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THE DIET OF CHESAPEAKE BAY OSPREYS AND THEIR IMPACT ON THE LOCAL FISHERY

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ABSTRACT.—Ospreys (*Pandion haliaetus*), were observed at seven nests located in southwestern Chesapeake Bay, for 642 hr between 21 May and 25 July 1985. On average 5.4 fish/day were delivered to the nests. The size of fish delivered ranged from 4 to 43 cm, and the mean weight of fish delivered was 156.9 g. Atlantic Menhaden (*Brevortia tyrannus*) accounted for nearly 75% of the diet, although White Perch (*Morone americana*), Atlantic Croaker (*Micropogonias undulatus*), Oyster Toadfish (*Opsanus tau*), and American Eel (*Anguilla rostrata*) also were common prey. Chesapeake Bay Ospreys, estimated at 3000 breeding pairs, would be expected to eat about 132 171 kg of fish during the 52-day nestling period. This "harvest" represents 0.004% of the annual Chesapeake Bay commercial harvest and likely has a minimal impact on the local fishery.

La dieta de Águila Pescadora (*Pandion haliaetus*) en la Bahía Chesapeake y su impacto en la pesca local

EXTRACTO.—Águilas Pescadoras (*Pandion haliaetus*) en siete nidos ubicados en la zona sudoeste de la Bahía Chesapeake, fueron observadas por 642 horas entre el 21 de mayo y el 25 de julio de 1985. Un promedio de 5.4 pesces/día fueron llevados a cada nido. El tamaño del pescado que fue llevado al nido osciló entre 4 y 43 cm, y el peso medio fue de 156.9 g. Los peces de la especie *Brevortia tyrannus* constituyeron cerca del 75% de la dieta, aunque peces de las especies *Morone americana, Micropogonias undulatus, Opsanus tau, Anguilla rostrata* también fueron presa común. Se estima que 3000 pares de Águilas Pescadoras de la Bahía de Chesapeake, en la época reproductiva, podrían comer aproximadamente 132 171 kg de pescado durante los 52 días del período en que las crías están en el nido. Esta "cosecha" de peces representa 0.004% de la pesca comercial anual de la Bahía de Chesapeake y al parecer tiene un impacto mínimo en la industria de pesca local.

[Traducción de Eudoxio Paredes-Ruiz]

Few studies have reported on the feeding ecology of Ospreys (*Pandion haliaetus*) in the Chesapeake Bay (Stinson 1978, McLean 1986). Because Ospreys might compete with commercial fishermen for the bay's ever-diminishing fish populations, this paper reports on the food habits of Ospreys of southwestern Chesapeake Bay and their bearing on the bay's fishery.

MATERIALS AND METHODS

Between 21 May and 25 July 1985, we observed seven Osprey nests located in Mathews and Lancaster Counties, Virginia. Nests were approximately 25 to 125 m from shore making them easy to observe and accessible by boat. At three sites, nests were close enough to allow two to be observed simultaneously. Ospreys were observed 4 d/wk. Each day included two 7.5 hr observation periods (0530–1300 and 1300–2030 H) which were arranged systematically to allow 16 hr of observation per nest. We used 20 by 60, 40 by 60 and 40 by 80 spotting scopes for observation of the number, species and size of fish delivered to the nest. We estimated the size of fish using reference points in and around the nest including the resident Osprey's tarsus. We also affixed a wooden rod, graduated at 12 cm intervals, to the nest to improve our size estimates. We later converted size estimates to grams using length-weight relationships specific for each fish (Table 1), and we based our calculation of species composition in the diet on wet weight values.

To further substantiate diet composition, we visited each nest twice a week to collect prey remains. Later, using a reference collection at the Virginia Institute of Marine Science and the assistance of the collection curator, the remains were identified. Diet composition was based on frequency of occurrence of the prey item.

