point where No. 1 had been marked and we had never been more than fifty miles away in a direct line. Nightfall stopped my observation and No. 1 was not seen again. This bird had actually traveled seventy miles in making the circuit; still, that is probably nothing as a jaunt for a gooney in surveying his territorial boundaries.

Our next daylight station was No. 64 at the outer end of the most southerly transect line, headed back toward the mainland. Here, by putting off in the skiff, seven birds were marked with red pigment. There was more wind blowing than on previous days and therefore greater difficulty in flinging pigment. Even while we were in the light skiff, with but twelve inches free board the birds did not like to allow us up wind from them. It blocked their line of take-off. They showed very little fear, however, and came within a foot of my spoon with which chum was thrown out. It was not difficult therefore to fling pigment on them.

We reached our next station, No. 63, at 11:30, and soon chummed eleven goonies, three of which had been marked with red paint at Station 64 at eight o'clock. The other four had dropped out of the picture. At three o'clock we were at station 62 and eighteen birds were chummed fairly promptly, one of which was marked thirty-six miles away. He had been so prompt and so eager at the previous two stations that he was christened "Old Bum." Here he came right up under the vessel's poop and looked up at my lunch counter on the rail. Once he almost caught the food in mid-air. Not until an hour had passed did another marked bird appear. Then three birds arrived, two of which were red splashed, making a total of three out of seven marked that morning at Station 64. There were now twenty-one birds about the ship but only eight or ten showed any particular interest in food. Others seemed to have come "just to be sociable."

Our next and last station of the cruise, No. 60, was occupied at sunset. Of the nine birds that came about before dark, one was "Old Bum," just as eager as ever and the last of the seven birds marked at Station 64, sixty miles away. This fellow holds the record for straight line traveling among my marked birds. He, however, gave some evidence of being a professional hanger-on who had more or less adapted his habit to



Fig. 5. Albatross in background has just emerged and is folding the wings and swallowing food.

the ways of man along the regular steamer lane that we had been following fairly closely all day into the port of San Diego.

#### SUMMARY AND CONCLUSIONS

1.—A total of twenty-five Black-footed Albatrosses were marked at sea off the coast of southern California. Of these twelve repeated at twenty miles, seven at thirty miles, three at forty miles and one at fifty and sixty miles (see fig. 6.).

2.—In watching the birds and making counts at the various stations it becomes evident that the large majority of individuals, even though they could not be marked, were not found at adjacent stations.

3.—A surprisingly large proportion of the birds showed little interest in the ship as a source of food and only a small proportion approached near enough to be marked.

4.—Marked birds in a number of cases probably attended the ship in transit. On the other hand, it was commonly true that marked birds arrived only after the ship had been stopped for thirty to sixty minutes, that is, they came from a considerable distance. There seemed to be some communicable interest transmitted by some means not entirely clear to us.

5.—The most attractive bait discovered is animal fat. Bacon fat was superior to beef suet. The semi-solid gelatin settling out from roast beef drippings was of no interest at all and was neglected after the first taste. Taste buds in the tip of the bill appear to be highly sensitive and discriminative. The turpentine-linseed flux of paints used in marking is very repugnant and seemed to be recognizable by odor before actual contact was made. I was repeatedly impressed by their seeming acuity of olfactory perception.

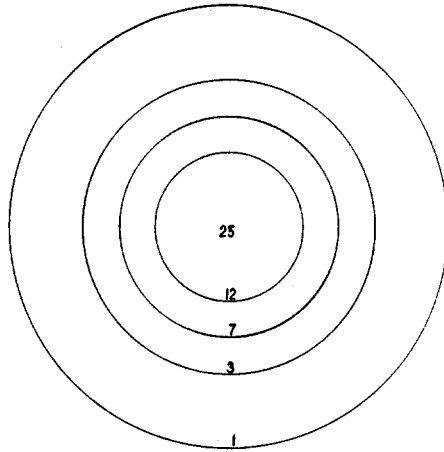


Fig. 6. Diagram representing results of marking of albatrosses; 25 birds were marked; 12 repeated at 20 miles, 7 at 30, 3 at 40, and 1 at 50 and 60 miles.

6.—Albatrosses engaged in subsurface feeding in either of two ways. One way was by the tip-up method of surface-feeding ducks, the wings remaining closely folded. The other method was by a complete submergence with wings fairly well extended and seemingly used in swimming down to a distance of two or more feet. A turn was then made and the bird again broke surface head first. Photographs of both types of subsurface feeding were obtained.

7.—It is more than probable that the use of an attractive bait in chumming at consecutive stations induced birds to wander farther than normal from the point of first marking. Individual birds even appeared to “remember” from one station to another the feeding procedure.

8.—On the ship’s return to a general area along a subsequent transect line thirty miles farther south, no marked bird from the previous transect ever appeared.

9.—In undisturbed nature these birds probably have a feeding area with a radius of about fifteen or twenty miles. It is conceded, however, that with the drift of water masses the area of an individual bird may drift also.

*University of California, Los Angeles, September 1, 1941.*