

perhaps three, broods in a season. June 26 I found large young out of the nest; July 25 I obtained a nest with three eggs; and on September 25 I heard young birds crying for food. They are our commonest summer bird, taking the place around the door of the Chippy in the East. The breasts of the nestlings are spotted, but they soon show traces of the chestnut dorsal patch. A curious prolonged, grating *tsip* is the only note of the young birds. They leave just as *oregonus* becomes plentiful—November 1. There is a great difference between the eggs of the nest spoken of above and those of a clutch taken in June in New Mexico. Both nests are the ordinary "Ground Sparrow" affair. The ground color is the same in all the eggs, i.e. a bluish-white, but while the New Mexico eggs are very faintly dotted with brown—scarcely noticeable—the Colorado eggs are everywhere dotted with reddish spots, tending to form a wreath around the larger end. I would hesitate to believe the two clutches to be of *caniceps* had I not shot the birds.

41. *Spizella montana*, *Ridg.* TREE SPARROW. — A rare migratory visitant in spring and fall.

42. *Spizella socialis*, *Bp.* CHIPPING SPARROW. — Rare; not nearly as common as the following.

43. *Spizella socialis arizonæ*, *Cowes.* ARIZONA CHIPPING SPARROW. — Common; breeds.

[To be concluded.]

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## CRITICAL NOTES ON A PETREL NEW TO NORTH AMERICA.

BY WILLIAM BREWSTER.

SOME months since, while passing the natural history store of W. J. Knowlton, Tremont St., Boston, my attention was attracted by a mounted Petrel, which, with spread wings, hung conspicuously displayed in the window. I saw at once that it was a species new to me and, upon entering, was greatly astonished to learn that it had been received only a short time before *in the flesh*, and in a comparatively fresh condition. Further inquiries elicited the information that it had been mounted for Mr. E. H. Woodman of Concord, N. H., and upon writing to that gentleman, I was very kindly put in possession of the following particulars. The bird had been sent him by a client, Mr. Nathan F. Smith, who conducts a large farm at Mt. Morris, Livingston Co.,

New York. One of the laborers while ploughing an old corn-field, noticed it running in a freshly-turned furrow and despatched it with a stick. It was apparently exhausted, for it made no attempt to escape. This was early in April, 1880, probably not far from the fifth of the month, as I find its reception recorded on Mr. Knowlton's books as April 10. A letter afterwards received from Mr. Smith confirms all of these facts, but adds nothing of interest, save that the farm "comprises what are known as flats, lying along the Genesee River, about forty miles south of Lake Ontario."

So much for the details of its capture; resting as they do on the testimony of three different persons, who, at the time, were not aware of the importance of the case, there can be no doubt as to their entire authenticity. The specimen itself, through Mr. Woodman's generosity, has recently come into my possession and to a consideration of its relationship I now invite the reader's attention.

In Dr. Coues's invaluable monograph of the Petrels\* ("Critical Review of the Family Procellariidæ: Part iv; — Embracing the *Æstrelateæ* and the *Prioneæ*"), under the head of *Æstrelata mollis* (p. 151), occurs the following paragraph: —

"There is a specimen, No. 15,706, in the Smithsonian Museum from the Antarctic Ocean, by Mr. T. R. Peale, which, with the size and general appearance of *mollis* differs as follows: The under surfaces of the wings are, except just along the edges, purely and uninterruptedly white; as much so as in *Cookii*. The inner vanes of all the primaries, instead of being simply duller and grayer than the outer, have trenchantly defined pure white areas; these white spaces occupy the whole of the webs at the base; as they extend more towards the apex they become less wide, leaving a narrow space of dark color along the inside of the shafts; apically they terminate with an acutely pointed outline, which stretches towards the tips of the feather, and is bounded internally and externally by dark colored portions of the feather. The general pattern is exactly that seen in the primaries of most *Lari*; and the definition of the two colored areas is as strict. In other respects the bird is like quite a young *mollis*, being dark colored both above and below; but the tint of the clouding below is more intensely sooty than in any specimen of typical *mollis* I

\* Proc. Phil. Acad., May, 1866.

have seen; and there is this peculiarity in addition, that the under tail coverts remain pure white."

