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AERIAL FORAGING BY TRICOLORED HERONS, SNOWY, AND GREAT EGRETS

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Tricolored Herons (*Egretta tricolor*) and Snowy Egrets (*E. thula*) are intermediate-sized herons that forage actively, are opportunistic in exploiting ephemeral food resources, and exhibit behavioral plasticity (Toland 1999). Great Egrets (*Ardea alba*) are larger and use a less active approach in their foraging, often remaining motionless for extensive periods as they forage. Most foraging of Tricolored Herons and Snowy Egrets is done in shallow water, but both species will occasionally take prey by aerial feeding in water that is too deep for them to wade (Kushlan 1976). Great Egrets commonly forage in deeper water, but also occasionally take prey from flight (Kushlan 1976). Aerial feeding has been described as a number of distinct foraging behaviors that include: "Hovering," where a heron hovers over a spot and reaches down with it bill to seize prey (Grimes 1936, Jenni 1969); "Hovering-stirring," where the heron stirs water or debris with a foot with legs dangling (Meyerriecks 1959, Sprunt 1936); "Dipping, "where the heron continues in direct flight while capturing prey from the water (Dickinson 1947), and "Foot-dragging," where the heron drags its toes through the water while catching prey during direct flight (Kushlan 1972). Dipping or Hovering has been recorded for many heron species (Kushlan 1976) and is often associated with taking dead or injured fish (Reese 1973, Rodgers 1974, 1975). We report here on additional observations of Tricolored Herons and Snowy Egrets and Great Egrets using Dipping and Foot-dragging methods in foraging and assess the overlap of Dipping, Hovering, and Foot-dragging foraging behaviors.

On 12 March 1997 from about 0900-1000, we were walking along Anhinga Trail in Everglades National Park in south Florida. The elongate pool along the trail narrows to 2-3 m, and has emergent vegetation along both sides with occasional vegetation emerging from the open water. WED saw two Tricolored Herons make 2-3 m flights from one side of the water body to the other, alighting on low perches on either side. The birds flew low over the water and usually, with legs and feet partially dangling but not touching the water, paused in flight and stabbed at the water surface to seize 3-4 cm fish (probably *Gambusia* sp.). This pause in the bird's direct flight was sometimes accompanied by hovering for 2-3 wingbeats. One heron caught one fish on one attempt, the other caught 2 fish in 6 attempts. The second bird also hover-gleaned an unidentified prey item from emergent vegetation. JAJ independently observed three Tricolored Herons performing the same maneuvers. Two birds each caught a fish in single attempts, the third bird caught six fish in six attempts. Two of the three herons were probably the same birds recorded by WED. The total of 16 attempts resulted in 12 captures (75%). Flights were all 2-3 m from one perch to another and Dipping was accompanied by very little hovering.

On 11 March 1999 WED witnessed Dipping behavior by eight Snowy Egrets and a Tricolored Heron foraging at the J. N. "Ding" Darling National Wildlife Refuge on Sanibel Island, Florida. At the junction of Cross Dike and Indigo Trails, the waterway makes a right-angle turn and varies in width from 7-12 m. Mangroves line both shores except for one stretch cleared of vegetation along the dike. Two floating platforms, about 1 × 1.5 m,

containing mangrove seedlings were anchored about mid-stream. From about 0750-0800 eight Snowy Egrets flew back and forth between perches on mangroves, from one shore to another, from one of the floating platforms to shore, or from mangrove perches to the limestone-sand shoreline. Sometimes a bird sallied forth from a platform or mangrove perch and returned to its original perch. Typically an egret flew close to the water surface in slow direct flight with legs dangling, often with feet dragging in water, and attempted to seize a fish at the surface by lowering its head and stabbing with its bill. One to three prey-capture attempts were made per direct flight. In some flights a bird dragged its feet constantly, in some forays it dragged its feet only immediately before attempting prey capture, and in a few cases a bird did not drag its feet. There was no hovering. The situation was chaotic, a frenzy of activity, with several birds Dipping or Foot-dragging at the same time. It was not possible to determine a success rate for prey capture but several observations were made of egrets bringing ashore approximately 5-cm fish before swallowing them. Only once did a Tricolored Heron leave the shore and unsuccessfully try to capture prey by Dipping. At about 0800 the herons dispersed and further Dipping behavior was not seen.

