

FOOT-STIRRING FEEDING BEHAVIOR IN HERONS

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A PECULIAR type of feeding behavior, described by various authors as "stirring," "scraping," "raking," and so on, has been recorded for several species of herons and other birds (see, for example, Rand, 1956). Briefly, the feeding heron extends one leg and vibrates or quivers it, especially the foot, then stabs at any prey that darts from the disturbance. The purpose of this paper is to describe my observations of this behavior in three North American heron species, and to give several examples of apparent "footedness" (i.e., preference for one foot while foot-stirring) in these same species. My observations concern the Snowy Egret (*Leucophoyx thula*), Reddish Egret (*Dichromanassa rufescens*), and the Louisiana Heron (*Hydranassa tricolor*). All three species were observed in Florida Bay and around the Laguna de la Joyas, near Puerto Arista, Chiapas, Mexico. Additional observations of the Snowy Egret were made on Rulers Bar Hassock, Jamaica Bay, western Long Island, New York, and near Tehuantepec, Oaxaca, Mexico.

USE OF THE FEET

Snowy Egret.—In Florida Bay, the clearness of the water and the relative tameness of this species offered exceptional opportunities to see the feet during this behavior. The whole body, particularly the extended leg, vibrates, and these movements seem to impart a stirring motion to the foot. Usually the bird stirs the substrate, but on several occasions I could clearly see individual birds stir the foot above the surface of the mud, not in it. The bright yellow toes of *thula* are sharply set off from the black legs, and when one of these egrets stirs above the substrate, I get the impression that it is using its foot as a lure.

Stirring is probably the best description of the motion of the foot, but at times N. B. Moore's term "raking" is more appropriate (Baird *et al.*, 1884). When raking, Snowy Egrets extend one leg, then rake the substrate by short, rapid movements of the toes. I saw that this species usually rakes mud, but it tends to stir aquatic vegetation. For example, while using this feeding method on the shallow reefs near Cowpens Cut in Florida Bay, several Snowy Egrets concentrated on stirring tufts of turtle grass (*Thalassia*). When a fish darted from one tuft to another, the egret peered at the tuft, stirred it until the fish moved again, then repeated this procedure until it made a successful strike or moved to a new location. Stirring tufts of turtle grass by *thula* resembles the weed-stirring of the Reef Heron (*Demigretta schistacea*) seen by Hartley (Gibb and Hartley, 1957).

However, when feeding in the shallow muds of Dove Creek slough on Key Largo, Florida, Snowy Egrets tended to rake more than stir. Perhaps different

kinds of prey are taken by stirring and raking; however, fish is the only food I have seen Snowy Egrets secure by either method.

The usual movements made by a Snowy Egret foot-stirring are "stir-peer-stab" or "stir-stab." However, one bird stirred continuously for about one minute, then it twirled about with open wings as it chased several fish forced to move by the egret's activities. Another individual raked the mud of Dove Creek slough until an area of about 100 square feet had been roiled, then the bird ran through the muddied water with open wings, stabbing to the right and left at the harried fish.

The Snowy Egret also shows an interesting aerial variant of this feeding method that I call "hovering-stirring." Sprunt (1936) saw a Snowy Egret hover and pat the surface of the water, while Bond (1934) and Grimes (1936) both observed *thula* feed on the wing. N. B. Moore (Baird *et al.*, *op. cit.*) saw a flock of Snowy Egrets feed by hovering over a shoal of minnows, but apparently none of these authors saw the egrets stir the water while feeding. My observations of hovering-stirring were made in Florida Bay, and typically the feeding egret hovered over one spot, dangled one or both legs, then stirred a tuft of grass or some debris until the prey was forced to move. The strike was always made from the hovering position.

"Foot paddling," in which the legs and feet are moved rapidly up and down on the substrate, has been recorded for *Leucophoyx thula* and *Egretta garzetta* in the Amsterdam Zoo by Portielje (1928). This behavior is very similar to the paddling of many gulls and waders (see discussion in Tinbergen, 1953). I have seen paddling in *thula* on one occasion (Rulers Bar Hassock, May 15, 1954). A single Snowy Egret was stirring in the manner described, when suddenly it stopped, paddled vigorously for about 20 seconds, then resumed stirring. The paddling movements were clearly distinct from those used in stirring.