RESULTS AND DISCUSSION

We observed 378 fish being delivered in 642 hr of observation, giving an average of 54 fish/nest (SD = 12.5, $N = 7$) for the 10 wk. This delivery rate is equivalent to 5.4 fish/d given one observation day for each nest per week. Fish lengths ranged approximately 4–43 cm. During one nest visit, we noticed the occupants eating a very large Menhaden (*Brevoortia tyrannus*) measured later at 43 cm, but

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Table 1. Length-weight relationships of fish eaten by Chesapeake Bay Ospreys in 1985.

SPECIES	EQUATION[a]
Menhaden (*Brevoortia tyrannus*)	Ln W = −12.075 + 3.215 Ln fork L[b]
Eel (*Anguilla rostrata*)	Log W = −6.56 + 3.34 Log L[c]
Hogchoker (*Trinectes maculatus*)	Log W = −3.71095 + 2.65844 Log L[d]
Perch (*Morone americana*)	Log W = −5.172 + 3.190 Log L[e]
Flounder (*Paralichthys dentatus*)	Log W = −5.8759 + 3.3238 Log L[f]
Catfish (*Ictalurus catus*)	Log Y = 1.9791 + 0.1689 Log X[g]
Oyster Toadfish (*Opsanus tau*)	Log W = −5.223 + 3.223 Log L[h]
Seatrout (*Cynoscion nebulosus*)	Log W = −4.423 + 2.861 Log L[i]
Butterfish (*Peprilus triacanthus*)	Log W = −5.1852 + 3.2646 Log L[j]

[a] W or Y = Weight (g), L or X = Length (mm).
[b] From J. Merriner (National Marine Fisheries Service, unpubl. data).
[c] From Harrell and Loyacano (1980).
[d] From Dawson (1962) and D. Haven (Virginia Institute of Marine Science, unpubl. data).
[e] From St. Pierre and Davis (1972).
[f] From Lux and Porter (1966).
[g] From Jachowski and Schwartz (1965).
[h] From Swartz and van Engel (1968).
[i] From Mercer (1983).
[j] From Dupaul and McEachran (1973).

most large fish were American Eel (*Anguilla rostrata*), White Perch (*Morone americana*), White Catfish (*Ictalurus catus*), Atlantic Croaker (*Micropogonias undulatus*), or Spotted Seatrout (*Cynoscion nebulosus*).

Conversions of fish lengths to weights revealed that Atlantic Menhaden accounted for nearly 75% of the diet (Table 2). White Perch represented over 7% of the diet, whereas Atlantic Croaker, Oyster Toadfish (*Opsanus tau*), and American Eel each comprised about 3% of the diet. During the 10 wk of observation, we recorded 15 species delivered to the nest (Table 2). The mean weight of fish delivered during the nestling period was 156.9 g (SD = 167.1, N = 246). Diet composition varied among broods, however, nearly all broods received at least 50% Menhaden.

Analysis of prey remains indicated that Menhaden constituted almost 65%, whereas Oyster Toadfish, Atlantic Needlefish, White Perch, Croaker, and Sunfish together comprised 23%. Menhaden, in the form of opercula, pectoral and caudal fins, and scales, predominated in the remains taken at each nest. Mandibles, craniums, and bills of Needlefish and jaws of Oyster Toadfish were particularly well represented at two nests. The few American Eel remains reflected a bias in determining diet composition from prey remains; some prey (e.g., eel) were eaten more easily and had fewer bones and hard parts which would be rejected by the feeding Osprey. Also, food items found in the nest may have been nest material. The large Bluefish (*Pomatomus saltatrix*) cranium found in one of the nests was probably collected from the shore nearby. In other parts of the bay, Ospreys have been observed gathering Bluefish remains from the beach (P. Spitzer, pers. comm.).

