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USE OF TONGUE-FLICKING BEHAVIOR BY THE SNOWY EGRET

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Abstract.—Snowy Egrets (*Egretta thula*) were observed using the tongue-flicking feeding technique during full moon, spring tide periods in a southern New Jersey salt marsh. Egrets fed mainly on two species of fish, which were normally confined to salt marsh pannes. Spring tides flooded the marsh to a depth of 15–25 cm causing a dispersal of fish over the entire marsh surface. The resulting drop in prey density could have initiated the use of this prey-attracting foraging technique. Tongue-flicking may have been more efficient than other feeding techniques when prey were widely dispersed.

UTILIZACIÓN DE LA TÉCNICA DE MOVIMIENTO DE LA LENGUA POR INDIVIDUOS DE *EGRETTA THULA*

Sinopsis.—En un anegado salobre del sur de New Jersey, se observaron (en noches de luna llena) a individuos de garza blanca (*Egretta thula*) utilizar la técnica de movimiento de la lengua para atraer presas, durante el periodo primaveral de incremento en los niveles de agua. Las garzas se alimentaron principalmente de dos especies de peces, que normalmente están confinados a anegados salobres. Debido a las aguas primaverales, el anegado se inundó hasta una profundidad de 15–25 cm, causando una dispersión de los peces a través de toda la superficie de éste. El resultante decrecimiento en la densidad de presas puede haber iniciado el patrón de conducta de movimiento de lengua, para atraer a los peces. Esta técnica de forrajeo puede que sea más eficiente que otras utilizadas por las garzas cuando los peces utilizados como alimento, están dispersos.

Snowy Egrets (*Egretta thula*) use a greater variety of foraging techniques than any other North American heron (Kushlan 1976). One of the least investigated and understood of these techniques is tongue-flicking (Buckley and Buckley 1968, Parks and Bressler 1963), which Kushlan (1973) found to attract fish. Observations of tongue-flicking were made as part of a more comprehensive investigation of the effects of prey and environmental characteristics on Snowy Egret foraging strategies (Master 1989).

STUDY AREA

The salt marsh where observations were made is located near the town of Stone Harbor, Cape May County, New Jersey. Under normal tidal conditions, the marsh is not inundated during either of the two daily high tides. Spring tides, which coincide with the full moon and last from 6 to 8 d, inundate the marsh surface for a period of several hours to a depth of 15–25 cm. Tidal height is dependent upon monthly and daily tidal fluctuations. The maximum inundation depth of 20–25 cm usually occurs during the evening high tide on the day of the full moon in July and August. This period lasts for approximately 1–2 h.

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METHODS

All of the data reported were collected during 15 h of observation on five July/August full-moon days over a period of 3 yr. These particular days were chosen because maximum water depth presumably equated with maximum prey dispersal. Tongue-flicking was also observed during spring tides of lesser magnitude throughout the study.

Detailed foraging observations were made only on Snowy Egrets located within 150 m of the 10.5-m-high observation tower used during this study. Egrets were chosen in the order in which they were discovered and observation continued until they flew away, moved out of sight or stopped feeding (Willard 1977). Only data from those individuals observed for at least 10 min were included in foraging analyses. All individuals that engaged in tongue-flicking did so for the entire observation period. Fish density was measured using the Petersen mark-recapture technique.

RESULTS

During the early stages of flooding (1–10 cm in depth), Snowy Egrets arrived on the marsh and began feeding. Common foraging techniques used at this time included stand and wait, walk slowly, walk quickly, run and hop (Kushlan 1976). At maximum depth, 19 of the Snowy Egrets observed on all sample days (62% of the total observed) used the tongue-flicking feeding technique. With the exception of five individuals seen using the technique on large pannes (>1000 m^2), tongue-flicking was observed exclusively during spring tides throughout the 404 h of observation accumulated during all aspects of this project.

The use of this feeding technique during spring tides may have reflected changes in the distribution of the Snowy Egret's major prey items, the Mummichog (*Fundulus heteroclitus*) and Sheepshead Minnow (*Cyprinodon variegatus*) (Master 1989). During non-spring tide periods, these fishes were found in tidal channels and isolated salt marsh pannes where egrets normally did most of their foraging. The mean density of fish in pannes was 65.6 ± 1.5 (SD) fish/m^2 of panne substrate (n = 33) (Master 1989). During spring tides, fishes dispersed from these confined areas with the rising water level which resulted in a change in density. Fish density over the marsh surface dropped to only 0.30 ± 0.10 fish/m^2 (n = 54) during these periods (Master 1989).

DISCUSSION

The use of what Kushlan (1973) described as a prey-attracting behavior suggests that egrets may have been minimizing the energetic cost of foraging. Egret stepping rates have been used as an indication of effort expended during foraging bouts (Hafner et al. 1980). Snowy Egrets were nearly stationary when using tongue-flicking, which reduced their stepping rate significantly below the rate for other spring tide feeding techniques (Table 1). Kent (1986) determined that standing egrets required less energy than those using active foraging techniques. Presumably, less

TABLE 1. Comparison of the mean (±SE) stepping rate, capture rate and capture efficiency among spring tide foraging behaviors.

	Foraging behavior	
	Tongue-flicking (n = 10)	Other behaviors (n = 21)
Steps/min	0.38 ± 0.03	12.70 ± 0.33[a]
Captures/min	0.44 ± 0.04	0.39 ± 0.01
Captures/strike	0.38 ± 0.02	0.37 ± 0.01

[a] $P < 0.001$; Wilcoxon two-sample test.

stepping reduced energy expenditure during foraging bouts, although the energetic cost of tongue-flicking itself remains unknown. Conversely, capture rate (captures/min) and capture efficiency (captures/strike), when using tongue-flicking, were comparable with other spring-tide feeding techniques (Table 1). Therefore, tongue-flicking Snowy Egrets acquired similar quantities of prey when compared to individuals using other techniques but may have expended less energy in the process. Kushlan (1973) suggested that egrets use feeding behaviors that maximize energy intake and minimize energy expenditure under specific environmental conditions. Energy efficient prey size selection has been noted in both the Snowy Egret and closely related Little Egret (*E. garzetta*) (Cezilly et al. 1988, Itzkowitz and Makie 1986).

A major problem in foraging studies is that prey distribution patterns are usually not known precisely when predators are present (Kushlan 1978). Perceived changes in prey distribution are often inferred by observing the foraging success of predators rather than by direct sampling of the prey population (Hafner et al. 1980). Consequently, it is often difficult to imply that changes in the foraging behavior of predators are the result of changes in prey distribution. Erwin et al. (1985) did relate prey distribution to Little Egret foraging behavior in different habitats. They observed that less active foraging techniques were used in the habitat with the most cover and lowest prey density.

Spring tides in southern New Jersey provided a natural experiment regarding the relationship between prey distribution and foraging behavior within a single habitat. Observations suggested that use of the relatively sedentary tongue-flicking behavior may have also been a response to reduced prey density.

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