

GENERAL NOTES

Further observations on use of the feet by foraging herons.—In two previous contributions (Meyerriecks, Wilson Bull., 71:153–158, 1959; Auk, 83:471–472, 1966), I described how foraging herons use their feet in what is usually referred to as “foot-stirring” or “foot-raking” feeding behavior. To my knowledge, prior to 1970 this mode of foraging behavior was known for nine species of the Family Ardeidae: Snowy Egret (*Leucophoyx thula*); Reddish Egret (*Dichromanassa rufescens*); Louisiana Heron (*Hydranassa tricolor*); Reef Heron (*Demigretta schistacea*); Little Egret (*Egretta garzetta*); Pied Heron (*Notophoyx picata*); White-faced Heron (*Notophoyx novaehollandiae*); Green Heron (*Butorides virescens*); and Black Heron (*Melanophoyx ardesiaca*) (see descriptions and contained references in Meyerriecks, op. cit.).

My purpose here is threefold: 1) to describe my observations of use of the feet while foraging by two additional species of herons, one using a “classical” method (foot-raking by the Little Blue Heron, *Florida caerulea*), and the other using the feet in a somewhat different manner in order to capture prey (Common Egret, *Casmerodius albus*); 2) to describe my observations of variations in this kind of behavior in species already known to use their feet while foraging (Louisiana Heron and Snowy Egret); and 3) to add an additional observation for the Green Heron.

All observations were made in the winter of 1969–70 at three localities in the Florida Keys: 1) a large slough on Little Duck Key, west of Marathon, Key Vaca; 2) the ocean side of Little Duck Key; and 3) the tidal shallows on the eastern side of Fiesta Key, located southwest of Islamorada, Upper Matecumbe Key. On many charts Fiesta Key is also known as Greyhound Key. Observations at Little Duck Key slough were made from blinds placed at the edge of the slough or directly from an open position alongside U.S. Highway 1. Those made on the ocean side of Little Duck Key and from Fiesta Key were from an open position at the edge of the tidal flats.

Little Blue Heron.—Two adults of this species were observed on 18 February 70 using their feet to forage in a manner somewhat reminiscent of both the Reddish Egret and the Green Heron, i.e., they would move forward using the “Wade Slowly” foraging technique (see details in Meyerriecks, Publ. Nuttall Ornith. Club, No. 2, 1960), occasionally stopping for a moment to extend one leg with toes widespread. Then they were seen to rake or scrape the substrate with a backward drag of the extended foot. At other times, the foraging heron would stop, peer down into the shallows, then extend a leg and foot-rake, afterwards peering intently at the raked area. The general stance of both birds and the peering down behavior were like those of the Reddish Egrets engaged in foot-raking. However, the raking motion of the spread toes was closer to that performed by Green Herons: unhurried, deliberate, a longer stroke than that of the Reddish Egret. Clearly, the use of the feet by these Little Blue Herons differed strikingly as compared with Snowy Egrets, the foot-stirrer *par excellence*.

One of the adults was seen to forage in Little Duck Key slough for two hours and 17 minutes; it foot-raked nine times during this period and was successful in capturing two small fish immediately after two separate foot-rakes. All of its raking appeared to be made in the soft mud covering the bottom of the slough. Water in the slough was clear and several inches deep. The other adult foraged in shallow pools left by the receding tide on the ocean side of Little Duck Key. This was a different individual because both birds were in view at the same time as seen from my position on the bordering road. This ocean-side adult raked only patches of turtle grass (*Thalassia*). The foraging bird

would wade forward slowly, spy a patch of turtle grass, extend one leg and rake over the surface of the vegetation with a single, backward dragging motion, then peer intently at the raked patch. This adult was watched for 27 minutes and made 14 foot-rakes, only one of which led to the seizure of a small fish. Neither bird showed any aerial variant of this behavior, nor did I ever see an immature (white-plumaged) Little Blue Heron use its feet to foot-rake. Neither of the adults showed any preference for use of the right or left foot, but the brevity of the observations does not eliminate the possibility of "footedness" in this species.

On 16 March 70 I observed another adult Little Blue Heron use foot-raking twice during an observation period of 10 minutes at the Little Duck Key slough, but it made no strikes. It is not known if this was one of the two adults previously seen at or near the slough.