The diet of Ospreys in southwestern Chesapeake Bay appears to reflect local prey availability; these results are similar to those of a recent study of Florida Ospreys (Edwards 1988). In Chesapeake Bay, Menhaden are plentiful and represent over 80% of the commercial catch (Thompson 1984). Because Menhaden school near the water's surface, they make attractive prey. On two occasions, we observed a male Osprey clutching two Menhaden, one in each set of talons. American Eels were hunted primarily over shallow water. Though a significant diet item in this study, they reputedly are unimportant in the diet of Osprey populations elsewhere (P. Spitzer, pers. comm.). Needlefish (*Strongylura marina*), Oyster Toadfish, Summer Flounder (*Paralichthys dentatus*) and Hogchokers (*Trinectes maculatus*) are typically bottom dwellers but also are found occasionally in the shallows, especially at high tide. Under these conditions, Ospreys can effectively capture these fish about 0.5 m beneath the water's surface (pers. observation). In Florida, Edwards (1988) demonstrated that Ospreys preferred Sunfish (*Lepomis* spp.)

Table 2. The diet of Ospreys in southwestern Chesapeake Bay based on the mean weight of fish delivered to the nest.

SPECIES	WEIGHT (g)[a]	% OF DIET
Menhaden (*Brevoortia tyrannus*)	152.5 (134.4, 255)	74.69
White perch (*Morone americana*)	290.0 (366.0, 13)	7.24
Atlantic croaker (*Micropogonias undulatus*)	185.9 (117.2, 11)	3.93
Oyster toadfish (*Opsanus tau*)	133.7 (52.8, 13)	3.34
American eel (*Anguilla rostrata*)	93.0 (90.6, 16)	2.86
Hogchoker (*Trinectes maculatus*)	120.5 (68.8, 8)	1.85
Summer flounder (*Paralichthys dentatus*)	82.0 (82.2, 11)	1.73
White catfish (*Ictalurus catus*)	223.2 (17.82, 4)	1.71
Spotted seatrout (*Cynoscion nebulosus*)	410.0 (278.6, 2)	1.58
Harvestfish (*Peprilus alepidotus*)	228.8 (—, 1)	0.44
Butterfish (*Peprilus triacanthus*)	222.8 (—, 1)	0.43
Needlefish (*Strongylura marina*)	54.6 (—, 1)	0.10
Cutlassfish (*Trichiurus lepturus*)	22.9 (25.0, 2)	0.09
Sunfish (*Lepomis macrochirus*)	15.2 (—, 1)	0.03
Spanish mackerel (*Scomberomorus maculatus*)	45.7 (—, 1)[b]	—
Unknown	32[c]	—
	Total	100.02

[a] Mean (SD, *N*).
[b] Length (cm); uncertain of length–weight relationship.
[c] Total number of unidentifiable species.

when they were more abundant and Shad (*Dorosoma* spp.) when Sunfish abundance declined.

In terms of fish size and the average number of fish delivered daily, our findings are consistent with some others' (Stinson 1978, Hakkinen 1977, Prevost 1982, Henny 1988). In an earlier study of Chesapeake Bay Ospreys, Stinson (1978) reported a mean fish size of 237.1 g (SD = 160.0). Prevost (1982) observed African Ospreys with fish as large as 740 g, though most fish generally weighed between 200 and 400 g. In Finland, Hakkinen (1977) found that 5.2 (SD = 1.0) fish were delivered per day.

It is likely that the Ospreys' impact on a fishery is insignificant. Hakkinen (1977) calculated that the Osprey population in Finland consumed 0.6% of the total Finnish freshwater fish catch. In the Chesapeake Bay, Ospreys consume 5.4 fish/d per breeding pair including young. Given a mean fish weight of 156.9 g, the Chesapeake Bay Osprey population (estimated at 3000 breeding pairs) would be expected to eat approximately 132 171 kg of fish over the 52-d nestling period. This Osprey "harvest" represents 0.004% of the annual Chesapeake Bay commercial harvest of nearly 300 million kg (Thompson 1984). Clearly, the Ospreys' influence on the bay's fishery is negligible.

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