This specimen had been previously described by Peale (Zool. U. S. Expl. Exped., 1848, p. 299) under the name of *Procellaria gularis*, but Dr. Coues, after expressing his doubts as to its probable relationship, provisionally referred it to *Æ. mollis*,\* and there the matter has rested, the type, up to the present time remaining unique.

The above description proved so nearly satisfactory that upon first reading it I felt little doubt as to the relationship of the bird in hand; but all uncertainty on this point has since been removed, for through the kind offices of Mr. Ridgway, the Smithsonian specimen "No. 15,706" is now before me. A comparison of the two at once establishes their perfect specific identity. The differences that obtain are just those which would be expected when the relative ages of the specimens are considered. Peale's example is a young bird, apparently in its first year; while mine, if not an adult, is certainly much older and probably in nearly mature plumage. Generally speaking, it may be said to differ from the type in having the predominating areas above pure cinereous instead of plumbeous; the crown and forehead much mixed with white; the lores and a conspicuous superciliary stripe pure white, unmingled with darker color; the transocular faciæ, though equally dark, much more restricted; and the white areas below, † considerably more extended and of a purer character.

Of the stages in *Æ. mollis*, Dr. Coues says: "the older the bird the clearer and purer is the cinereous and the more trenchantly defined are the boundaries of the several differently colored areas; the difference in this respect being especially notable in the forehead and sides of the breast. Young birds are all over of a pretty uniform deep brownish ash or fuliginous cinereous; inclining to smoky brown on the wings and tail."

And now a word as to the relationship which these interesting specimens bear to *Æ. mollis*. Of the latter I have only a single specimen, an adult, kindly furnished by my friend Mr. Allen, from the collection of the Cambridge Museum of Comparative Zoölogy. But the testimony which it affords, taken in connection

\* Upon looking more closely into the earlier history of the case I find that this arrangement was first instituted by Cassin, who, in the second edition of the U. S. Expl. Ex., places Peale's specimen under *Procellaria mollis*.

† The type of *gularis* has a pure white throat and light breast.

with the excellent description of *mollis* given by Dr. Coues, is quite sufficient. The peculiar marking of the primaries in *gularis*, now confirmed by this second specimen, would alone be conclusive, but in addition, I find certain structural differences which were apparently overlooked by Dr. Coues. The tail of *gularis* is shorter and much less decidedly rounded than is that of *mollis*. This difference is best shown by the graduation of the rectrices. For *mollis* Dr. Coues gives the graduation as 1.30 (the specimen before me measures 1.05, but the bird is in a moulting state and the tail not fully developed), while in the two specimens of *gularis*, it is respectively only .60 and .90. Furthermore, *gularis* has the central pair of rectrices broader and more evenly rounded at the tips than are those of *mollis*.

These characters, although of undoubted specific value, will by no means warrant generic separation, the general shape and proportions of the two birds being strikingly similar, and the bill and feet — in this family the most important of all the generic characters — absolutely identical. Accordingly, while I follow Dr. Coues in referring Peale's bird to the genus *Æstrelata*, I do not hesitate to reinstate it as a perfectly valid species.

In view of the fact that both the previous descriptions are founded on a young bird, and that one of them (Peale's) is too superficial to be available in nice determinations, while the other, by Dr. Coues, is only incidental in character, I take the present opportunity to redescribe the species as follows:—

**Æstrelata gularis, (Peale), Brewster. PEALE'S PETREL.**

Ch. sp. similis *Æ mollis* sed tectricibus caudæ inferioribus candidis; alis subtus fere ex toto candidis; duabus tertiis partibus pogonii interni abrupte albis; cauda breviori ac minus conspicue curvata; rectricibus mediis latioribus.

Adult (?) plumage. No. 5224, author's collection, Mt. Morris, Livingston Co., New York, April, 1880. Upper parts, including the tail coverts and exposed surface of rectrices, pure cinereous, which deepens to plumbeous only on the occiput, rump and wings, the latter having the middle and greater coverts of the same tint as the back. The feathers of the back (but not those of the rump or occiput), with the greater and middle wing-coverts, broadly tipped with ashy-white, giving these parts a scaled appearance. The throat, jugulum, upper part of breast, and under tail-coverts, pure, silky white. The cinereous of the upper parts comes down along the sides of the neck, encroaching more and more and deepening in tint as it extends backward, until it throws across the abdomen a broad band