I was surprised to see this behavior in Little Blue Herons because I have watched this species forage for hundreds of hours and have not seen this feeding technique prior to these observations. No environmental variable such as weather, nature of the substrate, water condition, etc., seemed to differ strikingly from hundreds of other heron-foraging days I have recorded; hence, I believe that foot-raking may be a highly unusual foraging technique for this species. One is tempted to consider observational learning as a possible explanation for such rare occurrences in a few individuals. Seven or eight species of herons may be foraging in close approximation in sloughs and similar environments in the Florida Keys. Included in the group, typically, will be such frequent users of foot-stirring as Snowy Egrets, a species that not only engages in this behavior more often than any other North American heron, but also does so for longer periods and with greater success. Thus, ample opportunities are provided for other species to observe a proven method of prey capture.

Common Egret.—I made observations of use of the feet while foraging by two individuals of this species. The first was seen on the ocean side of Little Duck Key; the second was observed foraging in the shallows on the eastern side of Fiesta Key. The first bird was seen foraging at low tide among patches of turtle grass on 18 February 70. The foraging bird, using the wade slowly method of searching for prey, would approach a patch of vegetation, bend over and peer intently at it for several moments, a posture I had seen previously hundreds of times. Suddenly the bird extended its right leg with toes wide-spread, and then slowly raked the edge of the turtle grass patch with its toes. The motion was made deliberately, very slowly, a kind of *probing* of the vegetation. The foot was neither vibrated in the manner of the Snowy Egret nor was it used in the raking motion of the Reddish Egret. It was in fact a different way of disturbing prey from their hiding places. This egret foot-probed four times at four separate patches of grass and was successful in capturing fish after each probe. The bird probed twice with each foot. My observations were ended when a shell collector disturbed the egret.

The second individual was seen foraging among red mangrove (*Rhizophora mangle*) prop roots. On 15 March 70 this egret was seen first to use its feet directly in prey capture assistance when it struck at a fish which escaped by swimming into the cover of a nearby tangle of mangrove prop roots. Mangrove leaves and other debris at the base of the prop roots were covered by a few inches of very clear water. After the missed strike, the egret ran toward the mangroves, leaned over, and peered intently inside the prop root cover. Several times it swayed its neck from side to side, as if to gain a better view or perhaps to fixate its intended victim. Next, it extended its left leg, but the toes were held together. The bird then inserted its foot into the prop root cover and made a slow, deliberate raking motion twice over the debris on the substrate. It withdrew its foot and peered

intently at the debris. I watched this individual forage for 70 minutes, and during this period the egret made seven strikes, two of which were successful. Of the missed strikes, three resulted in the egret running toward a prop root tangle and giving the performance just described. On its last use of foot-probing, the egret disturbed a fish which was promptly captured as it swam out from its protective cover.

As with the Little Blue Heron, I am prompted to consider this use of the feet by the Common Egret as exceptional behavior in view of the rarity of its occurrence, based on my own extended field observations. Several authors (cited in Meyerriecks, 1959) have noted the lack of foot-stirring in this species, although Bagg and Eliot (reference, op. cit.) described a different manner of prey capture involving use of the feet. In both my observations and those of Bagg and Eliot, the Common Egret used its feet in a manner quite different from that of "classical" foot-stirring or foot-raking.

Other heron species.—The smaller heron species (e.g., Louisiana Heron, Green Heron) normally do not forage among the densely packed pneumatophores of black mangroves (*Avicennia nitida*) but prefer to search for prey in the shallows at the edge of the pneumatophore zone or else among the less densely packed ones. However, on 13 January 70 at a slough in Layton, Long Key, I watched a single adult Snowy Egret foot-stir repeatedly in densely packed pneumatophores. The bird would vibrate its extended foot at the base of several pneumatophores in the classic style of this species. I watched this bird forage for nine minutes, and during this period it stirred the vegetation almost continuously, making 23 strikes. Seven attempts were successful in capturing very small fish. After one strike, during which the bird's head struck several pneumatophores, it closed its right eye repeatedly and shook its head a number of times. Perhaps general avoidance of the packed zone of pneumatophores is brought about by such annoyance or even injury to the eyes during a strike. Additionally, even though this egret made seven successful strikes in the dense zone, interference with a strike and subsequent loss of prey might stimulate a foraging bird to leave the pneumatophore area and seek more profitable foraging elsewhere.