On 9 March 2000 at 10:35, JAJ observed a Great Egret at Corkscrew Swamp Audubon Sanctuary as it flew from a barely emergent stump, dipped into the water with its bill in an unsuccessful effort to seize a small fish, then returned to its original perch. Its feet dangled to near the water, but only once barely touched it.

Kushlan (1972) associated the use of aerial foraging by Tricolored Herons and Snowy Egrets with lowered prey availability. Our observations suggest that the birds were simply opportunistic and availed themselves of surface prey. At Anhinga Trail and Corkscrew Swamp, water levels were seasonally low, concentrating prey that were easily observed by us.

McIlhenny (*in* Dickinson 1947) observed Tricolored Herons and Snowy Egrets ". . . swoop down and hover for a moment, darting" the head underwater to seize a twig that could be used in nest-building. This behavior appears to fall between Hovering and Dipping, since the herons "hover for a moment," but is marginally relevant since it did not involve prey capture. Dickinson (1947), however, reported observations of 50-60 Snowy Egrets Dipping and taking fish prey while circling over open water of a lake. Fargo (1937) reported Snowy Egrets Dipping while flying back and forth across a 7-m-wide ditch. Rogers (1974) reported multiple observations of Snowy Egrets Hovering (often with legs dangling and feet submerged). He (1975) also observed Hovering by Tricolored Herons. In both cases the birds were feeding on dead or dying fish. Jenni (1969) reported Tricolored Herons and Snowy Egrets "flying low over the water, or hovering and reaching down into the water to grasp prey in the bill." We believe that Hovering and Dipping are associated behaviors—extremes of a behavioral continuum. The Tricolored Herons we watched occasionally hovered momentarily when taking live, active prey but mostly maintained direct flight. The Snowy Egrets foraged by Foot-dragging and Dipping but did not hover. Reports of Hovering often are associated with retrieving dead, dying, or highly concentrated prey, where possibilities of escape are low and hovering before striking is therefore a viable option. We suggest that Dipping and Hovering are variations on the same foraging theme, and that the escape potential of the prey determines which foraging behavior is practiced. Foot-dragging may or may not be included in the aerial foraging repertoire of birds feeding at the same time, and thus the function of foot-dragging remains problematic. It may serve to startle prey into movement or simply be an artifact of slow direct flight with feet dangling for balance. We suggest other possible functions: dragging the feet would slow forward momentum and could also steer and stabilize motion—like the rudder on a boat—thus steadying the bird and facilitating prey capture.

A study by E. A. Chapin (unpublished records of the Bureau of the Biological Survey from analysis of stomach contents of birds collected from diverse coastal areas of the

U.S.; cited in Howell 1932) revealed that killifish were a frequent food of Tricolored Herons, being found in 38 of 48 stomachs. Other studies which examined regurgitated boluses from nestlings, also revealed a preponderance of killifish and topminnows in Tricolored Heron and Snowy Egret diets (Jenni 1969, Frederick 1997). These primarily surface-feeding fish would be especially vulnerable to aerial foraging. The presumed prey of the Tricolored Herons, *Gambusia*, were clearly visible at the sites of our observations, and surface feeding fish were clearly the prey of Snowy Egrets at Sanibel Island.

Although Kent (1987) found that Tricolored Herons had a greater striking efficiency when walking slowly than with more active foraging, our observations suggest that aerial foraging can be very efficient. Kent (1987) also noted that the foraging behavior that resulted in the greatest striking efficiency may not be the behavior most often used. Clearly, the best mode of foraging may vary with individual abilities, microhabitat, prey availability, potential predators, lighting, and wind conditions. In the case we observed for Dipping Tricolored Herons at Everglades National Park, prey were easily available, in good light with no wind, and the shoreline provided numerous perches on opposite sides of a narrow water body. We suspect that the presence of numerous patrolling alligators at Anhinga Trail and at Corkscrew Swamp may have made aerial foraging a less hazardous option than wading or perching on emergent vegetation in open water. The Sanibel Island birds appeared to be momentarily exploiting an ephemeral surface prey in water too deep for wading.

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