## GENERAL NOTES

**Observations of Pellet-Casting by Horned and Pied-billed Grebes.**—In his interesting article "Feather-eating and Pellet-formation in the Great Crested Grebe" *(Brit. Birds,* 49: 432–435, 1956), Simmons summarizes the evidence for the theory that feathers eaten by grebes form the necessary rough material in which fish bones and other indigestible items can be ejected in the form of pellets. He goes on to say that "the pellet itself is unknown and no observer seems as yet to have witnessed the actual oral ejection of one. Thus the final and concrete proof of the connection between feather-eating and pellet-formation is still lacking."

I have been fortunate enough to witness pellet-casting by two species of grebe, the Horned *(Podiceps auritus)* and the Pied-billed *(Podilymbus podiceps).* Because of the apparent novelty of these observations, it seems worthwhile to describe them in some detail.

On 8 June 1957 I spent several hours watching a pair of Horned Grebes on Portage Creek (T 13 N, R 6 W, Sec. 17), a few miles south of Delta, Manitoba. The birds were bringing up what looked like dense masses of green algae roughly twice the size of their bills and appeared to be getting small particles of food from these masses before discarding the bulk of the algae. At 2:40 P.M., the male (larger and brighter than his mate, and with longer head plumes) started drinking repeatedly, dipping his bill into the water, raising it still partly opened, and then shaking his head once or twice. Three minutes later he coughed up a dark-green pellet, which appeared to be roughly three quarters of an inch long and one quarter of an inch in diameter. He then dipped his bill into the water and shook his head as though to clean his bill, and within two minutes he resumed diving for food. At 4:40 P.M. the same day, the female drank several times and acted as though she were casting a pellet, but she was so far away that I could not be positive that she had done so.

On 24 April 1960 I spent approximately seven hours watching a pair of Pied-billed Grebes on Jemmerson Slough, a small, fishless body of water two miles west of the town of Spirit Lake, Dickinson County, Iowa. The pair was building a nest, but no eggs had as yet been laid. After diving for food from 3:16 to approximately 3:40 P.M., the female preened, oiled her plumage, and rested near some clumps of emergent vegetation until 3:59, when she swam out onto open water. There she made five drinking movements at intervals of from several to approximately 20 seconds. Then she coughed up a narrow, irregularly shaped, reddish pellet at least two inches long. Almost immediately afterwards she started diving for food.

Two points strike me as being significant in connection with these observations. First, in both instances the birds appeared to be taking a high proportion of indigestible material (algae, chitin) along with their food; and second, in both instances pellet-casting was preceded by drinking motions.

While it is now established that grebes do cast pellets, it has not as yet been possible to analyze the contents of these pellets, and the possible relation of the grebes' habit of feather-eating is still open to conjecture. One thing, however, can probably be stated with certainty; and that is that grebes whose diet is predominantly fish do not cast daily pellets of fish bones felted together with feathers from their own bodies. The following calculations indicate the improbability of this: The feather tracts on the breast and sides of a Red-necked Grebe *(Podiceps*

*grisegena)* consist of approximately 2,000 feathers, which would form well over one half of the bulk of feathers available for use in plucking for pellet formation. If we assume that only these feathers were used, that the birds cast one pellet per day, that this pellet contained 100 feathers (a not unreasonable number judging from the figure of the stomach contents of a Red-necked Grebe in Wetmore's account of *Food and Economic Relations of North American Grebes,* U.S. Dept. Agric. Bull. 1196: 8, 1924), and that these feathers take 20 days to attain full growth, each feather would be eaten as soon as it stopped growing, and the entire tracts would be in a perpetual state of molt. Even if the growth rate of these replacement feathers were double this and all the body feathers were involved, one fourth of the body feathers would be growing at any one time. I do not recall skinning a grebe that did not have numerous pin feathers, but none taken outside the seasons when regular molt is to be expected had anything like one fourth of the plumage growing. Indeed, it might be argued that such an amount of feather growth would be a serious drain on the energy resources of the bird, both through the actual formation of the feathers and in the reduction of the insulating and waterproof covering.

Nor is there any good evidence for regular plucking of feathers. Simmons *(Brit. Birds,* 49: 432, 1956) states that "adult Great Crested Grebes [*Podiceps cristatus*] seldom, if ever, deliberately pluck feathers for their own consumption though they sometimes do so when giving feathers to the young." My observations on the North American species of grebes are in agreement with his.