of nearly pure plumbeous. Around this colored tract there is nowhere a definite line of demarcation: the cinereous of the neck fades imperceptibly into the white of the throat, and the edges of the abdominal bar become mingled with white, until the dark color is entirely lost along the sides under the wings, and at the beginning of the under tail coverts; while forward, on the lower part of the breast, and over the ventral region generally, the feathers are spotted, barred, or finely vermiculated, in varying shades of color. The sides of the head backward to behind the eye (where the band of color already described begins), are essentially white, but the feathers immediately below the eye are obscurely banded, and there is a narrow but distinct transocular fascia of a dark color, which barely interrupts a broad and pure white superciliary-line passing from the bill to a short distance behind the eye. The forehead and crown are much mixed with white. On the forehead the white forms a broad edging to the feathers and extending more narrowly around their tips confines the plumbeous ash to triangular central patches; but towards the crown it becomes restricted to the edges alone and when the occiput is reached, gives way entirely to the uniform plumbeous of that part.

The peculiar color and marking of the wings, alike in both specimens, has already been so well treated by Dr. Coues that I will save repeating these details by referring the reader to his description, previously quoted in the present article. But in this connection it is necessary to call attention to two points which are not there noticed. The first is, that the *secondaries*, as well as the *primaries*, have the white areas on their inner webs. The second, that each successive primary, beginning with the first, is lighter and more plumbeous than the preceding one; but with the first *secondary*, the color abruptly darkens again, becoming on the exposed portion nearly black, and continuing uniformly so to the *tertials*, which are of an equally dark cast.

The bill is black; the tarsus, obscure flesh-color with a bluish tinge. The basal third of toes, with contained webs, pale yellowish; the terminal portion, black.

*Dimensions.* Bill (chord of culmen), 1.03 inches. Height at base, .46; width, .42. Tarsus, 1.37. Outer toe and claw, 1.65; middle, 1.70; inner, 1.43. Wing, 9.88. Tail, 3.95; the graduation of the rectrices, .90.

Young ( $\delta$ ) No. 15,706, National Museum. Antarctic Ocean, lat. 68° S., long. 95° W., March 21. (Peale's type of *Procellaria gularis*). Above cinereous-brown, inclining to black on the tips of the secondaries and *tertials*; below, sooty-plumbeous; throat and under tail-coverts white, transocular facie broad and dark. Otherwise generally similar to the adult (as represented by specimen No. 5224).

*Dimensions.* Bill (chord of culmen), 1.05. Height at base, .50; width .45. Tarsus, 1.35. Outer toe and claw, 1.65; middle do., 1.65; inner do., 1.36. Wing, 9.80. Tail, 3.90; graduation of the rectrices, .60.

But before leaving the subject it becomes necessary to consider a Petrel which was unknown when Dr. Coues investigated the

family. This is *Æstrelata defilippiana*, described\* by Drs. Giglioli and Salvadori from four specimens taken off the coast of Peru in lat. 18° 4' S., long. 79° 35' W.

In comparing their supposed species with *Æ. gularis* "as described by Coues" the joint author's remark; "But our species differs . . . in its smaller dimensions and slighter make (*Æ. gularis* being in size and make similar to *Æ. mollis*), in the cinereous coloration of its upper, and the pure white of its lower parts, while *Æ. gularis* would be dark-colored above and below having only the tail-coverts white." *Æ. defilippiana* also "has a bill relatively, and in some specimens, absolutely longer."

But these color-differences lose much of their significance when it is remembered that the bird "described by Coues" was the young of *gularis*. My more mature specimen agrees very closely with their description save that it is not "*subtus omnino pure alba*" (this is afterwards slightly qualified by "*lateribus pectoris vix cinereo-tinctis*"),— and it is by no means improbable that the fully adult *gularis* will be found to have the under parts wholly white.†

The discrepancy in size is less easily reconciled. The birds examined by Drs. Giglioli and Salvadori are all apparently smaller than either of the known examples of *gularis*. But still the largest of the former approaches suspiciously close to the smaller of the two latter:— *Æ. defilippiana*, wing, 9.45; *Æ. gularis*, do., 9.80:— and furthermore, in respect to individual size, the Petrels are notoriously variable. Nor can a comparison of measurements taken by different persons always be relied upon. Different methods give widely divergent results.‡ Scarcely two

\* "On some new Procellariidæ collected during a voyage around the world in 1865-68 by H. I. M.'s S. 'Magenta.' By Henry Hillyer Giglioli, Sc. D., C. M. Z. S., Naturalist to the expedition, and Thomas Salvadori, M. D., C. M. Z. S., Assistant in the Royal Zoological Museum of Turin," *Ibis* 1869 pp. 63-65.