Reddish Egret.—The foot-stirring of this species differs from that of the Snowy Egret in the following ways: 1) *rufescens* does not extend its leg forward and vibrate it, but simply vibrates its feet as it wades forward in a normal manner; 2) the foot is not moved in a stirring motion but rather it is scraped or raked over the surface of the mud; and 3) *rufescens* scrapes both mud and aquatic vegetation, even when hovering (see below). N. B. Moore (Baird *et al.*, *op. cit.*), commenting on the scraping behavior of *rufescens*, states that "It is a mode peculiar to this species, and not to be mistaken for that of any other."

Motion pictures I took of one Reddish Egret using this feeding method clearly show the scraping movements so typical of this species. The foot is moved rapidly back and forth as the bird slowly wades forward, and the toes appear to scrape or rake the substrate. Of the many Reddish Egrets I have watched using this method, none made stirring movements.

When scraping, *rufescens* almost always uses the technique "scrape-peer-stab." Typically, the feeding bird wades forward slowly, scraping as it goes, then it stops and peers intently at the surface of the water, and then it either stabs at some prey or moves on, usually resuming the scraping movements. As mentioned, in areas where tufts of aquatic grass abound, Reddish Egrets move these plants in search of prey by scraping, not stirring.

This species also shows the aerial variant "hovering-scraping." When hovering over the water, *rufescens* is an extremely agile, graceful species as it moves effortlessly from tuft to tuft. The legs of the bird are dangled, and the plants are agitated by scraping motions of the feet. As with the Snowy Egret, *rufescens* strikes from the hovering position. Although quantitative evidence is lacking, I believe that *rufescens* uses the hovering method more frequently than *thula*.

Louisiana Heron.—This species resembles the Snowy Egret in that it extends one leg and foot forward and then vibrates it rapidly, thus imparting a stirring motion to the foot. I have never seen tuft-stirring in *tricolor*, but I did observe that this species always stirs mud, unlike *thula*, which may stir or rake it. I have never seen hovering-stirring in *tricolor*.

McIlhenny (1936) claims that the Louisiana Heron uses foot-stirring during the winter only, "when the water is cold and their food supply inactive." This was not the case in the winter of 1955-56 in Florida Bay. All of the stirring observations I made of *tricolor* were recorded during warm periods, and I was able to see the tiny fish the herons were preying upon moving about quite actively. For example, the air temperature at Cowpens Cut on April 6, 1956, at 1130 hours was 85 degrees F., and the fish sought by the herons were constantly moving about my boat. On this date I watched a Louisiana Heron foot-stir for three minutes.

DURATION OF FOOT-STIRRING

Of the three species I have watched, the Snowy Egret uses foot-stirring as a feeding method more often and for longer periods than the other two. N. B. Moore (Baird *et al.*, *op. cit.*) also observed that *thula* uses this technique more frequently than *tricolor* and *rufescens*. Table 1 was made by selecting comparable observations from my field notes. Only those records made of all three species using foot-stirring feeding behavior on the same day in the same place are listed. One bird only was watched during the entire period of observation, and the duration of foot-stirring was recorded with a stopwatch. A glance at Table 1 shows that the Snowy Egret uses foot-stirring for longer periods than do the Reddish Egret and the Louisiana Heron.

Table 2 lists observations of foot-stirring in these same three species that are not comparable as to day, place, and so on, but the data support my belief that Snowy Egrets use this feeding method more often and for longer periods than the other two species.

The few records I have of feeding success while using foot-stirring (see Tables 1 and 2) show that the method is effective. N. B. Moore (*op. cit.*) watched a flock of 70 Snowy Egrets on February 18, 1873, and "scarcely one of this species obtained food without raking for it, numbers being thus engaged at the same time." All of the successful strikes listed in the tables were made on small fish.