The bones of most fish consist largely of calcium carbonate, which is dissolved by hydrochloric acid in the stomach but presumably not in the alkaline environment of the small intestine. Hence, it is likely that a prime function of the swallowed feathers is to retain those bones in the stomach until they can be dissolved. A "built-in" device comparable to this feather mat is found in the anhingas. According to Garrod *(Proc. Zool. Soc. London,* 1876: 343) "the pyloric orifice in *Plotus* [ = *Anhinga*] *anhinga* . . . is protected by a mat of lengthy hair-like processes, much like cocoa-nut fibre, which nearly half fills the second stomach." Similar structures have been described by Garrod *(ibid.,* 1878: 680–681) for the African species *(A. rufa,* formerly known as *Plotus levaillanti)* and by Forbes *(ibid.,* 1882: 209–210) for the Indian species *(A. melanogaster).*

Hanzák *(Acta Mus. Natl. Pragae,* 8B: 32, 1952) mentions a record of the stomach contents of one Great Crested Grebe, which consisted of five fish, 6, 7, 8, 9, and 12 centimeters long. The bones from these fish, plus an equal mass of feathers, would make at least one large pellet. As these grebes have two regular feeding periods per day (one in the morning and one in the evening), two such pellets would probably be cast each day if the fish bones were not dissolved. The number of feathers required to make such a pellet, the acid environment of the stomach, and the lack of observations of pellet-casting in this species (which has probably been watched for more and longer periods than any other grebe), are all strong arguments against such frequent pellet-casting by fish-eating grebes.

On the other hand, chitin and vegetable matter, the latter taken incidentally in fish stomachs or attached to other animal food items, probably cannot be digested thoroughly by grebes. It is these types of material which I believe form the bulk of most grebe pellets. That feathers or hair may not be a necessary component of pellets is shown by the fact that some birds cast pellets containing none of these materials. For example, a Loggerhead Shrike *(Lanius ludovicianus)* kept in our laboratory for several weeks regularly cast pellets of grasshopper chitin held

together by mucus. However, the mushlike mass, consisting in part of broken-down feathers (see Hanzák, *op. cit.*, p. 34), found in some grebe stomachs probably is ejected with other indigestible material in the form of pellets. The condition of the feather fragments suggests that these feathers have remained in the stomach for considerable periods, and it is therefore likely that when grebes are feeding on fish, pellets may only be cast at intervals of several days.

To summarize, in the instances in which I have observed pellet-casting in grebes, the ejection was preceded by drinking motions and followed almost immediately by foraging. Feathers swallowed by grebes probably function to retain fish bones in the acid environment of the stomach where they may be at least partly dissolved. Pellet-casting is probably more frequent in grebes feeding on insects and other invertebrates than it is in those feeding on fish. The frequency with which pellets are cast and the proportion and significance of feathers in the pellets remain to be determined.

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**The Kestrel *(Falco tinnunculus)* in the New World.**—The Kestrel has wandered at least once to North America, where a specimen was collected at Strawberry Hill, near Nantasket, Massachusetts, on 29 September 1887, and we report here the second record for the New World and the first for the West Indies.

The bird from the West Indies was taken by hand in an exhausted condition on the street of the village of Le Carbet on the west coast of Martinique on 9 December 1959, and sent at once to one of us (R. P.) at Fort de France. It died very soon after and upon dissection was found to be extremely emaciated. It is an adult female with a wing length of 252 mm. The specimen was identified subsequently (by C. V.), who took it to New York to compare it with the series in the American Museum of Natural History. It belongs to the nominate race *(F. t. tinnunculus* Linnaeus), and its wing length matches closely the average wing length of the females of the nominate race from Europe, which measure 240–270 (253.8) in 20 adults. This specimen is now in the collection of the Collège Séminaire of Fort de France, Martinique, French West Indies.

The specimen from Massachusetts is in the collection of the Chicago Natural History Museum (number 37631) and came from the collection of C. B. Cory, where it had the catalogue number 11636. It is a female of the nominate race in juvenal plumage with a wing length of 236 mm. The conditions under which this specimen was taken are unknown to us, but we believe there can be little doubt that the specimen taken in Martinique had flown the Atlantic. Its exhaustion followed by its rapid death and extreme degree of emaciation support our belief.

An enquiry addressed to the Weather Bureau of the United States Department of Commerce failed, however, to reveal the existence of an easterly storm or strong winds that could have carried or assisted the bird across the Atlantic. In fact, the Weather Bureau reports that the winds were adverse, at least in the North Atlantic, between 6 and 9 December 1959, stating ". . . that winds were strong and blowing from west to east north of 35 degrees . . . [and] more easterly . . . [but] not very strong . . . southward between 25 degrees and 15 degrees." Martinique lies slightly south of 15 degrees. Nevertheless, it is still possible that the bird may have been deflected to the West Indies by the North East