Rowley also gives a superb figure of the bird in his Ornithological Miscellany (Vol. I; p. 255, pl. xxxiii) but adds nothing new to an account taken from the text of the *Ibis* article.

† In speaking of the young of *Æ. mollis* Dr. Coues says: "The whole under parts are not notably different from the back, though, however, the dark color only occupies the tips of the feathers; their basal moiety remaining white." This statement is significant in this connection, for upon examining my specimen, I find that the plumbeous color below, and also on certain parts of the head and neck, is mainly confined to the tips of the feathers, their concealed portions being snowy-white.

‡ Since writing the above I find a curiously apropos illustration of this. In Peale's original description of the type specimen the "wing from the carpal joint" is given as "ten and a half inches" while my measurement of the same bird made it 9.80, a difference of nearly three quarters of an inch.

ornithologists of my acquaintance measure either the tail or the tarsus from precisely the same relative points. We are not told that *Æ. defilippiana* was actually compared with *Æ. mollis* and if extraneous data were alone made use of there is surely room for a doubt in this connection. Again in respect to the bills there is nothing to show whether the *chord* or the *arc* was measured. If the latter (they simply say "*rostr. a fronte*") the apparent discrepancy would be pretty satisfactorily explained.

In summing up the matter, it is perhaps enough to say that *Æstrelata gularis* finds its nearest known affine in *Æ. defilippiana*. To go further than this would be hazardous under the present conditions of the case, but the relationship of the two birds is so extremely close that larger suites of specimens may confidently be expected to bridge over the slight differences which now separate them. In such an event *defilippiana*, Giglioli and Salvadori, 1869, will of course give place to *gularis*, Peale, 1848.

In concluding, I quote in full all that Peale has handed down to us relating to the life history of the species which he had the honor to discover and describe. It is, so far as I know, the only account that has ever been written.

"This bird was found amidst icebergs, buffeting the storms and fogs of the Antarctic regions. We saw but few of them, and obtained but a single specimen, on the 21st of March, while the Ship Peacock was enveloped in a fog, latitude 68° S., longitude 95° W. of Greenwich. Their flight was easy and not very rapid. They were silent, and alighted on the water to examine some slips of paper and chips purposely thrown from the boat."\*

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## SOME OBSERVATIONS ON THE MIGRATION OF BIRDS.

BY W. E. D. SCOTT.

WHILE showing some friends the astronomical observatory and accessories connected with the College of New Jersey at Princeton, on the night of October 19, 1880, after looking at a number of objects through the nine-and-one-half inch equatorial, we were

\* U. S. Expl. Exp., Zoölogy, p. 410. (Edition of 1858).

shown the moon, then a few days past its full phase. While viewing this object my attention was at once arrested by numbers of small birds more or less plainly seen passing across the field of observation. They were in many cases very clearly defined against the bright background; the movements of the wings were plainly to be seen, as well as the entire action of flight. In the same way the shape of the head and the tail were conspicuous, when the bird was well focused. As the moon had not been very long above the horizon the direction of observation was consequently toward the east, and the majority of the birds observed were flying almost at right angles to the direction in which the glass was pointed.

Here then was opportunity for the determination of two points — the kind of birds that were flying and the general direction in which they were moving. Respecting the first, it was comparatively easy to decide as to what families the species belonged. This point was gained by observing the general shape of the birds, their relative size, the motion of their wings, and their manner of flying; that is whether the flight was direct or undulating, by continuous strokes of the wings or by an intermittent motion of those members.

Most of the birds seen were the smaller land birds, among which were plainly recognized Warblers, Finches, Woodpeckers, and Blackbirds; the relative numbers being in the order of kinds above named. Among the Finches I would particularly mention *Chrysomitris tristis*, which has a very characteristic flight; and the Blackbirds were conspicuous by the peculiar shape of the tail, from which characteristic I feel most positive in my identification of *Quiscalus purpureus*. I mention such details to explain just how observations were made and conclusions arrived at.

