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Bill-vibrating: A Prey-attracting Behavior of the Snowy Egret, Leucophoyx thula

ABSTRACT: *The snowy egret* (Leucophoyx thula) *attracts fish by rapidly opening and closing its bill with the tip submerged in the water. In comparison with four other types of feeding behavior, bill-vibrating was as successful as the more energetic types. In southern Florida this behavior is apparently used to attract the mosquito fish* (Gambusia affinis). *Observations of bill-vibrating behavior suggest that imitation of other birds and individual variation in ability in part determine the use of a particular feeding technique.*

The snowy egret (*Leucophoyx thula*) employs a number of behavior patterns to catch prey. Use of feet or wings while wading (Meyerriecks, 1959) and feeding while in flight (Kushlan, 1972a) are fairly common, at least in southern Florida. In a more unusual feeding behavior, the snowy egret attracts prey by rapidly vibrating its mandibles in the water. This behavior has been briefly noted by Parks and Bressler (1963). I have observed bill-vibrating behavior on a number of occasions. This paper is primarily based on 4 hr of observations made on 14 March 1972 at a shallow canal-edge marsh in Shark Valley, Everglades National Park, Florida.

When bill-vibrating, a snowy egret standing in shallow water crouches low holding its body parallel to the water surface, ventral body coverts nearly touching the water. Most commonly the head is held partially out from the body but a crook remains in the neck which permits the bird to stab beyond the position of its head. The tip of the bill is submerged from one-third to one-half its total length. Both upper and lower mandibles are opened and shut with great rapidity, causing water at the tip of the bill to ripple in concentric circles. In addition, drops of water spray laterally several centimeters. The bill is held at a single place for as long as 30 sec. If not successful, the heron moves its head, bringing the bill to another location either to one side or far out in front. While vibrating, frequent stabs are made. I have recorded a single bird making 31 strikes in 23 min (1.3 per min). Strikes were not directed at the spot where the bill entered the water but rather at points 2 to 10 cm distant. On one occasion, I saw a bird bill-vibrating directly in front of its body strike to the side at a point opposite its right leg. Often, when initiating a feeding sequence, a bird will begin bill movement prior to placing its bill in the water. On eight occasions I have seen an egret lift its bill from the water and, while continuing to vibrate in the air, put it down at another spot. A bird sometimes will walk slowly to another location while continuing to vibrate its bill in the water.

The stance taken during bill-vibrating seems to be derived from one of the less common variations of stand-and-wait feeding behavior. When using stand-and-wait behavior, snowy egrets usually stand fairly upright in shallow water with the bill pointing either horizontally or slightly downward. Less commonly, snowy egrets crouch low either in the water or on a rock with neck

retracted and bill pointing to the water. This stance is very similar to the usual feeding posture of the green heron (*Butorides virescens*) depicted by Meyerriecks (1960: Fig. 2). An identical stance is assumed by the snowy egret during bill-vibrating except that the bill is held in the water.

The origin of using rapid bill motion to attract prey is not as clear as the origin of the stance. The only other heron reported to catch fish by bill-vibrating behavior is the black-crowned night heron (*Nycticorax nycticorax*) (Drinkwater, 1958), a species only distantly related to the snowy egret (Bock, 1956). The capability of bill-vibrating may be widespread in the family, however, as Blaker (1969) saw a cattle egret (*Bubulcus ibis*) vibrate its bill for 2 sec in a muddy pond which contained no animal life. Not seeing the bird catch fish, he considered this behavior to be nonfunctional.

All my observations of bill-vibrating were in late morning or early afternoon. On 14 March 1972, I observed a variety of feeding methods and measured the success of five of these: stand and wait, wade slowly, active pursuit, foot-dragging and bill-vibrating. (Descriptions of these techniques are found in Meyerriecks, 1959, 1960; Kushlan, 1972a and this paper.) Bill-vibrating was as successful (measured in terms of prey caught per attempts) as the more energetic types observed (Table 1). The least successful technique observed during this period was stand and wait.

