Prey Handling in Yellow-crowned Night Herons

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Although an extensive literature exists on the foraging ecology of wading birds (reviewed by Kushlan 1978), detailed studies of the Yellow-crowned Night Heron (*Nyctanassa violacea*) are lacking. The yellow-crown is unique among the ardeids in that it specializes on crustacean prey (Palmer 1962, Hancock and Elliott 1978) and exhibits behavioral and morphological adaptations suited to this diet. Analyses of prey handling are presented here.

Feeding data were collected at Mount Sinai Harbor and John F. Kennedy Wildlife Sanctuary, Long Island, New York and Stone Harbor, New Jersey between May and August 1979 and 1980. Adult yellow-crowns were observed foraging in tide channels, tide-pool depressions, *Spartina* grass, and on mud flats. Prey included fiddler crabs (*Uca pugnax*), marsh crabs (*Sesarma reticulatum*), rock crabs (*Cancer irroratus*), and American eels (*Anguilla rostrata*). Data were also collected at a commercial shrimp farm situated on a cleared mangrove swamp in Chomes, Puntarenas Province, Costa Rica during October and December 1980. Yellow-crowns foraged in man-made basins containing penaeid shrimps, portunid crabs, and various fishes. All observations were made during daylight hours, although feeding also occurred at night.

Prey sizes were estimated by comparing captured large prey with the length of the heron's bill (mean bill length ± 1 SD = 72.7 mm ± 3.3, from measurements of 15 male and 15 female museum specimens, unpubl. data; dimensions of males and females were pooled, because sexes were indistinguishable in the field). Published data (Mulstay 1975) and measurements of prey remains from nest sites were used to estimate sizes of small prey. Prey-handling times were recorded with a stopwatch. (I defined prey-handling time as the time elapsed between initial grasping of prey and swallowing.)

Handling time varied directly with prey size within Brachyura (Fig. 1). A Model I regression of logarithmically transformed handling times on rank order of crabs by increasing size (1 through 4) was highly significant ($0.001 < P < 0.005$; regression equation: $y = 0.611x + 0.165$; Sokal and Rohlf 1969), justifying the above conclusion. All observations were pooled within a given prey category regardless of geographic locality. Crabs exhibited no marked behavioral differences among species after capture; therefore, size was considered the major determinant of handling time. There was a direct association between handling time and prey length within *Anguilla rostrata* (Fig. 2, Kendall Tau coefficient = 0.566; $0.008 < P < 0.014$; Gibbons 1976). Typically, all eel size classes wrapped their body around the yellow-crown's bill during manipulation, contributing to

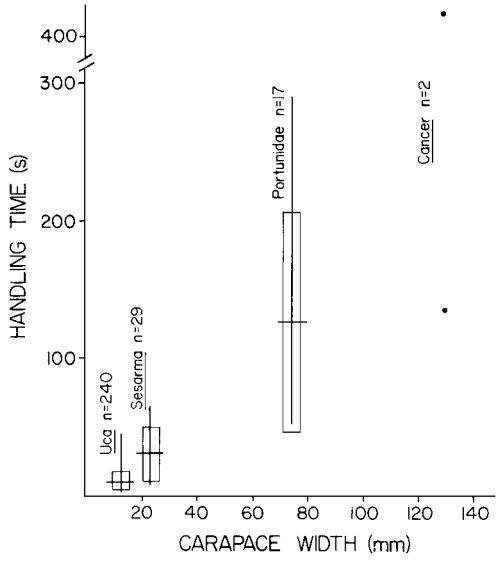

Fig. 1. Handling time of Yellow-crowned Night Herons in relation to prey size within Brachyura. Horizontal lines represent means, vertical lines depict ranges, rectangles enclose mean ± 1 SD, and points indicate individual observations.

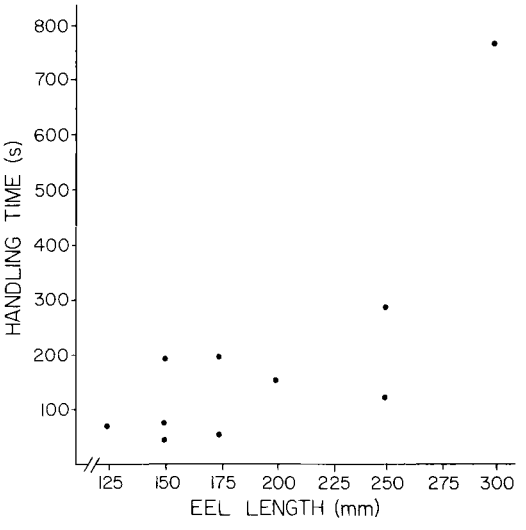

Fig. 2. Handling time of Yellow-crowned Night Herons in relation to prey length within *Anguilla rostrata*. Points represent individual observations.

TABLE 1. Frequencies of prey dropping by Yellow-crowned Night Herons.[a]

Prey	Mean carapace width (mm)[b]	Prey (*n*)	Drops/prey	Percentage of prey dropped ≥1 time
Uca pugnax	13.2	240	0.10	7.5
Sesarma reticulatum	22.7	29	0.90	31.0
Portunidae	75.0	17	4.24	82.4
Cancer irroratus	130.0	2	9.00	100.0

[a] Data are from field observations in New York and New Jersey, except for Portunidae (not identified to genus), which were observed in Chomes, Puntarenas Province, Costa Rica.

[b] Mean sizes of Portunidae and *Cancer* were estimated in the field (see text). The mean size of *Uca* was determined from 17 carapaces found in prey remains at nest sites. The mean size of *Sesarma* was determined from measurements of 248 individuals from Mount Sinai Harbor, New York (Mulstay 1975).

handling time. Eels also demonstrate this behavior when handled by other ardeids (Recher and Recher 1968). Amphipods and small fishes (<20 mm) constituted the category of smallest prey captured by yellow-crowns during my field observations. Consumption of these prey occurred almost instantaneously after grasping.

The frequency of prey (crab) dropping during manipulation is reported in Table 1 (an item that fell from the bill while the heron's head was raised was considered a "drop"). Larger crabs were dropped more frequently than smaller ones (R×C test of independence; $G = 60.34$, $df = 3$, $P < 0.005$; Sokal and Rohlf 1969). Yellow-crowns transported greater than 95% of larger prey, including rock crabs, portunid crabs, large marsh crabs, and eels, away from submerged areas to exposed terrestrial patches. Smaller prey (fiddler crabs and small fishes) were rarely carried to other sites before ingestion. The transport of prey to exposed surfaces is common among wading birds (Kushlan 1978) and is obviously a measure associated with reducing escapes (Recher and Recher 1968). Prey transported by yellow-crowns moved awkwardly on exposed surfaces and failed to escape when dropped. The herons usually impaled these prey repeatedly with their bills by jabbing their heads downward. Herons removed the crabs' chelae and legs by gripping either the appendages or carapaces in their bills and then vigorously shaking their heads. The carapaces were crushed between the mandibles and swallowed with characteristic upward head tilting; the appendages were eaten subsequently. After the entire prey was consumed, the heron returned to the water and drank to facilitate swallowing.

In summary, the duration of prey handling by Yellow-crowned Night Herons is directly related to prey size. This relationship has been found in other wading birds (Recher and Recher 1968, Kushlan 1979, Quinney and Smith 1980). Prey transport by yellow-crowns away from submerged areas to exposed surfaces is a behavior used to reduce prey escapes during manipulation.

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