In regard to the second point, with rare exceptions the birds were found to be flying from northwest to southeast. I do not mean that this was absolutely the direction but that it was the approximate and general one.

It is not within the scope of the present paper to do more than give details on two other points, namely, the estimated number of birds passing through a given space during a given time and the height at which the birds were most abundant. For the basis of the first of these points it was necessary to note, first, how many birds passed through the field of observation per minute,



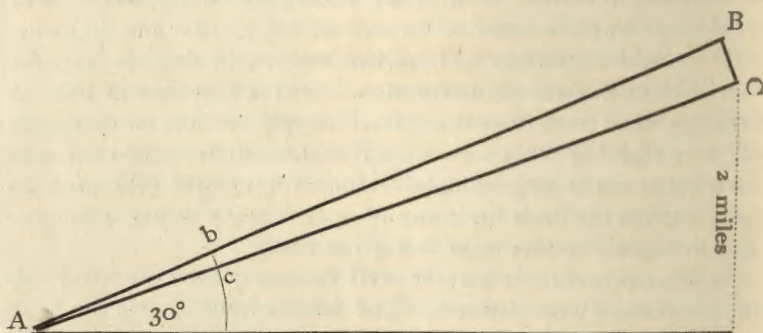
and, second, how near or how far distant from the glass the birds would have to be in order to be seen at all, that is to be in focus.

The height of the moon above the horizon in degrees and the two limits of the area of observation — that is how near or how far the birds noted were from the glass — supply the data for determining how high the birds seen were flying, and this, combined with the number noted as passing per minute through the field of observation, gives the basis for computing how many birds were passing through a square mile in a given time.

In this connection it may be well to specify how the two limits of observation were defined. The inferior limit, that is the nearest point where objects could be seen with distinctness, was easily determined by the power of the glass; this is about one mile distant. The superior limit, or the most distant point, is provisionally assumed to be not more than about four miles away, on the hypothesis that the birds would not fly at a greater height than ten thousand feet. It may appear, as future observations are made, that this last limit is not correct but the reasons for assuming such a height as the superior limit are sufficient to warrant its use in this case, for birds were observed on this same night at a late hour when the height of the moon above the horizon would make the point at which the birds were noted almost at this great elevation, viz., ten thousand feet.

I am greatly indebted to Professor Charles A. Young for assistance in these observations, and with his aid have arrived at the conclusion that the average number of birds passing through the field of observation per minute was four and one half. Professor Young has also kindly assisted me with the details of the problem in regard to the limits and area of the field; and the following diagram and computations are from his study of the matter.

Moon's altitude =  $30^\circ$ ; moon's semidiameter =  $15' 05''$ . The area of observation is a flat triangle = B, A, C. From this must be deducted the small triangle b, A, c, the area within a mile of the glass. The flight of the birds is thought to be nearly at right angles to the field of observation.



Area of triangle B, A, C, = 0.07020 miles.

Area of triangle b, A, c, = 0.00439 miles.

Therefore b, B, C, c = 0.06581 =  $\frac{1}{15.2}$  mile.

Distance from A to B = four miles.

Number of birds seen per minute =  $4\frac{1}{2}$ .

Number of birds per square mile per minute = 68.

[Mr. Scott's novel and important observations definitely establish on a scientific basis several points in relation to the migration of birds that have heretofore rested almost wholly on conjecture and probability.

We have, first, the fact that the nearest birds seen through the telescope must have been at least one mile above the earth, and may have ranged in elevation from one mile to four miles. It has been held that birds when migrating may fly at a sufficient height to be able to distinguish such prominent features of the landscape as coast lines, the principal water courses, and mountain chains over a wide area. Of this, thanks to Mr. Scott, we now have proof. It therefore follows that during clear nights birds are not without guidance during their long migratory journeys, while the state of bewilderment they exhibit during dark nights and thick weather becomes explainable on the ground of their inability to discern their usual landmarks,—points that have been assumed as probable but heretofore not actually proven.

These observations further indicate that many of our smaller birds migrate not only at night but at a considerable elevation,—far beyond recognition by ordinary means of observation. A promising field is here opened up, in which it is to be hoped investigation will be further pushed, not only by Mr. Scott but by others who may have opportunity therefor.—  
J. A. ALLEN.]