TABLE 1
DURATION OF FOOT-STIRRING AND FEEDING SUCCESS IN THREE SPECIES OF HERONS

Species		Place and date			
		Florida Bay		Chiapas, Mexico	
		December 16, 1955	March 11, 1956	March 12, 1956	June 24, 1956
<i>Leucophoyx thula</i>	Period ¹	63	27	19	17
	Duration ²	13	26	15	12
	Success ³	3/10	5/9	2/17	1/5
<i>Dichromanassa rufescens</i>	Period	150	41	75	8
	Duration	2	3	4	2
	Success	1/4	1/8	1/11	0/0
<i>Hydranassa tricolor</i>	Period	35	57	83	6
	Duration	1	2	1	1
	Success	0/0	0/3	1/1	0/0

¹ Total period of observation in minutes.

² Duration of foot-stirring in minutes.

³ Number of successful strikes/total strikes while foot-stirring.

TABLE 2
FREQUENCY AND DURATION OF FOOT-STIRRING AND FEEDING SUCCESS
IN THREE SPECIES OF HERONS¹

Species	Number of observations	Total observation period in minutes	Total duration of foot-stirring in minutes	Strike success ²
<i>Leucophoyx thula</i>	10	319	87	17/62
<i>Dichromanassa rufescens</i>	5	470	10	4/23
<i>Hydranassa tricolor</i>	4	120	8	4/17

¹ All of the separate observational periods are combined, as are the duration of foot-stirring and strike success.

² Number of successful strikes/total strikes while foot-stirring.

FOOTEDNESS

I have the following four records of footedness in herons while using foot-stirring feeding behavior: Snowy Egret, 2 (both right); Reddish Egret, 1 (right); and Louisiana Heron, 1 (left). All four individuals used the foot indicated for the entire duration of foot-stirring. These clear cut preferences differ from Hartley's (Gibb and Hartley, 1957) observation of a Reef Heron that used "either foot, but the right more often than the left, to stir tufts of weed to bolt small fishes." Some Snowy Egrets I watched seemed to "lean" toward the use of one foot during an extended period of foot-stirring, but none of these birds was as clear cut in its preference as those cited.

FOOT-STIRRING IN OTHER HERONS

I found many references to the foot-stirring feeding behavior of various herons, but Rand (1956) mentions only *thula* and *tricolor*. Prior to my own observations of *rufescens*, only those of N. B. Moore (Baird *et al.*, *op. cit.*) appear to have been available for this species. However, a number of observations of this feeding method have been made in several Old World species of herons. Hartley's record for the Reef Heron has been mentioned, while White (1946), Hopkins (1948), Koenig (1952), and Hobbs (1957) have seen foot-stirring in the Little Egret (*Egretta garzetta*). In Australia, Hopkins (1948) saw this feeding method in the Pied Heron (*Notophoxyx picata*), and Hobbs (1957) observed foot-stirring in the White-faced Heron (*Notophoxyx novaehollandiae*).

I have never seen foot-stirring in the Common Egret (*Casmerodius albus*), and several authors comment on the absence of foot-stirring in this species (e.g., Rand, 1956; Hobbs, 1957). However, Bagg and Eliot (1937), citing the observation of F. A. Stebbins and A. M. Bowen, state that "the Egret [i.e., *albus*] waded deeper, and when on a muddy bottom would, with the aid of his wings, hop straight up clear of the water and come down with stiff, spread toes, and then scrutinized the 'roil' he had caused for dislodged prey. He swallowed several fish." Although it is not foot-stirring, this observation suggests that some herons may effectively secure food by a feeding method using the legs and feet to disturb the prey without recourse to stirring or scraping.

DISCUSSION

The bright yellow toes of *thula* and *garzetta* are sharply set off from the black legs, and both species use foot-stirring feeding methods. This distinctive pattern suggests that it may have evolved in conjunction with this peculiar feeding technique. However, the feet of *thula* turn a brilliant coral orange during the early part of the breeding season, and the feet are conspicuously displayed at this time (Meyerriecks, 1958). In addition, the feet of *garzetta* become crimson-pink during the breeding season (Henry, 1955), but the displays of

the Little Egret are not known in detail. It is possible that the feeding function of this pattern is primary and the display function secondary; however, both functions will reinforce the selection of bright feet. More information on the frequency and duration of foot-stirring in herons is needed before any conclusions can be made.

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