An immature Green Heron, a bird of the year based on its plumage, was seen to foot-rake on 16 January 70 at the Layton slough. It did so five times, but the bird did not make any strikes after use of its feet. As pointed out previously (Meyerriecks, 1966, op. cit.), this is a very rare foraging method for this species.

In my 1959 paper I noted that I had never seen the Louisiana Heron use the scrape method of the Reddish Egret. Rather, its use of the feet closely resembled that of the Snowy Egret; that is, classic foot-stirring. On 19 February 70, however, I saw a lone adult Louisiana Heron use foot-scraping three times while foraging in the shallows east of Fiesta Key. The bird made one unsuccessful strike. The performance was very similar to that of the normal foot-scraping of the Reddish Egret.

Recently, Vanden Berge (Amer. Midl. Nat., 84: 289-364, 1970) has made a detailed study and analysis of ciconiiform appendicular musculature. He points out that "Four genera of the ardeids which were examined, namely, *Florida*, *Dichromanassa*, *Hydranassa*, and *Leucophoyx*, were remarkably consistent in the quantitative measurements and qualitative variations which were noted among all Ciconiiformes." He adds that "Of all the Ardeidae, these four 'day' herons show the most diversified locomotory activity during feeding." I could not agree more with respect to the last three genera, but this statement is misleading for *Florida*. The Little Blue Heron is a slow, deliberate forager and shows neither the active running techniques nor the more advanced wing-involved methods of the other three genera. Even in its rare foot-raking, as described here for the first time, this species again is slow and deliberate while foraging. Vanden Berge was

unable to study the pelvic musculature of *Casmerodius albus*; it would be of the greatest interest to know if its musculature agreed with that of the four "day" heron genera studied by him. My field observations and the detailed anatomical investigations of Vanden Berge suggest that heron foraging behavior provides a fertile field for studies of the functional anatomy of heron musculature.—ANDREW J. MEYERRECKS, *Department of Biology, University of South Florida, Tampa, Florida 33620, 28 January 1971.*

Size differences between Ross' and Snow Goose eggs at Karrak Lake, Northwest Territories in 1968.—In the central Canadian Arctic Ross' Geese (*Chen rossii*) and Snow Geese (*Chen caerulescens*) nest in mixed colonies on islands in shallow tundra lakes (Ryder, Auk, 86: 282-292, 1969). During nesting studies of the Ross' Goose at Karrak Lake, Northwest Territories (67°15'N 100°15'W) I occasionally found it difficult to determine visually whether temporarily unattended nests belonged to Ross' or Snow Geese. When I approached a nesting island during the egg-laying period, attending pairs would flush at a considerable distance (Ryder, Canadian Wildl. Serv. Rept. Ser. No. 3:27, 1967). One of the procedures used to obtain nest histories (i.e. follow the fate of nest and eggs from the day the first egg was laid to the hatching or disappearance of all eggs) was to mark all newly-started nests in a number of study areas at the colony. We temporarily assigned a species to each marked nest until the female was seen sitting on the nest. This method had one major drawback. On occasion marked nests were destroyed by predators (arctic fox, *Alopex lagopus*; Glaucous Gull, *Larus hyperboreus*; Herring Gull, *L. argentatus*) before laying was completed or just after completion. In such

TABLE 1
MEASUREMENTS OF SNOW GOOSE AND ROSS' GOOSE EGGS, KARRAK LAKE, NORTHWEST TERRITORIES, 1968

Snow Goose	Length (mm)	Width (mm)
N	50	50
upper	87.9	56.7
Range:		
lower	72.6	50.5
Average	80.5	53.8
S.D.	2.0	1.3
Ross' Goose	Length (mm)	Width (mm)
N	52	52
upper	80.2	51.4
Range:		
lower	67.2	44.7
Average	73.1	47.5
S.D.	2.5	1.5

Average lengths and widths are significantly different, $P < 0.01$.