The range of prey taken during bill-vibrating is not known. However, the only four prey items identified visually were mosquito fish (*Gambusia affinis*). This fish is characteristically attracted to disturbances in the water (Kushlan, 1972b:91), particularly disturbances at the bottom which agitate the sediment or at the surface where it often catches struggling insects caught in the surface film. To test the effectiveness of surface disturbance in attracting fish, a piece of wood was fashioned to approximate the size and shape of a snowy egret bill. The tip of this model was rapidly moved up and down breaking the water surface. Ten trials of 10 sec each were conducted at a shallow pool containing six species of small, minnow-sized fish common in southern Florida. During each trial the number of fish attracted to within a 10 cm radius was tabulated. Five min elapsed between trials. An average of 28 mosquito fish (range 19 - 40) was attracted but none of the other species. It would seem that bill-vibrating may be a technique which attracts primarily a single species of fish. It is notable that the mosquito fish is probably the most ubiquitous of the small fishes of southern Florida. It is found in high densities in a number of habitats, particularly along the edges of canals. These trials demonstrated another aspect of surface disturbance. The ripples made by the model caused reflection at the water surface adjacent to the place where it entered the water. Even though mosquito fish closely approached and even bit at the model they were difficult to see. Fish were, however, clearly visible several centimeters from the point of disturbance. As noted above, this is the area to which most strikes are directed.

TABLE 1.— Feeding success of snowy egrets feeding by different techniques during 1 min observations

Feeding technique	Number of observations	Total number of successes/attempts	Per cent success
Stand and wait	4	3/16	19
Walk slowly	3	6/24	25
Active pursuit	1	1/3	33
Foot-dragging	5	4/12	33
Bill-vibrating	22	7/29	24

One aspect of heron biology which has received little attention to date is the role of feeding behavior in the ecology of various species. For example, why does a heron possessing the wide behavioral repertoire of the snowy egret use a particular feeding behavior in a given circumstance? I suggest as a working hypothesis that an egret utilizes the feeding behavior which maximizes its intake of energy while minimizing the energy expended in obtaining it. Such an optimization hypothesis would be most closely approximated when there exists strong pressure to maximize efficiency, for example, when feeding young. However, we may expect an approach towards maximal efficiency at other times as well. The factors which could lead to maximization of energy intake may involve behavioral, ecological and morphological aspects of heron biology.

The snowy egret provides an exceptional subject for study of the behavioral aspects of food ecology. I have previously suggested (Kushlan, 1972a) that variation in the availability of prey during the day may be one factor involved in determining feeding behavior in the snowy egret. Observations of bill-vibrating behavior suggest two other possible factors.

During the observation period of 14 March 1972 one bird fed by bill-vibrating almost exclusively for the entire time. Four other birds joined the first at various times but none fed for longer than 5 min. My observations of one of these birds will serve to demonstrate the pattern. The snowy egret feeding by bill-vibrating was joined by one which had previously been feeding by foot-stirring. The second bird then began bill-vibrating also. It continued for 3 min, making a few strikes, only one of which was successful. It then stood up, looked around and flew over to a group of snowy egrets which were feeding by foot-dragging, whereupon it joined their activities. These observations suggest that imitation of the successful feeding methods of other birds is one factor governing the choice of feeding behavior.

It was apparent that the one bird which fed by bill-vibrating throughout the observation period of 14 March 1972 was substantially more successful than the other birds which on occasion attempted to use this behavior. Bill-vibrating seems much less energy-demanding than the other types of active feeding observed on that day; yet it was equally successful. According to the hypothesis suggested above, it would be advantageous for an egret to feed by bill-vibrating under such circumstances. That more birds were not observed bill-vibrating and that some were not efficient at it suggest that there was some variation in the ability of different birds to feed by this method. It would seem, therefore, that the choice of feeding behavior by an egret may depend at least in part upon its individual capability to perform the necessary physical actions in such a way as to efficiently capture prey.

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